Music Therapy, Acquired Brain Injury and Interpersonal Communication Competencies

Randomized cross-over study on music therapy in neurological rehabilitation

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MUSIC THERAPY, ACQUIRED BRAIN INJURY AND INTERPERSONAL COMMUNICATION COMPETENCIES

Randomized cross-over study on music therapy in neurological rehabilitation

THESIS SUBMITTED FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY
BY

SØREN VESTER HALD

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Randomized cross-over study on music therapy in neurological rehabilitation

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Thesis submitted for the degree of
Doctor of philosophy

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The doctoral program in music therapy
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Aalborg University, Denmark
2012

Declaration

I confirm that this thesis and the research it presents has not previously, in part or in its entirety, been submitted for examination at an academic institution of higher education in Denmark or abroad. Except where otherwise indicated, this thesis is my own work.

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DATE SØREN VESTER HALD

Abstract

Background

Acquired brain injury (ABI) often affects physical, cognitive and psychological aspects of a person's functioning (Bateman, et al., 2010). Psychosocial problems associated with ABI may be the major challenge facing the rehabilitation process (Morton & Wehman, 1995). Consequently, interventions that counter these challenges are crucial. Clinical practice shows that music is a useful tool to stimulate interaction since musical interaction can be engaged at almost any cognitive and physical level and still be meaningful (Baker & Tamplin, 2006; Gilbertson, 2005; Hald, 2011). In addition, music therapy researchers specialising in ABI have found that:

- Music therapy is a powerful means to improve communication, general behavior, and musical behavior (Purdie, Hamilton, & Baldwin, 1997).
- Music therapy can increase emotional stability, clarify thoughts, stimulate spontaneous interaction, and increase motivation and co-operation (Nayak, Wheeler, Shiflett, & Agostinelli, 2000).
- Music therapy can move a participant towards integration and conventional interaction (S. Gilbertson & Aldridge, 2008, p.141).

The theoretical framework for this study is based on Daniel Stern's (2000) concept of ways-of-being-with, the theories of communicative musicality (Malloch & Trevarthen, 2009), and the model of interpersonal communication competencies (Rubin & Martin, 1994). The theories support the notion that musical interaction and improvisation can facilitate development in basic communicative competencies.

Purpose

The main purpose of this study has been to examine whether 20 music therapy sessions in neurological rehabilitation have an effect on interpersonal communication competencies in everyday life and musical interactions as compared to standard rehabilitation alone. A secondary purpose of the study has been to develop a research protocol that in a consistent and reliable way assesses interpersonal communication competencies in music and everyday life. The third purpose has been to develop an Improvisation Assessment Profile Protocol that in a reliable way would reveal information about a participant's communicative musicality.

Research questions

1) What effect does music therapy have on interpersonal communication competencies in people with acquired brain injury?

2) How can revised versions of Rubin and Martin's (1994) Interpersonal Communication Competence Scale (ICCS) reliably measure the participants'

interpersonal communication competencies in both music and everyday life?

3) How can the Improvisation Assessment Profile be implemented as a reliable rater-tool in measuring improvisational autonomy and communicative musicality?

Method/design

A randomized cross-over design involving 11 persons with ABI was adopted to answer the main research question (Question 1). The 11 participants were randomized into two intervention groups using a matched pairs design (Robson, 2011). Group I (n=6) commenced with 20 music therapy sessions plus standard rehabilitation. Group II commenced with standard rehabilitation alone. After a wash-out period, the conditions were crossed over. The 11 participants were recruited from the Activity Center at the rehabilitation institution Høskoven in Aarhus and had all lived with their ABI for more than five years. In addition, seven out of the eight participants who completed all measurements had previously participated in music therapy, either in groups or individually. Participants, staff, and relatives completed the Rehabilitation Needs Questionnaire (RNQ) as a means of identifying the individual rehabilitation needs of the participants; these were then used to inform the choice of music therapy interventions.

Interpersonal communication competencies (ICC) in daily life were measured using two questionnaires. The researcher adapted the Interpersonal Communication Competence Scale (ICCS) (Rubin & Martin, 1994) into a self-report version specifically for the target population (ICCS_PAR), and a version designed to collect ICC information on the participant from staff and relatives (ICCS_SR).

In order to measure interpersonal communication competencies in musical improvisation, four improvisation assessment exercises were implemented pre and post music therapy. The participants and the music therapist leading the assessments reported their ICC experiences of engaging in the musical exercises using two musical interaction questionnaires developed for the research. The musical questionnaires were developed based on the ICCS (Rubin & Martin, 1994). An Interpersonal Communication Competence Scale Music Therapist version (ICCS_MT) and an Interpersonal Communication Competence Scale Music Therapy Participant version (ICCS_MTP) were developed. Blinded raters scored the participants' musical improvisations using a musical rater version of the ICCS (ICCS_MusRat) and the Improvisation Assessment Profile – Autonomy (IAP_Aut) (Bruscia, 1987). The IAP ratings were performed using four IAP scales; Rhythmic ground, Phrasing, Tonal/melodic ground, and Volume, and ratings were transformed into Likert-scale type data. The four IAP scales were chosen because they correspond with the features that define

communicative musicality (pulse, quality and phrasing) (Malloch & Trevarthen, 2009).

Results

Question 1

Questionnaire data from staff and relatives' evaluation of interpersonal communication competencies in everyday life (ICCS_SR) were subjected to ANOVA analyses indicating a non-significant effect of music therapy on interpersonal communication competencies as compared to the effect of standard rehabilitation alone.

Results indicate a significant ($p < .01$) correlation between interpersonal communication competencies in music, as evaluated by the music therapist, and everyday life, as rated by staff and relatives.

The improvisation assessment profile (IAP) analysis showed no significant development after 20 music therapy sessions, but results indicated increased partnership in phrasing, volume and tonal/melodic ground and increased autonomy in establishing rhythmic ground.

The effect size values on the subscale "self-disclosure" (staff/relative evaluation: $d=-1.447$, and music therapist evaluation: $d=-1.723$) suggest that the music therapy protocol led to an effect on the participants' self-disclosure competencies in both music and everyday life. Self-disclosure refers to being open and disclosing personal material to others. It seems realistic that the music therapy group format – the therapeutic style when initiating the improvisational and structured music playing – could have had a positive effect on the participants' self-disclosure competencies. This result was achieved despite the majority of the participants having participated in music therapy prior to this study. However, the small sample size means that all results have to be interpreted with high level of caution.

Question 2

The original ICCS by Rubin and Martin (1994) was translated into Danish and rephrased into a participant and a staff/relative questionnaire suitable for the ABI population. The Cronbach Alpha value on the participant version (ICCS_Par) indicated a "questionable" internal consistency ($\alpha=.675$), whereas the Cronbach Alpha value on the staff/relative version (ICCS_SR) indicated an "acceptable" internal consistency ($\alpha=.774$). These results indicate that further revision of the Danish version of the ICCS_Par has to be conducted or that the ICCS_Par questionnaire was too complex for the ABI population to complete. It has been possible to rephrase the original ICCS into three music versions: one version for music therapy participants, one version for music therapists, and one version for blinded raters to complete. The Cronbach Alpha value on the music therapist version (ICCS_MT) indicates a "good" internal consistency

(α=.890) whereas Cronbach Alpha values on the rater version (ICCS_MusRat) and music therapy participant version (ICCS_MTP) indicate that both have an "excellent" internal consistency (α=.902 and α=.933 respectively). Though the results are promising, further testing and revision of the questionnaires is needed in order to increase the reliability.

Question 3
Cohen's Kappa calculations on the raters' agreement on IAP ratings suggest that the raters agreed more when rating the participants' autonomy in regards to Rhythmic ground (K_w=.621) and Phrasing (K_w=.603), than on Volume (K_w=.475) and Tonal/melodic ground (K_w=.357). The results indicate that IAP rating can be applied as a valid and reliable rater-tool in measuring improvisational autonomy and communicative musicality in free improvisations.

Conclusion

The results suggest that music therapy (20 sessions) can have an effect on self-disclosure competencies in people with ABI even after more than five years of rehabilitation. A new measurement tool on interpersonal communication competencies in music and everyday life based on the ICCS by Rubin & Martin (1994) has been constructed. The study reveals a new way of calculating an IAP per minute score that assesses communicative musicality and gives a quantitative score on autonomy in musical improvisations.

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Table of Contents

List of Tables

List of Figures

List of Appendices

Chapter 1 – Introduction

This chapter contextualizes the research. The chapter starts by describing the context of the study, which concerns the post-hospitalization rehabilitation of people with acquired brain injury (ABI). The initial inspiration for this research project arose in this context where I, in the music therapy setting, experienced how playing music and improvising with voice and instruments could retrain basic interpersonal communication competencies of people with ABI. Basic knowledge and epidemiology of the researched population (people with ABI) is presented in order to give an understanding of the researched population. To narrow the focus of the study, definitions of verbal and nonverbal communication and their use in this thesis are hereafter stated. Personality changes and the consequences of ABI on interpersonal communication competencies are also presented in this chapter. Last in this chapter, theories of "self" and musical communication theory are presented in order to set the theoretical framework of this project: that the interacting "self" in the music therapy setting is provided with the possibility to rehearse fundamental communicative competencies.

Chapter 2 starts with a review of the research concerning music therapy with people who have suffered from ABI. The review of music therapy studies is followed by a review of research on ABI and interpersonal communication from other clinical areas. Last in Chapter 2 the research questions are presented.

Chapter 3 is a presentation of the methods applied in this study. The chapter describes: 1) the trial design, 2) participants and interventions, 3) outcomes (measures), 4) sample size, 5) randomization, 6) blinding and 7) statistical methods and ethical considerations.

Chapter 4 is a presentation of the statistical analyses and results of this study. Results from the randomized controlled crossover study include the effect of standard rehabilitation and music therapy on interpersonal communication competencies in everyday life, as scored by staff/relatives and participants. This is followed by a presentation of the results relating to the effects of music therapy on interpersonal communication competencies in four musical exercises performed pre and post 20 music therapy sessions, as rated by the music therapist, the music therapy participant, and the two blinded raters (including an IAP-Autonomy rating). The results chapter concludes with a correlation analysis of measures on interpersonal communication competencies in music and daily life. The last part of Chapter 4 presents the results of testing the study's reliability and validity. Finally, results of an internal consistency analysis (Cronbach alpha) on all the newly developed questionnaires and research tools are presented.

In Chapter 5 the results are related to the previous research and literature referred to in Chapters one and two. The last sections of Chapter 5 are a

discussion of study limitations, choice of intervention, research design, methods, and analysis. The clinical applicability of the individual parts of the research protocol is also discussed, as well as recommendations for future research.

1.1 Context of the study

This section presents the legislative framework for the present study. In Denmark, people who have suffered an acquired brain injury (ABI) first receive intensive rehabilitation at a hospital. When the first intensive hospital rehabilitation is concluded, the person is discharged to their home municipality. If needed, they are offered continued rehabilitation in their home municipality (either in their home or in a community rehabilitation centre). The legislative framework for the continued rehabilitation is the social services act § 104, which states that: "The municipal council shall offer activity and social services for people with significant physical or mental disability, or with special social problems, for the maintenance or improvement of personal skills or living conditions" (Goverment, 2012, p.1 (my translation)).

A governmental analysis of the rehabilitation methods used in ABI rehabilitation in Denmark emphasizes that people with ABI need active involvement in the form of therapeutic and educational approaches that support personal motivation, autonomy and sense of self in order to better master their new life situation (Sundhedsstyrelsen, 2011). The governmental analysis stresses that ABI rehabilitation should involve interaction with others in settings where there are understanding and opportunities of individuals' needs and that support development of a new, positive, understanding of their life situation (Sundhedsstyrelsen, 2011).

The present study was undertaken in an institution that is funded by § 104 in the Danish social service act; Høskoven in Aarhus. The aim of the study has been to research and subsequently document whether music therapy, used in addressing rehabilitation needs, has an effect on people with ABI in terms of their competence in communicating with others – both musically and in everyday interactions. The underlying idea is that a decrease in rehabilitation needs and an increase in interpersonal communication competencies would hopefully promote increased interactions with others and help the people with ABI develop a new, positive, understanding of their life situation.

1.2 Background information

This section presents general knowledge about music therapy, ABI, and my own perspectives that informed the research. In a literature review on the psychosocial and emotional sequelae of individuals with traumatic brain injury, Morton and Wehman (1995) state that "Researchers have consistently suggested that the psychosocial problems associated with traumatic brain injury (TBI)

may actually be the major challenge facing rehabilitation"(Morton & Wehman, 1995, p. 81). Their findings are supported by a Danish follow-up study on post-ABI rehabilitation which concludes that "symptomatology, functioning and social conditions remain affected and perhaps stagnant in long-term survivors of stroke"(Teasdale & Engberg, 2005, p.1). A British study finds that people with Traumatic brain injury, one year post-injury, experience social communication skill deficits which are associated with decreased community participation and life satisfaction (Dahlberg, et al., 2007). This finding aligns with the findings from another study where people with ABI complained more about loneliness than any other aspect of their situation (Thomsen, 1974). Hyman (1972) found that social isolation amongst stroke patients correlates with poor motivation for rehabilitation. Rehabilitation professionals generally agree that emotional, social, and behavioral impairments are more predictive of the level of personal limitations following ABI than are cognitive and physical impairments (M. A. Struchen, et al., 2008, p.1).

In music therapy theory, several approaches to conducting music therapy in ABI rehabilitation are described (Aldridge, 2005; F. Baker & Tamplin, 2006; Michael H. Thaut, 2005; Tomaino, 1998). The focus on the need for rehabilitation is central in both Thaut (2005) and Baker et al.'s (2005) books on neurological rehabilitation. Both focus on the functional effect of making music (sensor motoric, speech/verbal, and cognitive). However, when engaging the participant in identifying rehabilitation needs, the actual clinical approach "[…] draws on an unlimited number of musical resources and experiences to be translated creatively, yet logically, into a functional therapeutic experience for the client"(Michael H. Thaut, 2005, p127). A more communicative approach to clinical ABI music therapy is described by Aldridge (2005, p12) who states the "[…] hypotheses that we are performed beings and that our performance is achieved through and with others as dialogue". By being in dialogue (both verbally and musically) with the music therapy participants, Aldridge (2005) argues that the participants' identities are being validated. In addition, Aldridge (2005, p.59) illustrates how music therapy in ABI rehabilitation can potentially facilitate communication, promote memory skills, encourage rhythmic movement, give room for emotional expression and relief, and increase quality of life.

In this study, the clinical music therapy was conducted in groups and based on the participants' rehabilitation needs (implying a functional approach). In addition, the music therapy finished with a concert performance (participation of which was voluntary and decided in the first session). The actual music therapy sessions began in Høskovens café, where the groups met and had coffee before going to the therapy room together. When all were in place in the therapy room, the sessions continued with a verbal "check-in" where participants verbally shared issues present in their minds. After this "real world" debrief, a body awareness/warm-up helped the participants focus their

energy to the present time. A vocal warm-up, followed by structured singing and instrumental/voice improvisation, commenced to practice the participants' personal vocal expression and vocal range. This was undertaken to address rehabilitation needs and as a preparation for the later singing of songs at the concert. After a short break, the songs for the performance were rehearsed with instruments. The sessions all concluded with a verbal "check-out" where everybody verbally expressed how he or she had experienced the session.

The communication and energy in the groups revolved around both addressing rehabilitation needs and preparing the concert. The preparation for the concert meant repetitive practice and rehearsals, which in return also had a positive impact on the functional rehabilitation needs. The participants had an experience of sharing music and thoughts while learning to agree on differing musical needs and tastes. Through this process, the participants potentially experienced meaning, identity, engagement and belonging. A fundamental feature of this type of work is the acceptance of the differences between group members. Stige (2003) called this "unity beyond uniformity" (p. 173). Letting the music therapy extend beyond the four walls of the music therapy room, i.e. with a musical performance, points in the direction of Community Music Therapy (Stige et al., 2010). However, the community was only active as an audience and not engaged directly in any music-making. In relation to finishing with a public concert performance, Ansdell writes: "Performance occasions can be an appropriate therapeutic medium – providing a site, focus, tool or occasion for music therapy work with both individual and socio-cultural dimensions of human needs […]. Performance work in music therapy can keep a focus on process whilst also working for outcomes [...]. Performances create and sustain networks of relationships between and amongst people, institutions and communities" (Stige, et al., 2010, p.165). The concert performance has, in other words, given the conducted therapy a socio-cultural framework. The participants have worked together and formed relationships focusing on both the concert and individual rehabilitation needs. In relation to working together in making music (musicing), Pavlicevic writes, "Collaborative musicing, […] affords relationships and interactions to be enacted with all the improvisatory complexities of everyday life. [..] This "improvisatory" stance goes beyond "musical" improvisation, and absorbs events, speech, and interruptions and intrusions from its periphery" (Stige, et al., 2010, p.111).

The Pavlicevic quote points in the direction of the aim of this study, which has been to measure whether music therapy (which includes structured and improvised musical communication), has an effect on everyday improvisation competencies (which include verbal and nonverbal communication). This whole chapter is an introduction to the theoretical framework of this study. However, in order to guide the reader into the study, the next section is an introduction to the clinical and personal experiences leading to the focus of the study.

1.2.1 Researchers clinical experiences leading to the focus of the study

This section presents my clinical music therapy background and the precursor to this research. According to Bateson (1991), it is necessary for readers of scientific texts to have knowledge and awareness of the researcher's background and assumptions in order to critically evaluate the results.

In 2004, I finished my Master in music therapy from Aalborg University and was employed as a full-time music therapist at the institution where I undertook my last internship; Høskoven, a rehabilitation institution for people with ABI. At Høskoven, I worked clinically with 24 full-time residents (inpatients), 47 persons enrolled in the day activity centre (outpatients), and up to 12 persons with acute ABI who had been given a ten-month rehabilitation offer immediately after hospitalization. From March 2004 to November 2010, music therapy was offered to all residents and participants at Høskoven (for more info on Høskoven see Section 3.2.1).

The music therapy participants'[1] rehabilitation needs, musical preferences, and musical competencies guided the music therapy that I conducted at Høskoven. In my work, I experienced that focusing on competencies (musical, physical, relational, communicative, etc.) increased the participants' motivation towards own rehabilitation. In my clinical work I have found it beneficial and rewarding to work together with colleagues from the "conventional therapies". Both my colleagues and I experienced that, when we applied the positive psychology approach, the music therapy participants became more motivated and involved in their own functional rehabilitation. In positive psychology (Seligman, 2011), the focus on competencies promotes a more positive understanding of the participants' life situation, resulting in increased engagement in their own rehabilitation and consequently an increase in the level of autonomy. Applying positive psychology in music therapy, is according to Ruud (2010, p90), not new. Ruud writes "Music therapists, perhaps more concerned with talents, resources, or basic competencies, have a long tradition of applying musical performance as a way to discover, asses and utilize motor, cognitive, emotional, social and communicative skills implicit in producing music"(Ruud, 2010, p90). However, even though the positive psychology approach is present in the everyday practice of most music therapists "there have been few attempts to formulate a more comprehensive approach to such a positive practise" (Rudd, 2010, p90). The goal of this project is not to formulate such an approach; I merely state that I have found it beneficial to apply the positive psychology

[1] In my clinical work, I have normally used the term participants when I referred to the people receiving music therapy. This is a conscious choice since the term participant implies an equal relationship and it has therefore been used throughout the thesis when referring to people participating in music therapy.

approach when addressing functional goals in ABI rehabilitation. In addition, the positive psychology approach has affected the choice of interpersonal communication measure (see Section 2.7).

One event in 2007 made me aware of the potential for music therapy to affect communication in people with ABI. In a music therapy group of four acutely injured people, one participant (a former medical doctor who had had a stroke) verbally expressed how he regarded the benefits of instrumental improvisation in group music therapy. He said; *it is peculiar how you are able to make us communicate. We live together in the same house, but it is not until we come to music therapy that we start communicating*. In the music therapy setting I experienced that both the ability to understand (decode) and send (encode) nonverbal and musical signals increased. These could be musical/nonverbal signals of turn-giving, phrasing, mirroring, etc. I started wondering whether the increased communication in music therapy could be transferred into daily life communication. I wondered if these "communicative musicality" competencies, as described by Malloch and Trevarthen (2009), are being retrained in music therapy, and whether the communicative musicality competencies can then transfer from the musical interaction into everyday communication via what Stern (2000) calls 'ways-of-being-with'. These theories will be elaborated later (in Sections 1.5 and 1.6), but in summary, communicative musicality has to do with the aspects of communication that are nonverbal (e.g. dynamics, quality, timing, etc.). In addition, the cognitive aspects of communication (attention, memory, expressiveness) and the emotional aspects of communication (empathy, supportiveness, self-disclosure etc.) are potentially retrained during the music therapy interaction and transferred into everyday communication as well.

In order to support the relevance of this study, the next section is an introduction to the epidemiology of ABI.

1.2.2 ABI epidemiology

This section is an introduction to epidemiology of people with acquired brain injury (ABI). The ABI abbreviation refers to brain damage caused by events after birth. An ABI is the result of either traumatic brain injury (e.g. head trauma due to accident, neurosurgery, head injury etc.) or non-traumatic injury as the consequence of either an internal or external source (e.g. stroke, brain tumour, disease, poisoning, hypoxia, or substance abuse). ABI does not include damage to the brain resulting from neurodegenerative disorders (e.g. multiple sclerosis, Alzheimer disease, etc.). According to the Brain Injury Network (BIN), there has been some confusion in the literature regarding the distinction between TBI (traumatic brain injury) and ABI. However, the neurological field has, in recent years, acknowledged that TBI is a sub-category of ABI (Network, 2012). At the International Brain Injury Association and the European Brain

Injury Society WebPages there is no clear distinction between ABI and TBI, and they both seem to focus on TBI (Croisiaux, 2012; IBIA, 2012).

There are approximately 60,000 people in Denmark living with an ABI, of which stroke and traumatic brain injury are the main causes. According to the Danish National Patient Registry, Denmark had approximately 12,500 new cases of hospitalization from stroke in 2009 (227 per 100 000) and about 9,500 cases of hospitalization from traumatic brain injury and other forms of acquired brain injury (173 per 100 000) (Hørder, Beck, & Andersen, 2011). In Europe the incidence of hospitalized and fatal TBI is approximately 235 per 100 000, similar to that found in Australia (Maas, Stocchetti, & Bullock, 2008). The incidents of stroke in Europe vary from region to region as well as with gender. In men there are 101.2 per 100 000 in Sesto Fiorentino (Italy) and 239.3 per 100 000 in Kaunas (Lithuania) (Wolfe, 2009). In addition, chances of suffering a stroke increase with age (Gade, 1997).

1.2.3 Consequences of an ABI

This section presents an overview of some of the functional consequences of having an ABI. Since the brain is every person's "centre of control", having an ABI can result in cognitive, physical, emotional, or behavioural impairments (Bateman, et al., 2010). The Rusk Institute of Rehabilitation Medicine has made a neuropsychological model of functional disabilities following traumatic brain injury (Kay, Newman, Cavallo, Ezrachi, & Resnick, 1992). The model describes three problem areas (Physical, Cognitive, and Psychological) which all influence the functional level of people with ABI. A person's functional level is experienced individually, but unfolds within the interpersonal space. Therefore, the interpersonal consequence of having an ABI has been added to the model in this portrayal of the individuals' consequences of having an ABI. A list of significant cognitive, physical, psychological, and interpersonal challenges following ABI is given in Table 1.

Table 1 Significant cognitive, physical, psychological, and interpersonal challenges following ABI

The cognitive factors (including the ability to choose, understand, remember, and use information) • Attention and concentration • Speed of information processing and understanding information • Memory (short- and long-term) • Verbal language skills (understanding and producing words - Aphasia) • Executive function (conducting, planning, organizing, and assembling activities) • Reasoning, problem-solving, decision-making, and judgment • Controlling impulses and desires, and being patient (Bateman, et al., 2010; Kay, et al., 1992)
The physical factors (including paralysis or weakening of body functions, muscle strength, and coordination) • Movement, balance and coordination • Loss of sensation (including vision, hearing, taste and smell)

• Tiredness and fatigue • Headaches • Muscular speaking and swallowing disorders • Incontinence • Epilepsy (Bateman, et al., 2010; Kay, et al., 1992)
The psychological/emotional factors • Temper outburst and irritability • Depression • Anxiety • Mood swings • Lack of emotional response (Bateman, et al., 2010; Kay, et al., 1992)
The interpersonal factors (due to the mentioned cognitive, physical, and psychological/emotional problems) • Difficulties in maintaining a topic in a conversation • Remembering agreements • Lack of self-expression (verbal and nonverbal) • Lack of initiative • Lack of understanding of social rules (inappropriate behaviour) • Repetitive talk • Immobility (Bateman, et al., 2010; Kay, et al., 1992)

As indicated in Table 1, having an ABI not only affects the individual but also his/her ability to interact with others. While the entire context is important to ensure a satisfactory life existence, this study primarily focuses on the individual person's ability to interact (not the context's ability to adapt). Similarly, I acknowledge the significance of brain functioning and its role in performing communicative and cognitive tasks. However, since the study does not involve brain scans and participants are not selected based on type of injury, it is not relevant for this study to describe how the brain functions or what areas are involved in the different cognitive and communicative tasks.

To provide the reader with the necessary background to understand the study, the next section will focus on theories of communication.

1.3 Communication

This section is an introduction to the term communication. The verb 'to communicate' comes from Latin and means 'to share' or 'to make common' – a meaning that, according to Hargie and Dickson (2004), is "reflected in many of the definitions available in the current literature"(p.12). The concept of communication can be viewed from a range of theoretical perspectives and is "notoriously difficult to pin down" (Hargie & Dickson, 2004, p.12). "Despite the ancient roots and growing profusion of theories about communication, I argue that communication theory as an identifiable field of study does not yet exist"(Craig, 1999, p.119). These statements underline the need for an introduction to how communication is viewed in this thesis.

Communication can be conceptualised as a process of sending and receiving messages, or what Craig (1999) termed "the conventional transmission model" due to its focus on information exchange. According to Craig (1999), the other major tradition of conceptualizing communication is the "constructural model" which focuses on communication as a constitutive process that produces and reproduces shared meaning.

It is not within the scope of this project to discuss meta-theory on communication. I will merely define it as the interchange of thoughts, opinions, or information by words (verbally) or by sound and signs (nonverbally) (Dictionary.com, 2011) thereby excluding written and all other non-live forms of communication. A more detailed definition of communication that is also in line with the usage in this thesis is that by Hargie and Dickson (2001). It states that communication is a process that requires at least two people contributing to the "ongoing and dynamic sequence of events in which each affects and is affected by the other in a system of reciprocal determination. […] each at the same time perceives the other in context, makes some sort of sense of what is happening, comes to a decision as to how to react and respond accordingly" (Hargie & Dickson, 2004, p.13). My definition of communication is therefore in line with the "constructural model".

The ability to communicate competently relies on a range of competencies. The next section will explicate how interpersonal communication competencies are defined in this thesis.

1.3.1 Interpersonal communication competencies

This section is an introduction to the concept of interpersonal communication competencies (ICC). The literature definitions of interpersonal communication are very diverse as Jablin & Sias (2001) state in their review of competencies and their categorization: "There are almost as many definitions of communication competence as there are researchers interested in the construct" (Sias & Jablin, 2001, p.820). Their statement is in line with communication expert Spitzberg (2003) who states that "Few characteristics are more important to the everyday quality of life as the skill with which interpersonal communication is negotiated, yet few concepts are as difficult to define and assess as interpersonal skills" (p. 93).

The communication researcher Spitzberg has identified "well over 100 factor-analytically derived labels of skills or dimensions attributed to interpersonal competence or skill […] there still are no widely accepted theoretical models that specify what skills comprise the essential competencies of social interaction." (Spitzberg, 2003, p.117). Spitzberg (2003) has identified four studies that have developed comprehensive models of interpersonal communication competencies. (Bruch et al., 1998) and (Lamke et al., 1994) focus on competencies needed for interaction between genders. The third

study/model by Canary and Spitzberg (1989) focuses on conflict strategies, whereas the model by Rubin and Martin (1994) focuses on general interpersonal communication competencies. In the current study, the topic of interest is not interaction between genders nor is it conflict strategies. Therefore, the most relevant model of interpersonal communication for this study is Rubin and Martin (1994)'s model of interpersonal communication competencies. This model was constructed based on construct definitions used in ten other models of interpersonal communication competence (Rubin & Martin, 1994).

However, a major part of my literature review (Chapter 2) is a review of research tools on interpersonal communication used in ABI rehabilitation. The goal was to identify a tool that was generally applied in ABI research. All identified tools represent a construct of interpersonal communication and the tools are all reviewed in detail in Chapter 2. Three standardized interpersonal communication measurement tools that have been applied in ABI music therapy research were identified:

1. The "social interaction subscale" of the Sickness Impact Profile (SIP) (Nayak, et al., 2000) which assesses level of social dysfunction.
2. An adapted version of the Neurobehavioral Rating Scale (NRS) (Purdie, et al., 1997) which assess ABI-specific problems in relation to executive/cognitive functioning, positive symptoms, negative symptoms, and mood/affect (McCauley, et al., 2001).
3. A modified version of the Relationship Change Scale (RCS) (Jeong & Kim, 2007) which assesses eight features of relationship: Leading-advising, Self-enhancing-competitive, Aggressive-rejecting, Resisting-distrustful, Self-effacing-submissive, Docile-dependent, Cooperative-friendly, Accepting-assisting (Shannon & Guerney, 1973)

In ABI research from clinical fields other than music therapy, nine standardized tools on social interaction were identified:

1. Katz Adjustment Scale (KAS) assesses ten problematic areas: Belligerence, Apathy, Social irresponsibility, Orientation, Antisocial behavior, Speech-cognitive dysfunction, Bizarreness, Paranoid ideation, Verbal expansiveness, Emotional sensitivity (K. A. Baker, Schmidt, Heinemann, Langley, & Miranti, 1998).
2. Behaviorally Referenced Rating System of Intermediate Social Skills (BRISS) assess deficits in social behavior on both verbal and nonverbal components (Flanagan, McDonald, & Togher, 1995).
3. Social Communication Skills Questionnaire-adapted (SCSQ-a) assesses the participant's level of understanding of social communication and degree of insight regarding communicative behaviors (Dahlberg, et al., 2007).
4. Craig Handicap Assessment and Reporting Technique-Short Form (CHAR-SF) assesses living situation in terms of number of contacts with relatives, business contacts, friends, and strangers (Dahlberg, et al., 2007).

5. Interpersonal Relationship Rating Scale (IRRS) assesses inner-self, self-disclosure, reaching out to others, resourcefulness, empathy, and helping relationship (Brown & Sullivan, 1979).
6. Adaptive Behavior Scale (ABS) is a series of tests used to quantify the ability to live independently (Godfrey & Knight, 1988)
7. Community Integration Questionnaire (CIQ) measures the frequency of activities such as shopping, leisure pursuits, visiting friends, etc. (Dahlberg, et al., 2007).
8. Interpersonal Communication Inventory (ICI) assess social ability in self-concept, being a listener, verbal expressiveness, emotional coping, and self-disclosure (Vealey, Armstrong, Comar, & Greenleaf, 1998).
9. Profile of Functional Impairments in Communication (PFIC) evaluates participants' social ability in logical content, participation, quantity, quality, internal relation, external relation, clarity of expression, social style, subject matter, and aesthetics (Linscott, Knight, & Godfrey, 1996)

The process of selecting a research tool is described in Section 2.7 but it can be reduced to two major criteria: 1) the model of interpersonal communication had to be comprehensive (covering both verbal and nonverbal aspects), and 2) the model should have a positive psychology approach meaning that it should not focus on deficits, problems, and impairments. Requiring the model of communication to be comprehensive meant that the ICI and IRRS models were inapplicable; despite their overall perspective they do not assess the ability to follow interactional rules and aspects of nonverbal communication. The IRS was not selected because it assesses relationships and not communication. The CHAR-SF, CIQ and ABS were deemed inapplicable since they only assess frequency of social interactions. The other major criterion was that the model focuses on competencies. The SCSQ-a was therefore deselected since it assesses the participants' understanding of communication. The SIP, KAS, PFIC and BRISS were not selected primarily because they focus on impairments, dysfunction, and deficits. A more thorough presentation of the instruments is presented in Chapter 2.

It was decided that the model of interpersonal communication most appropriate for this study is the ten dimensions of interpersonal communication competence identified by communication experts Rubin and Martin (1994). The rationale is that theirs is the only comprehensive model that focuses on general communication competencies (Spitzberg, 2003). In addition, the Rubin and Martin (1994) model focuses on communication competencies and not communication deficits as most other interaction research tools tend to. Rubin and Martin (1994) state that there seems to be a broad agreement within the communication research community about their ten general interpersonal communication competencies (Rubin & Martin, 1994, p.32); self-disclosure, empathy, social relaxation, assertiveness, interaction management, altercentrism, expressiveness, supportiveness, immediacy, and environmental

control (for more details on the model, see Section 2.7). According to Rubin and Martin (1994), a person communicating competently has the ability to:

- Reveal personal information (self-disclosure)
- Feel as or with others (empathy)
- Have a relaxed stance in social contexts (social relaxation)
- Be able to stand on own rights (assertiveness)
- Follow the ritualistic form in communication (interaction management)
- Be attentive and flexible towards other persons (altercentrism)
- Have good verbal and nonverbal encoding skills (expressiveness)
- Have the ability to confirm the others being non-judgmental (supportiveness)
- Show others that they are approachable and available for communication (immediacy)
- Solve interpersonal problems in a cooperative way and achieve predetermined goals (environmental control)

Rubin and Martin's (1994) model has not previously been applied ABI research but has been successfully implemented in doctoral studies in communication (Macik-Frey, 2007) and psychology (Fields, 2008). The Rubin and Martin (1994) model has, in addition, been successfully applied in research on attachment style (Anders & Tucker, 2000) and leadership training (Chan, 2003).

In this study, Rubin and Martin's (1994) ten interpersonal communication competencies served as the main reference when referring to interpersonal communication competencies (ICC). The model was chosen because it also provides a definition of how the competencies are expressed in real life.

The following sections are an introduction to nonverbal communication (encoding/decoding abilities), the vocal elements of nonverbal communication, and the cognitive processes involved in interpersonal communication.

1.3.2 Nonverbal communication

This section presents an introduction to the elements that form nonverbal communication. The section is important because of the similarities in musical and nonverbal communication. In addition, the theoretical framework underlines that, when interacting musically (on instruments, with voice, or when dancing), people are given a possibility to retrain nonverbal communicative competencies.

The purpose of spoken communication is semantic interchange, whereas the purpose of nonverbal communication is often seen as complementing the spoken word (Hargie & Dickson, 2004). The nonverbal signals are in the "organon model" divided into paralinguistic signals (e.g. tone of voice, pacing, pausing, emphasis, timing, prosodic contour) and nonverbal expressions (e.g. gesture, posture, and facial expression) (Ridder, 2003). Burgoon & Bacue (2003)

write about the importance of nonverbal communication: "Far too often, however, theoretical and practical conceptions of communication skill emphasize the role of verbal cues while discounting the importance of nonverbal behaviours in actualization of this endeavour. This is particularly alarming given estimates that upwards of 60% of the meaning in any social situation is communicated nonverbally […] and research indicating that nonverbal cues are especially likely to be believed when they conflict with verbal messages" (Burgoon & Bacue, 2003, p.179).

Skilful nonverbal interpersonal interaction is defined by context or culture. Some people interact with ease in some contexts but fail in others. Burgoon and Bacue (2003) state: "Although disagreement surrounds the extent to which there are innate and culturally universal displays of such elemental relational messages as threat, aggression, association, pair bonding, and play, there is little dispute that cultures overlay on any existing universal substrata a host of unique display rules, resulting in tremendous variation in how people express and interpret nonverbal cues" (Burgoon & Bacue, 2003, p.183). Since there is great variation in how people express and interpret nonverbal cues, it is important to analyze several contexts when assessing a person's (nonverbal) communicative competencies. In this study, therefore, as many informants (staff and relatives) as possible have informed the researcher about how they experience the participants' interpersonal communication competencies in everyday life.

1.3.3 Nonverbal encoding and decoding

This section is an introduction to research findings concerning human ability to encode and decode nonverbal cues. As presented in Section 1.2.1, I have experienced that people with ABI improve the encoding and decoding of musical signals as an outcome of music therapy. The purpose of this study is to investigate whether the ability to encode and decode musical signals is transferable from music therapy into everyday life communication.

Burgoon and Bacue (2003, p.185) have summarized a range of studies and findings about the ability to understand (decode) and send (encode) nonverbal cues:

- There is a weak correlation between the ability to encode and decode nonverbal cues. Those good at decoding are also good at encoding.
- Encoding ability is multimodal. Those having an expressive voice also tend to have an expressive face and gestures.
- Encoding abilities are positively related to personality traits. Those who are extroverted, communicative, high in self-esteem, high in self-monitoring, non-dogmatic, and general physically attractive seem to be more skilled in nonverbal encoding.

- Decoding skills are positively related to being sociable, non-anxious, emphatic, publicly self-conscious, independent, psychologically flexible, and intellectually efficient.
- Decoding skills improve with maturation, practice, and training.
- The decoding ability is curvilinearly related to age in that this ability is poorer among the very young and elderly.
- Decoding abilities seem to be positively correlated with intelligence and mental abilities.

People with ABI may have their nonverbal encoding and decoding abilities affected by their injuries. Typically, the impact is greater on decoding abilities, since they are correlated with mental abilities, which are often affected by brain injury (Gade, 1997). The multimodal aspect of encoding abilities is encouraging since it indicates that training of expressiveness (in voice, music, or other modes) can have an effect on other modes of expression. As described in Section 1.2.1, music offers an excellent means of working with multimodal aspects of encoding through musical improvisation and music-making in groups.

1.4 Interpersonal communication competencies after brain injury

This section is an introduction describing how ABI might impact on interpersonal communication competencies (ICC). It is relevant to readers of this study to have an understanding of the interactional problems people with ABI experience.

Even though the literature emphasizes that ABI is often accompanied by social and interpersonal problems, there are only a limited number of empirical studies that investigate this (Struchen, 2005). In fact, my review (see Section 2.5) identified only three studies comparing the ICC of ABI/TBI individuals with that of normal populations (Marsh & Knight, 1991; Oddy, Coughlan, Tyerman, & Jenkins, 1985; Oddy & Humphrey, 1980). None of the identified studies use the term ABI but rather focus on the ABI subgroup, TBI. This may be due to the fact that TBI is often caused by motor vehicle accidents, where the forces involved result in injury to frontal lobes and/or cerebellum (Gilbertson & Aldridge, 2008). The frontal brain areas are essential for social interaction (Goldberg, 2009). Because of the lack of ICC and ABI research, this section will primarily refer to studies that have researched people with TBI.

Results from Marsh and Knight (1991)'s study showed that people with TBI appeared disinterested during conversations, and their speech was characterized as lacking in fluency and clarity. People with TBI also showed difficulties in finding appropriate words, used inappropriate expressions and were unable to express ideas clearly. Marsh and Knight (1991) did not find significant correlation between cognitive competencies and deficits in social

behaviour. Finset et al. (1995) find a large variability in social interaction and support patterns two years after a TBI. Most patients had more interaction and received more support from family members than from friends and neighbours. It was reported by 57.4% of the study subjects that their social network had markedly declined subsequent to injury. The more severe the trauma was perceived to be, the more support was given from family and friends. In addition, pre-injury personality traits affect social recovery following ABI (Oddy & Humphrey, 1980). Physical factors are only important for the resumption of work but not for other aspects of social recovery (Oddy & Humphrey, 1980).

In Table 2, Struchen (2005) presents a synthesis of information about common cognitive and behavioural changes seen after TBI. In the left column the cognitive and behavioural changes are listed, and in the right column the impact on social communication abilities are listed.

Table 2 Examples of common cognitive/behavioural changes seen after ABI

Cognitive/behavioural changes due to Traumatic brain injury	**Possible impact on social communication abilities**
Attention/Concentration	
Poor concentration	Difficulty maintaining a topic, difficulty keeping track of conversation in presence of distractions
Difficulty shifting attention	Difficulty switching topic, problems in shifting between speaker and listener roles
Slowed processing speed	Long pauses in speaking, slowed down speaking rate, difficulty comprehending others when speaking at normal rate.
Learning and memory	
Poor immediate memory	Repeats self, loses track of conversation topic
Intrusions, susceptibility to interference	Mixes up instructions or messages, has difficulty staying on topic
Poor organization of learning/recall	Disorganized speech, rambling
Executive Functioning	
Difficulty with integration	Difficulty reconciling conflicting verbal/nonverbal information
Reduced initiation	Reduced initiation of conversation, apparent lack of interest in others
Poor self-monitoring	Poor use of feedback, poor recognition of errors
Poor planning/organization	Poor sequencing in giving directions, poorly organized speech
Egocentricity	Interrupts, excessive talking, difficulty taking others' perspectives
Perseveration	Difficulty changing topic, stereotyped responses
Poor regulation of emotion/behaviour	Unpredictable social behaviour, inappropriate laughter, excessive expression of anger
Poor self-awareness	Described unrealistic goals or life situations, lack of credibility, poor use of compensatory strategies

(Margaret A. Struchen, 2005, p.90)

In relation to Rubin and Martin's (1994) description of interpersonal communication competencies (Section 1.3.1), an ABI can affect all ten sub-competencies.

Because of temporary and/or permanently damaged regions of the brain, people with ABI are forced to face changes affecting life goals, possibilities, status, etc. In addition, they often display changes in personality. The next section is an introduction to some of these personality changes.

1.4.1 Personality changes after ABI

Changes in personality traits are very common following severe ABI, occurring in 60-80% of the population (McDonald, Togher, & Code, 1999) and must be considered as a significant contributor to the reduction of psychosocial functioning in this group. The personality changes seen include:

- Irritability, agitation and anger
- Abrupt and unexpected acts of violence or episodic lack of control
- Impulsiveness, impatience and restlessness
- Inappropriate social responses
- Emotional labiality
- Anxiety, suspiciousness, delusion, paranoia and mania
- No spontaneity, sluggishness, and loss of interest in the environment
- Loss of drive or initiative
- Depression
- Self-centredness, childishness, giddiness, and insensitivity to others
- Over talkativeness, exuberance
- Helplessness and lack of insight (Kelly, Brown, Todd, & Kremer, 2008; Prigatano, 1992; Yeates, Gracey, & McGrath, 2008).

These personality traits are counter-productive for any interpersonal interaction. My clinical experience is that, because of these personality changes, people with ABI are often in need of clear directions when they engage in interpersonal interactions in groups. In relation to the present study, the clinical music therapy was conducted with the therapist as interactional guide. The role of the therapist is described more detailed in Chapter 3.

In the literature, people with traumatic brain injury (TBI) are often highlighted as having greater psychosocial problems than people with other types of ABI. For example, Struchen (2005) writes: "Diffuse axonal injury is caused by shearing stains due to angular acceleration forces that occur during incidents like motor vehicle accidents or falls….these injury mechanisms contribute to the most common cognitive impairments experienced following TBI, namely, problems with slowed processing, attention and memory functioning, and executive dysfunction" (Struchen, 2005, p.89). This is in contrast to the findings of Soryal et al. (1992), who conducted a retrospective survey on rehabilitation needs of 78 patients who had sustained spontaneous hemorrhagic brain injury

and compared them with the findings in traumatically brain-injured patients managed in the same unit. Although there were some neuropsychological differences between the two groups, these were not reflected in the degree of dependence in activities of daily living (ADLs), which were remarkably similar. Since the focus of this study is developments in the communicative competencies of music therapy participants, the next section will address the theory of the communicating self.

1.5 The communicating self

This section is an introduction to the theoretical foundation for considering musical interaction as a training ground for general interpersonal interaction competencies. The theoretical foundation is found in Damasio's (2011) and Stern's (2000) concepts of 'self'. The theoretical framework is that the interacting "self" in the music therapy setting provides a possibility to retrain fundamental nonverbal interactional competencies such as attentiveness, empathy, self-disclosure, self-awareness, tone of voice, turn-taking, etc., and that these competencies are transferable to interaction in everyday life.

Interpersonal communication is a continuous process of signalling and receiving signals from and to others. Neurologically, the communicative modus is a continuous process of sensory input, integration, and motor output. The communicating self is composed of many relatively separate, but interdependent, neural systems that function as a coherent self system (Hart, 2006, p.270). Neurologist Damasio (2010) emphasizes that the communicating "self" is neurological, stemming from a complex network of systems in body and brain. Damasio (2010) describes the 'self' as a process. The self-process can be viewed from two vantage points – either as a dynamic **object** made up of mind, traits, history and behaviour – or the self as a **knower** reflecting on the self-as-object. This study focuses on the participants' interpersonal behaviour/communication - and not reflections on the participants' behaviour. Therefore the focus in this study can be said to be on the self-as-object, defined as: "[…] a dynamic collection of integrated neural processes, centred on the representation of the living body, that finds expression in a dynamic collection of integrated mental processes"(Damasio, 2010, p.9). Damasio (2010) forms a theory of how the self is built in distinct steps and is grounded in the neurological functioning of the brainstem. The first step is a "generation of primordial feelings, the elementary feelings of existence that spring spontaneously from the protoself" (Damasio, 2010, p.22). The second step is the "core self" and concerns the relationship between the organism and the object. It "[…] unfolds in a sequence of images that describe an object engaging the protoself and modifying that protoself, including its primordial feelings"(Damasio, 2010, p.23). The last level is the autobiographical self, which is grounded in memory and has to do with knowledge relating to the past as well as anticipating the future.

In relation to this study, suffering from ABI can affect how the self is experienced and the manner in which the emerging proto-self is organized, and thus how the more complex senses of self (core, subjective, verbal, and autobiographical selves) come to be formed (Siegel, 2001, p.76). In Section 3.3.2 and 3.3.3 it is described how the clinical practice was designed in order to accommodate the participants with ABI that had self-sensing issues.

Whereas Damasio (2010) focuses his theory on neurological processes within the organism, another "self" theorist, Stern (2000), sees the "self" as constructed because of interpersonal interaction. Stern has developed a theory of "self experiences" or "self domains" based on research and observations of infants' interactions with their caregivers. According to Stern (2000), interpersonal relationships during a child's first years of life play a key factor in development of a "sense of self". Stern (2000) describes how the child, via interaction with significant others, forms a range of "self experiences" (emergent self, core self, inter subjective self, verbal self, and narrative self) emerging at different ages, and how they continue to play an important role throughout the person's lifespan. Interestingly, both Damasio and Stern have reached the same conclusion about levels of self-experiences, despite coming from two very different professions (brain research and child psychology). Damasio's "Proto self" is comparable to Stern's "Emergent self". Damasio's "Core self" is parallel to Stern's "Core self" and Damasio's "Autobiographical self" is alike to Stern's "Verbal and Narrative self".

An important aspect of Stern's (2000) theory is the "affect attunement" between mother and infant. Stern defines it as "expressing the quality of a shared affect state but without imitating the exact behavioral expression of the inner state" (Stern, 2000, p.251). Stern (2000) uses musical terms such as; speed and consistency, pulse, melodic contour and intensity, structural organization, etc. to describe affect attunement. These terms are similar to the terms used by Trevarthen and Malloch (2009) to describe "communicative musicality" indicating a similarity with "affect attunement". The intra-psychic background that conducts the nonverbal communication is what Stern (2000) has termed, "vitality affects" which are parallel to what Damasio (2010) has called "background" emotions. "By directing the flow of energy and information processing within the brain, primary emotions reflect a core process that interconnects processes within one mind, as well as connecting those of one mind to those of another" (Siegel, 2001, p.81).

In music therapy practice and theory, Stern's theories have had a profound influence (Wigram, 2010), especially Stern's theory of affect attunement which has been used to explain the processes within musical improvisation as the relating experience through music.

In order to describe how "affect attunement" and interpersonal interactions form the "self experiences", Stern (2000) originally used the concept of RIG (Representations of Interactions that have been Generalized). However, he has change the RIG term to the term "ways-of-being-with" when describing how multiple interactions are stored in the interactional memory as patterns of relationships.

These two phenomena "affect attunement" and "ways-of-being-with" concern how experiences are represented and how the self may develop a coherent representation of himself. When interacting musically, people are provided a possibility of "affect attunement" which can change their self-experience of being in relation with others. Or as Ruud puts it: "[…] musical improvisations afford a basis for relational experiences that may provide a link between body and mind and thus support a more coherent sense of self"(Ruud, 2010, p.31).

Sterns theory that "senses of self" are constructed and changed in interpersonal interaction will form the basis of this study's theoretical framework. The theoretical framework supports the notion that the music therapy participants' musical (nonverbal) "intersubjective self" is altered by the musical (and verbal) interaction in music therapy. In addition, it is hypothesized that the changes in the "intersubjective self" in music via 'ways-of-being-with', influence the participants' "intersubjective self" in everyday interactions.

1.6 Music and communication

This section will explain the theories of music and communication that are parts of this study's theoretical framework. This section will start with an introduction to Bonde's (2009) understanding of the nature of music, in order to set the framework for a communicative definition of music. Following this, Trevarthen and Malloch's (2009) concept of 'communicative musicality' is outlined.

1.6.1 Definition of music

There are multiple theoretical definitions of music available based on various criteria including: organization, appeal, meaning, social constructs, neurological processes, and engagement (Kania, 2010). In this thesis I have, based on its comparison with communication, chosen to use the definition of music presented by Bonde (2009, p.20), who sees the nature of music in the following way:

"1. […] music is a form of language – in the sense that music is a way of expressing one self, and it uses sound in a structured way; that follows certain linguistic 'syntactic rules', it has its own written language (notation), and it give sense to most listeners. However, music is not an unequivocal (discursive) language and will never be able to represent or name phenomenon in the inner or outer world with the same clarity and exactness as the verbal language. Therefore, music is best characterized as an ambiguous symbolic language.

2. […] music can have meaning – exceeding the strictly musical or aesthetic. This meaning is constructed in a complex interplay between the involved.
3. […] there is musical meaning and conscious knowledge that cannot and should not be expressed with words.[…]" (Bonde, 2009, p.20 (my translation))
The first point in Bonde's (2009) definition of music is especially relevant for this study since it underlines the commonalities between musical interaction and communication.

1.6.2 Theories on music and communication

Earlier studies suggests a connection between amusia (not being able to perceive and recall music) and aphasia (not being able to produce/perceive words) (Bonde, 2009). However, recent research indicates a more complex picture of the working brain (Vuust, 2007) with neurological systems involved in music and verbal interaction merely overlapping. This notion is supported by the archaeologist Mithen (2006) who suggests that verbal communication is an evolutionary extension of musical communication. He suggests that human phylogenies (the species' evolutionary development) are repeated in the ontogenesis (individual development). Musical communication through Mithen's lens is a prerequisite for verbal communication. Mithen's (2006) thoughts on communicative evolution are in line with Malloch and Trevarthen (2009) who state that musicality plays an in important role in infants' ability to create and sustain social relationships. Musical interaction is integral to Malloch and Trevarthen's (2009) perspective, seen as a necessary condition for later verbal communication. Malloch and Trevarthen's (2009) term 'communicative musicality' is defined by three parameters: pulse, quality and narrative:

- Pulse – regulate succession of behavioural events (vocal or gestural) through time. Pulse regulates the timing, coordination, and anticipation of communicative expressions.
- Quality – refers to body movement and voice contours (timber, pitch, volume) of expression through time.
- Narratives – is the combination of pulse and quality forming the person's expression and intention. The 'musical narratives' allow people to "share a sense of sympathy and situated meaning in a shared sense of passing time" (Malloch & Trevarthen, 2009, p.4)

In their recent book (Malloch & Trevarthen, 2009) the term 'communicative musicality' has been elaborated from a range of perspectives spanning from musicality in infancy, in healing, learning, and performance. 'Communicative musicality' is important in this study because the improvisational and structured approaches used in the clinical work (see Section 3.3.3) are hypothesized to promote change in the ability to regulate and lead (Autonomy); tonality/volume (quality), rhythmic ground (pulse) and phrasing (narratives) in improvised music. In addition, elements of communicative musicality may transcend to everyday non verbal interaction via "ways-of being with others".

In relation to the nonverbal aspects of communication, Trevarthen and Malloch's (Malloch & Trevarthen, 2009) theories of communicative musicality include both paralinguistic signals (e.g. tone of voice, pacing, pausing, emphasis, timing, prosodic contour) and nonverbal expressions (e.g. gesture, posture, and facial expression) as described in Section (1.3.2).

1.7 Theoretical frame

The theoretical framework of this study is informed by models of interpersonal communication competencies (Rubin & Martin, 1994), Nonverbal communication (Burgoon & Bacue, 2003), "Self-experiences", "affect attunement" and "ways-of-being-with" (Stern, 2000), as well as "communicative musicality" (Malloch & Trevarthen, 2009).

As illustrated in Figure 1 the reviewed theories have different focuses. While Rubin and Martin's (1994) model of interpersonal communication competencies (see Section 1.3) and the theories on nonverbal communication (Hargie & Dickson, 2004) (Section 1.3.2) describe how interpersonal competencies are manifested in "real life", the theories of Stern (2000) and Damasio (2010) concern how the interpersonal self is formed subjectively. Stern (2000) describes how interpersonal interactions affect the intrapersonal self, whereas Damasio is concerned with the neurological foundation of self. The theory of communicative musicality by Trevarthen and Malloch outlines how nonverbal communicative signals follow musical structures. Their focus on mother child interaction makes their theories very similar to those of Stern.

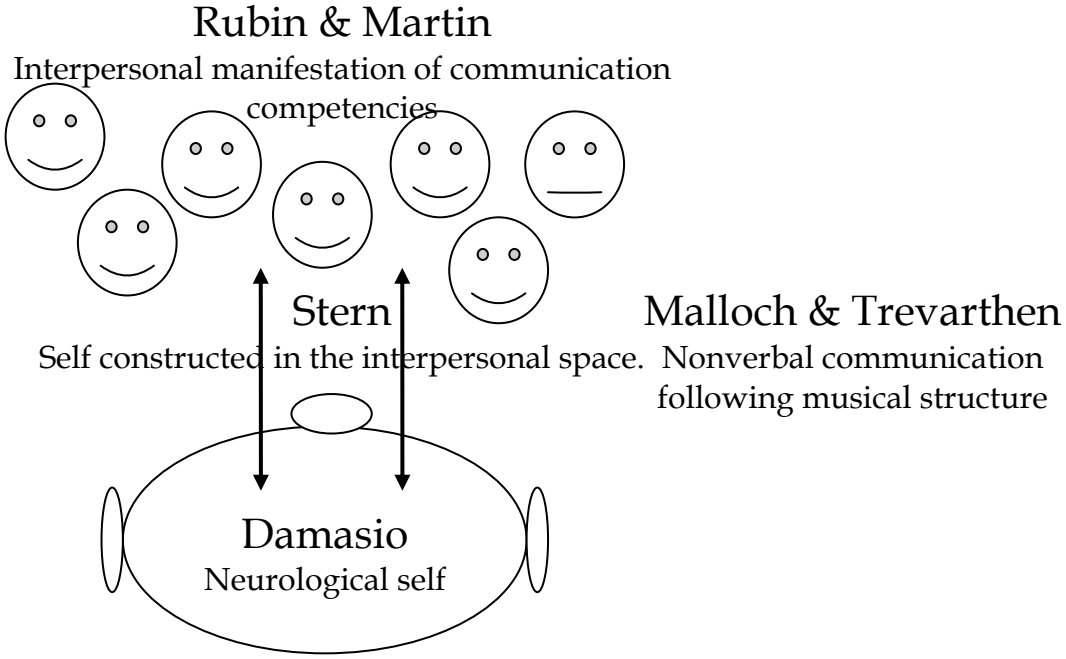


Figure 1 Theories used in forming theoretical frame

When combining the theories it is possible to form a theoretical framework for understanding why musical interaction might affect interpersonal communication competencies in everyday life. In the musical interaction, the participants are attuned to the pulse, quality and the narratives of the music. On an intra-personal level, the attunement might affect the participants' representations of "ways-of-being-with". If the participants' "ways-of-being-with" in music are changed, the participants' "ways-of-being-with" in everyday life may also be affected. Both Mithen (2006) and Trevarthen and Malloch (2009) see musical interaction as the foundation for verbal communication, therefore changes in musical communication competencies might affect verbal communication competencies as well.

The overall theoretical framework of this study is that the communicating (intersubjective) "self" in the music therapy setting is offered a possibility to rehearse communicative musicality abilities (pulse, quality and narratives) and interpersonal communication competencies such as attentiveness, empathy, self-disclosure, self-awareness, tone of voice, turn-taking, etc. The rehearsed interpersonal communication competencies can transfer from musical interactions via "ways-of-being-with-others" (Stern, 2000) into everyday interactions, affecting general interpersonal communication competencies (Rubin & Martin, 1994). The ICC in everyday life involve both nonverbal encoding and decoding abilities (Burgoon & Bacue, 2003).

Chapter 2 – Literature review

This chapter is a review of research literature concerning this project's three main interests; Acquired Brain Injury (ABI), Interpersonal Communication Competencies (ICC), and Music therapy. The knowledge gained from the review was used in formulating the research question. In addition, the knowledge gained has guided the choice of research design and measures used in this study. The review gives an overview of the research literature, methods, and measurements used in ABI, ICC and music therapy research. Research literature on ICC and ABI from clinical fields other than music therapy is reviewed in order to reveal tendencies in measurements on ICC and in applied research design. The review also includes a summary of the research concerning ABI and music therapy that does not focus on ICC.

After an introduction to the structure, goals, and methods of the review, the first section is a brief review of research on music therapy and ABI that does not address ICC. The subsequent review is of research covering all three main interests: ABI, ICC, and music therapy. Hereafter the research literature concerning other interventions than music therapy on ABI and ICC is reviewed. Following this, a rationale of the chosen research measurement is outlined, thus leading to the research questions. Since the primary focus of the review has been research design and measurements, the research outcomes are only reported summarily and are not reviewed for validity.

I have chosen to follow the guidelines on literature reviews presented in the online resources of the Writing Center at the University of North Carolina (2007), where it is stated: "The focus of a literature review […], is to summarize and synthesize the arguments and ideas of others without adding new contributions" (WCUNC, 2007, p.1). Robson(2011, p. 52) states that the purpose of a literature review is to put together the literature on the topic of interest and:

- Expose the main gaps in knowledge and identify areas of dispute and uncertainty
- Help identify general patterns within the research
- Put together studies with conflicting findings in order to explore explanations for discrepancies
- Define terminology and identify variations in definitions
- Identify appropriate research methodologies and instruments

The topics of interest in this project are ABI, ICC, and music therapy. The review has been organized according to the four problem categories described in Section 1.2.3 (Physical, Cognitive, Psychological, and social/interpersonal) plus a voice/speech category. The voice/speech category has been added because there is a substantial amount of ABI music therapy research with this focus. Only ABI music therapy research with a social/interpersonal focus is reviewed in detail. The last part of the review includes research on ICC and ABI

from professional fields other than music therapy. The chapter finishes with a presentation of the chosen research tools followed by the research questions.

2.1 Literature search

The literature search strategy aimed to address the different components of the project (ABI, ICC, and music therapy). The search was performed between the 8th of September 2008 and the 20th of February 2009. The databases used for the search were ArticleFirst, The Cochrane Library, Medline (PubMed), Proquest, bibliotek.dk, PsykInfo, Web of Science, and Aboline. The music therapy journals "Journal of Music Therapy", "Music therapy", and "Music therapy Perspectives" were also hand searched. The search terms used were different combinations of the following words: music, therapy, neurological rehabilitation, traumatic brain injury, brain, interpersonal competences, interpersonal skill, neurology, brain damage. Appendix 1 lists the combination of terms used. Another approach was using Google Scholar to search for publications by known ABI researchers' names (e.g. Wendy Magee, Felicity Baker, Simon Gilbertson, Nicki Cohen, and Margaret Struchen). Every search word combination and database search resulted in multiple "hits". E.g. The PubMed search for "interpersonal communication, brain injury" gave 2553 hits. Based on the criteria described later and through reading the title and abstract of the "hits", I decided whether the literature was relevant for this review and, if so, included the article in the initial selection of literature (see below for criteria). The search for research on ABI and ICC also included research from other clinical fields than music therapy. Therefore, the articles reviewed by Struchen (2005) were also included if the they fit the inclusion criteria as described in the next section.

Articles, books and theses were included in the review if they contained research or case reports on the topics of interest. The review was limited to English and Nordic language texts. When searching the Danish literature databases both the English and Danish version of the search word combinations were used. The gathered literature was then crosschecked with the literature from Gilbertson's (2005) review and any missing articles were included in the initial selection of literature. The initial literature identified through the search was then subjected to a further selection process based on the following criteria:

1. Only studies on adolescents and adults (14+) with medium to severe ABI were included. This criterion was set to reflect the population researched in this study.
2. Only RCT's, clinical trials and case studies were included. As the purpose of the review was to get an overview of research literature, theoretical and anecdotal texts were not included.
3. Only studies mentioning participants' diagnoses – specifically diagnoses of acquired brain injury (stroke, trauma, cerebral thrombosis, etc.) – were

included. This was in order to enable transfer of intervention, research method and results onto this study.

4. Studies with participants suffering from coma, low awareness state, and progressive ABI such as dementia were excluded. The rehabilitation needs of, and interventions used on such patients differ from those of the participants addressed in this study.
5. In order to enable transference of clinical and research methodologies, the interventions had to be described.
6. Music listening and other musical interventions that did not necessarily include a music therapist were included in the review. Since the main goal of this review was to identify research tools and methods in ABI rehabilitation research it was justifiable to include research where professionals other than music therapists performed the musical intervention. If the goal of this review had been to evaluate the effect of music therapy the criteria would have been as in Bradt et al (2010)'s Cochrane review on music therapy and ABI, where only studies where interventions are performed by a trained music therapist are included
7. Only English or Scandinavian texts were included. Since this author only understands English, Danish, Norwegian and Swedish it would have been too time consuming to include (translate) studies published in other languages.
8. Published after 1980. This criterion was incorporated in order to ensure relevance in the included research.

The structured literature search ended in December 2008. However, literature from the Cochrane review by Bradt et al.(2010) have been added since.

The literature selection and exclusion process resulted in 46 articles on music therapy and ABI and a further nineteen articles from other clinical fields.

The following section is an introduction to the structure of this review.

2.2 Structure of the research review

The organizational principle in this review is thematic. According to the Writing Center of the University of North Carolina, the organizing principle in a literature review can be either; Chronological, Thematic, Methodological, Current Situation, Historic, based on Methods and/or Standards, or other principals (WCUNC, 2007, p. 6) all depending on the purpose of the review. In the present literature review, the purpose has been to obtain an overview of general patterns in research methodologies and instruments/standards used in music therapy research with ABI participants. Therefore, the overall organizational principle in this review has been thematic.

2.2.1 Thematic categories

The thematic categories used to organize the music therapy and ABI literature are the four ABI problems areas described in Section 1.2.3. (cognitive, physical, psychological, and interpersonal). In addition, music therapy addressing voice and speech is added as a category of its own; despite it being viewed in section 1.2.3 as a combination of the physical, cognitive, and interpersonal areas. The rationale is that a substantial amount of the identified texts focus on the rehabilitation of voice and speech. The 46 identified research texts on music therapy and ABI were categorized the following way:

- Verbal/speech (voice functions and speech) – 15 texts
- Cognitive (organizing, memory, language, and logic thinking) – 8 texts
- Physical (motor skills, body functions and arousal) – 11 texts
- Psychological (emotions, self-perception and existential themes, quality of life) – 7 texts
- Social/interpersonal (Behavioral, involvement, interaction, and communication) – 6 texts

Several of the articles have had more than one research focus and the thematic categorization is therefore rather rough. Since the scope of this review is to clarify research methods and instruments, the organization is based on the article's main research outcome. E.g. if study is testing a specific rehabilitation method on motor skills and, in addition, has applied a quality of life measurement, the research is reviewed in the physical category. An exception to this principle is the studies that have measures of interpersonal interaction (due to the focus of this study). These studies have been categorized as studies on social/interpersonal interaction. One such study is the one by Nayak et al. (2000) who has mood as the main outcome and social interaction as secondary outcome. In addition, the study by Jeong and Kim (2007) on Rhythmic Auditory Stimuli effect on arm movement includes a relationship change scale. The Jeong and Kim (2007) study is reviewed in both the physical category (together with the other RAS studies), and in the interpersonal category.

2.2.2 Sub-headings

In the review of ABI music therapy research witch focus on ICC and studies from other professions than music therapy, the thematic categories have four sub-headings based on the purpose of the review:

1. Clinical methods
2. Research design
3. Outcome measures
4. Summary, including results

The clinical methods have been presented in narrative form in order to give an overview of the interventions researched. Background information on the interventions is presented where relevant.

The research designs are presented in both narrative and schematic form. The respective studies' research design and background information are presented. Background information includes information about the author, year of publication, number of participants, participant's age (14-24, 25-59, 60+) gender (♀♂), type of injury (TBI, stroke, other, or a mixed group), and clinical method (depending on the thematic category). The research designs are summarized in both text and schema. Regarding research design, Robson (2011) distinguishes between fixed, flexible, and multi-strategy designs. Fixed design studies involve pre-specification of measures and methods before data collection – an approach often referred to as quantitative or positivistic (Robson, 2011). A flexible design evolves during data collection and is often referred to as the qualitative strategy (Robson, 2011). The multi strategy design combines the fixed and flexible design. In the schematic representation of research designs, the multi strategy is indicated with an "X" in both the fixed and flexible column. In order to achieve validity in research, both fixed and flexible designs can incorporate randomization prior to intervention and participants are allocated to either a treatment or a control group. If the sample size is small the researcher can choose to implement a cross-over design (Robson, 2011). These research design features are elaborated in the method chapter (section 3.1). In the schematic representation of research designs, features incorporated in order to achieve validity are also indicated. An often-used research feature incorporated to achieve research validity is blinded rating. Blinded rating is where an independent person, not familiar with the allocation or treatment, evaluates the effect of the treatment. Studies with very few participants (<4) and where the participants are described individually are in this review considered as case studies.

In fixed design research, information on the dependent variable is most often collected using a research tool. These research measures/tools are in this review described in both narrative and schematic form. In the schematic form, information on study and publication year is presented followed by name of research tool, type of measure, and what the measure assesses. Because of this study's focus on interpersonal interaction, only the validity of the research instrument addressing interpersonal interaction is reviewed in detail. The validity of the research instruments is presented as the Cronbach alpha value (see section 3.8 for details on the Cronbach alpha value).

In Section 2.5 the research literature on interventions (not music therapy) on 'Interpersonal communication and ABI' is reviewed using the same thematic categories (clinical method, research design, research instrument and summary including results).

This literature review starts with a summary of music therapy research literature with a voice/speech, cognitive, physical, and psychological focus.

2.3 ABI music therapy research (voice/speech, cognitive, physical and psychological)

This section is a short summary of music therapy research with people with ABI that does not focus on the interpersonal benefits of applying music therapy. First, a summary of music therapy research on voice and speech skills.

2.3.1 Music therapy ABI research on voice and speech skills

Music therapy's effect on voice and speech skills is documented in 15 identified studies (see Table 3). Computer analysis of vocal abilities and aphasia tests is the most common measure. Boston diagnostic aphasia examination is applied in three studies (Belin, et al., 1996; Peretz, Racette, & Bard, 2006; Schlaug, Marchina, & Norton, 2008). Four studies have had a control condition to compare the music therapy speech/voice interventions to other or no interventions (Cohen, 1992; Cohen & Masse, 1993; Jungblut, 2005; Schlaug, et al., 2008). Randomization of different treatment conditions was conducted in two studies: Cohen et al. (1993) and Jungblut (2005). The transferability of musical skills to narrative skills is evaluated in most of the studies, but none of the authors has conducted a longitudinal test of treatment outcome – except Baker (2000) whose case story lasts for three years.

The results from the studies indicate that melodic intonation therapy (MIT) and singing instruction of people with ABI can have a positive impact on:

- Fundamental speaking frequency (Baker, 2004)
- Rate of speech (Baker, 2004; Cohen, 1988; Tamplin, 2008)
- Propositional speech (Schlaug, et al., 2008)
- Generation of words (Baker, 2000; Schlaug et al., 2008; Schlaug et al., 2007; Schlaug et al., 2004)
- Pronunciation (Cohen & Masse, 1993; Jungblut, 2005; Tamplin, 2008)
- Prosody (Baker, 2004; Jungblut, 2005)

Only one study (Peretz, et al., 2006) "questions" the effect of Melodic Intonation Therapy (MIT). They compared MIT interventions with similar speech interventions without music. Their results indicate that MIT has no short-term effect on pronunciation in speaking, but when singing along the participants did have better pronunciation. In Table 3 background information and research designs utilized in music therapy research on voice and speech skills is listed.

Table 3 Research designs in music therapy voice and speech rehabilitation

Background info							Research methodology					
	Year	Number of participants	Age : Young=14-24, Adult,=25-59, Old=60+	Gender:	TBI / Stroke / Other / Mix	MIT / Singing	Fleksible design	Fixed design	Control gr./cross-over	Blinded rating	Case descriptions	Randomized allocation
Morgan et al	(1982)	2	A	♀	Mix	S	X				X	
Signoret et al.	(1987)	1	O	♂	Stroke	S	X				X	
Cohen	(1988)	1	Y	♀	Other	S		X			X	
Cohen	(1992)	8	YA	♀♂	Mix	S		X	X	X	X	
Cohen et al	(1993)	32	AO	♀♂	Mix	S		X	X			X
Belin et al.	(1996)	7	A	-	Stroke	M		X			X	
Magee	(1999)	2	A	♂	Mix	S	X				X	
Baker	(2000)	2	A	♀♂	TBI	M	X				X	
Ramsey	(2002)	4	AO	♀♂	Mix	S	X				X	
Baker	(2004)	4	YA	♂	TBI	S		X			X	
Jungblut	(2005)	13	AO	♀♂	Stroke	S		X	X	X		X
Peretz et al	(2006)	8	AO	♀♂	Mix	M		X		X	X	
Schlaug et al	(2008)	2	A	♂	Stroke	M		X	X		X	
Kim et al	(2008)	7	AO	♀♂	Stroke	S	X				X	
Tamplin	(2008)	4	YA	♀♂	Mix	S		X		X	X	

TBI=traumatic brain injury, MIT=melodic intonation therapy

2.3.2 Music therapy ABI research on cognitive functioning

The literature search identified eight studies that focus on the cognitive effect of music therapy of which three studies have incorporated randomization in the design, namely Säkamö et al. (2008), Baker (2001), and Witt et al. (1994) (See Table 4). Three studies, Thostrup et al. (1995), Säkamö et al. (2008), and Baker (2001), apply receptive music therapy methods even though their procedures are very different. Other three studies has researched the effects of the Musical Attention Training Program, (Witt et al., 1994; Knox et al. 1998, 2003), which seem to have a profound effect on attention abilities. Only a few of the studies have tested for transferability of cognitive skills to other settings.

The results from the studies indicate that music therapy with people with ABI can have a positive impact:

- The ability of people with right side injury to form imagery, have emotional response to music, and think abstractly during music listening (Thostrup & Moe, 1995, 1999)
- Specially composed songs can help participants learn activities in daily living (Gervin, 1991)
- Music listening post-stroke has impact on verbal memory and focused attention (Sarkamo, et al., 2008)
- Attention skills can be trained via musical exercises (Knox & Jutai, 1996; Knox, Yokota-Adachi, Kershner, & Jutai, 2003)
- The post traumatic amnesia phase is shortened if listening to preferred music (Baker, 2001)

Table 4 lists background information and research designs utilized in music therapy research on cognitive skills.

Table 4 Research designs in cognitive music therapy rehabilitation

Background info							**Research methodology**					
	Year	Number of participants	Age : **Y**oung=14-24, **A**dult,=25-59, **O**ld=60+	Gender:	TBI / Stroke / Other / Mix	GIM/MATP/Other	Fleksible design	Fixed design	Control gr./Crossover	Blinded rating	Cases	Randomized allocation
Gervin	(1991)	1	A	♂	TBI	O	X				X	
Witt et al	(1994)	5	Y	♀♂	Mix	M		X	X		X	X
Thostrup et al	(1995)	5	AO	♀♂	Other	G		X			X	
Thostrup et al	(1999)	3	AO	♀♂	Mix	G	X				X	
Seibert et al	(2000)	1	Y	♀	Other	O	X				X	
Baker	(2001)	22	A	♀♂	-	O		X	X			(X)
Knox et al	(2003)	1	Y	♂	TBI	M		X			X	
Säkamö et al	(2008)	60	AO	♀♂	Stroke	O		X	X	X		X

TBI=traumatic brain injury, GIM=guided imagery of music, MATP=musical attention training program

2.3.3 Music therapy ABI research on physical functioning

Eleven research articles with a focus on the physical effect of music therapy have been identified (See Table 5). When addressing physical problems the musical elements tend to be given a secondary role, whilst the motoric synchronization and motor movements are in focus. Four studies (Cofrancesco, 1985; Jeong & Kim, 2007; Heather Purdie, 1997; Schneider, Schonle, Altenmuller, & Munte, 2007) found that music therapy could be an important aid in regaining hand and shoulder movement. Five of the studies are Randomized Control Trials, Jeon et al. (2007), Thaut (1997,2007), Schauer et al. (2003) and Schneider et al. (2007), all showing remarkable results. The study of Schneider et al. (2007) is especially strong in design, measurements, and results. There is no longitudinal transferability data in any of the studies.

The gait measurements used in the studies varies from EMG's, 3D video, and shoe pressure sensors. Each of these measurements produces de-humanized ratio interval data, making results from these studies more valid (at least from a positivistic stance) than studies that depend on raters or questionnaires.

The Rhythmic Auditory Stimulation (RAS) of gait has proven to show significant improvements on:

- Gait velocity
- Stride length
- Cadence and speed
- Symmetry deviation
- Rollover path length
- Muscle activation on paretic side (Hurt et al., 1998; Prassas et al., 1997; Staum, 1983; Thaut et al., 2007; Thaut et al., 1993; Thaut et al., 1997)

Table 5 lists background information and research designs utilized in music therapy research on physical skills.

Table 5 Research designs in physical music therapy ABI rehabilitation

Background info							**Research methodology**					
	Year	Number of participants	**Age : Young=14-24, Adult,=25-59, Old=60+**	Gender:	TBI / Stroke / Other / Mix	RAS/Other	Fleksible design	Fixed design	Control gr./Crossover	Blinded rating	Cases	Randomized allocation
Staum	(1983)	25	YAO	♀♂	MIX	R		X		X		

Cofancesco	(1985)	3	AO	?	Stroke	O		X			X	
Thaut et al	(1993)	10	AO	♀♂	Stroke	R		X				
Thaut et al	(1997)	20	O	♀♂	Stroke	R		X				X
Prassas et al	(1997)	8	AO	♀♂	Stroke	R		X				
Prudie	(1997)	1	A	♂	Other	O	X				X	
Hurt	(1998)	8	A	♀♂	TBI	R		X				
Schauer et al	(2003)	23	AO	♀♂	Stroke	O		X	X			X
Jeong et al	(2007)	33	AO	♀♂	Stroke	R		X	X			X
Thaut et al	(2007)	78	AO	♀♂	Stroke	R		X	X	X		X
Schneider et al	(2007)	40	AO	♀♂	Stroke	O		X	X			X

TBI=traumatic brain injury, RAS=rhythmic auditory stimuli

2.3.4 Music therapy ABI research on psychological functioning

Seven identified articles have their primary focus on the psychological effect of music therapy (See Table 6). None of the studies are RCT and only one has a fixed design. Interestingly, it seems that two music therapy sessions can have a significant effect on mood (Magge et al. 2002), even though the longitudinal effect is not mentioned in their study. The RCT studies by Särkamö et al.(2008) and Jeong et al. (2007) show that music listing and rhythmic auditory stimulation (RAS) have an impact on mood and quality of life. Three of the articles are case studies that describe the effects of analytical music therapy (Durham, 2002; Scheiby, 1999, 2002). In my own master thesis (Hald, 2004) two case studies are presented in order to show how adapted GIM can facilitate insight into self-experience and existential issues. Goldberg (1998) uses a modified version of GIM to facilitate expressions and regulate emotions. The study of song lyrics by Baker et al. (2005a) gives an insight to intra-psychic themes of people with ABI.

Music therapy with a psychological focus in ABI rehabilitation can:

- Help improve body self-esteem (Scheiby, 1999, 2002).
- Help tap into spirituality (Scheiby, 2002).
- Help regulate resources of physical and mental energy (Scheiby, 2002).
- Help improve time management (Scheiby, 2002).
- Help improve authenticity in improvisations (Scheiby, 1999, 2002).
- Help relation to environment (Durham, 2002).
- Help improve relaxation skills (Scheiby, 2002).
- Help express grief (Durham, 2002; Scheiby, 1999, 2002).
- Help send messages to significant others (Baker et al., 2005).
- Song lyrics can function as self-reflection (Baker et al., 2005).
- Song lyrics can be used for expressing concern for the future and express adversity (Baker et al., 2005).
- Song lyrics can be used for reflection upon relationships (Baker et al., 2005).
- Modified GIM can help participants become more compliant and friendly (Hald, 2004)

- Two music therapy sessions have a positive effect on anxiety, energy and openness (Magee & Davidson, 2002)
- Music listening has a positive effect in depression and confusion (Sarkamo, et al., 2008)

Table 6 lists background information and research designs utilized in music therapy research with a psychological focus.

Table 6 Research designs in psychological music therapy ABI rehabilitation

Background info								**Research methodology**				
	Year	Number of participants	Age : Young=14+, Adult,=25+ Old=60+	Gender:	TBI / Stroke / Other / Mix	AMT/GIM/Song writing/ Other	Fleksible design	Fixed design	Control gr./Crossover	Blinded rating	Cases	Randomized allocation
Scheiby	(1999)	1	O	♂	Stroke	A	X				X	
Scheiby	(2002)	1	A	♂	Stroke	A	X				X	
Durham	(2002)	1	A	♂	Other	A	X				X	
Goldberg	(1988)	3	AO	♂	Other	G	X				X	
Hald	(2004)	2	A	♀♂	Mix	G	X				X	
Baket et al.	(2005)	32	YA	♀♂	Mix	S	X					
Magee et al.	(2002)	14	---	---	Mix	O		X				

TBI=traumatic brain injury, GIM=guided imagery of music, AMT=analytical music therapy.

2.4 ABI music therapy research with interpersonal focus

This part of the review includes four music therapy studies that primarily focus on people with ABI's interpersonal rehabilitation. Due to the focus of the present study, two studies that have interpersonal benefits of music therapy as secondary outcome are included in the review here as well. The studies have been assigned to this category if the research performed focused on changes in interpersonal involvement, interaction, and/or communication.

2.4.1 Clinical ABI music therapy methods addressing interpersonal rehabilitation

The majority of the reviewed music therapy methods addressing interpersonal problems in ABI rehabilitation have made use of instrumental and vocal improvisation (Barker & Brunk, 1991; Gilbertson, 2006; Nayak et al., 2000; O'Callaghan, 1993; Purdie, 1997; Wheeler et al., 2003). Some describe their

intervention rather broadly. E.g. Pudie et al (1997) describe the intervention as 30-40 minutes of individual singing and instrument playing (percussion and synthesizer) of both familiar and improvised music. Gilbertson's (2006) clinical intervention was individual Nordoff/Robbins (N/R) music therapy; an approach developed in the seventies by Paul Nordoff and Clive Robbins involving structured improvisation that motivates participation and interaction. In N/R the therapist produces an expressive and predictable musical frame for musical communication. Bark and Brunk's (1991) intervention is a combination of creative arts and music therapy. The music therapy procedures conducted in Nayak et al. (2000) were primarily in small groups and consisted of a variety of music therapy procedures including singing, instrumental improvising, verbalizing, composing, and song writing, while Purdie's (1997) intervention was piano playing. The study by Jeong and Kim (2007) implemented a rhythmic auditory stimulus (RAS) music–movement intervention.

2.4.2 Research designs in interpersonal ABI music therapy studies

Three of the identified studies had a fixed design, two a flexible design, and one used mixed methods (See Table 7).

Gilbertson draws on a flexible design in his doctoral research, which is a narrative exploration of changes in musical communication of three participants with TBI (Gilbertson, 2006; Gilbertson & Aldridge, 2008). Gilbertson used a Therapeutic Narrative Analysis (Aldridge & Aldridge, 2002) of twelve clinical video examples. The video examples were selected from many hours of clinical material based on the representational value of the examples. Purdie (1997) also utilized a flexible design and described how a former piano teacher rediscovered and developed her existing skills of piano playing. The other case in Purdie (1997) was a 75-year-old female who had suffered a left hemisphere stroke, resulting in dysphasia and low mood. After a series of piano-playing sessions, the nursing staff reported that the woman's behavior in the ward had improved, and that she had become less difficult, and more tolerant of staff.

Four studies have a fixed design (Barker & Brunk, 1991; Jeong & Kim, 2007; Nayak, et al., 2000; Purdie, et al., 1997). For a period of 18 months, the therapists in Barker and Brunk (1991) rated the participants after each session in terms of: identification with art, their social behavior, use of physical skills, ability to express personal issues, the nature of the specific event. The rating scale used was not standardized but was published in the article. Nayak et al. (2000) aimed at undertaking a randomized, between-groups, repeated measures study on 18 participants. Pre- and post-treatment assessments of mood were conducted on participants via self-rating as well as a family rating of mood and social interaction. In addition, the music therapist rated mood and participation during therapy. In Nayak et al. (2000) the goal of random assignment was not fully achieved because the treatment required that two or more participants were available at the same time to be assigned to the same condition, thus

compromising the randomization process. In Purdie et al. (1997) 25% of the participants expressed a strong preference for music therapy; as a result they adjusted their randomization processes and called their design a "pragmatic randomized controlled trial". The Purdie et al. (1997) study involved 40 subjects with long-term physical and cognitive disabilities resulting from stroke. Only 15 (38%) of the subjects completed all tests and therapy. The study examined the effect of 12 individual, once-a-week, active music therapy sessions. Data on the participants were collected using questionnaires and tests pre-, mid-, and post-treatment. Independent raters used a musical behavior scale to perform video analysis of music therapy sessions 1, 6 and 12. The study by Jeong and Kim (2007) was primarily a fixed design with randomization of treatment or control group. Self-evaluation questionnaire measures were taken pre- and post-intervention. The design incorporates a flexible feature since the participants were also being interviewed, so the design thereby becomes a mixed method design.

In Table 7, the research designs used in interpersonal music therapy ABI rehabilitation are summarized; firstly, background information (author, year of publication, number of participant, gender, type of injury, and if improvisation was a part of the clinical method) and secondly, the research methodology (fixed, flexible, control group, blinding, case study, and randomization).

Table 7 Research designs used in interpersonal ABI rehabilitation

Background info							Research methodology					
	Year	Number of participants	Age :Young=14-24, Adult,=25-59, Old=60+	Gender:	TBI / Stroke / Other / Mix	Improvisation	Flexible design	Fixed design	Control gr./Crossover	Blinded rating	Cases	Randomized allocation
Gilbertson	2006	3	YA	♂	TBI	X	X				X	
Nayak et al	2000	18	AO	♀♂	TBI/S	X		X	X			(X)
Barker et al	1991	48	(AO)	(♀♂)	TBI	X		X			(X)	
Purdie et al	1997	40	AO	♀♂	Stroke	X		X	X	X		(X)
Purdie	1997	1	O	♀	Stroke		X				X	
Jeong et al	2007	33	AO	♀♂	Stroke	RAS	X	X			X	

2.4.3 Outcome measures used in ABI music therapy interpersonal rehabilitation

Several types of measurements have been used in assessing the interpersonal effect of music therapy in ABI rehabilitation (See Table 8).

In the study by Nayak et al. (2000) the participants' families and staff rated social interaction using seventeen questions adapted from the social interaction subscale of Sickness Impact Profile (SIP) (Bergner et al., 1981). The SIP consists of 137 items describing a specific dysfunction in 12 areas. The respondents indicate whether or not each item describes a dysfunction they experience on that day as a result of their illnesses. The social interaction subscale has 11 items where respondents rate their level of social dysfunction. The test-retest reliability of SIP is .79 and the Cronbach alpha of the psychosocial dimension of the instrument is .91 (de Bruin, de Witte, Stevens, & Deideriks, 1992 in Nayak et al. 2000). Staff also rated cooperation, motivation and how actively involved the participant was using a non-standardized rating tool. In addition, Nayak et al. (2000) collected data on mood via self-reporting and evaluation by family, staff and therapist using a 7-point Face Scale. The test-retest reliability of the Faces Scale is about .70 and the Cronbach alpha is .70 (McDowell & Newell, 1996 in Neyak et al. 2000).

In Purdie et al. (1997) the outcome measures were the Frenchay Aphasia Screening Test (FAST). The FAST was designed to detect linguistic disturbances and have high test-retest validity (Kendall's coefficient of concordance (of 0.97) and correlation with the Functional Communication Profile (FCP) (Enderby, Wood, Wade, & Hewer, 1986). The correlation coefficient between the FCP and FAST scores was 0.87 ($p<0.001$) (Enderby, et al., 1986). Purdie et al. (1997) also used the Hospital Anxiety and Depression Scale, Musical Behavior Rating Scale and an adapted version of the Neurobehavioral Rating Scale. Purdie et al. (1997) also used an adapted version of the Neurobehavioral Rating Scale (Behavioral Rating Scale) in assessing everyday-life behavior of the participant. The Neurobehavioral Rating scale was constructed to measure difficulties and problems in people with ABI's interaction. It is made up of 27 items and uses a 7-point Likert scale (not present, very mild, mild, moderate, moderate-severe, severe, extremely severe). McCauley et al. (2001) conducted a factor analysis on the items resulting in five subscales (plus a category with items that did not load onto any factor (attention, guilt, alertness, and hallucination). McCauley et al. (2001)'s five Neurobehavioral Rating Scale subgroups are: 1) executive/cognitive, 2) positive symptoms, 3) negative symptoms, 5) mood/affect. Unfortunately, Purdie et al. (1997) do not give any details on how they adapted the scale. Results were only presented as means and standard deviations. In addition, they do not explain which statistical tests they had used. A paired t-test was most likely used, but since they have three measurement points a repeated measure ANOVA analysis might also have been applied (see section 3.8.2. for details on ANOVA).

In Barker and Brunk (1991), the therapist rating scale was non-standardized. They reported their results in narrative ways making it problematic to assess the research tool and the significance of their results.

Jeong and Kim's (2007) study on Rhythmic Auditory Stimuli incorporates a translated and modified version of the Relationship Change Scale (Shannon & Guerney, 1973) to assess participants' perception of their interpersonal relationships. The tool consists of 25 items with a 5-point Likert scale. Cronbach's alpha coefficient for this instrument is reported to be between .88 and .95 in previous studies (Won, Lee, Lee, & Choi). The instrument focuses on eight features of relationship: Leading-advising, Self-enhancing-competitive, Aggressive-rejecting, Resisting-distrustful, Self-effacing-submissive, Docile-dependent, Cooperative-friendly, Accepting-assisting(Shannon & Guerney, 1973).

In Table 8 the research instruments applied in ABI music therapy research on interpersonal communication are summarized.

Table 8 Summary of research tools applied in ABI music therapy research on interpersonal rehabilitation

Author	Year	Research tool	Type	Assesses
Barker et al	1991	Behavior rating	Therapist rating	Non-standardized. Eleven scales on identification, social behavior, physical skills, self disclosure,
Nayak et al	2000	7-piont Face Scale	Self eval. /proxy	Mood and social interaction
		SIP	Self eval /proxy	Sickness Impact Profile
Purdie et al	1997	FAST	Test	Frenchay Aphasia Screening Test
		HADS	Questionnaire	Hospital Anxiety and Depression Scale
		MBRS	Rating	Musical Behavior Rating Scale(adapted from Neurobehavioral Rating Scale)
		BRS	Rating	Behavior Rating scale (adapted from Neurobehavioral Rating Scale)
Jeong et al	2007	RCS	Self eval. Questionnaire	Relationship Change Scale – measures change in defined relationships

2.4.4 Summary of ABI music therapy research on interpersonal rehabilitation

Up until the literature search for this study was finished in 2009 there were six studies that have researched the effect music therapy may have on interpersonal interaction in people with ABI (of which only three are RCTs

studies (Nayak et al., 2000, Jeong and Kim, 2007; Purdie et al., 1997)). Four of the studies (Barker and Brunk, 1991; Nayak et al., 2000; Purdie et al., 1997; Jeong & Kim, 2007) have incorporated fixed outcome measures on interpersonal interaction following music therapy. Two of the studies are case studies (Gilbertson, 2006; Purdie, 1997). All six identified studies indicate that music therapy has an effect on interpersonal communication.

Barker and Bunk (1991) finds that after two years of music therapy: "[…] patients became increasingly invested in their work, scoring higher in the first two categories (addressing personal issues and identification with work) in later sessions than they did at first. […] the majority of the patients moved from a passive role in the group to one of helpful leadership" (Barker & Bunk, 1991, p.29).

Purdie et al. (1997) applied a set of specific ABI research tools including a musical behavior rating scale (Purdie & Baldwin, 1995) and a Behavior Rating Scale adapted from the Neurobehavioral Rating Scale (Levin, et al., 1987) to assess the effect of 12 individual weekly music therapy sessions. Purdie et al. (1997) found that "On the communication test (aphasia test), the control group showed a gradual decline […]. The treatment group improved (on the aphasia test) […]. On the behavior sub-groups, the treatment group mean difference for emotional stability and clarity of thought approached statistical significance ($p=0.06$ and $p=0.07$ respectively). The treatment group also rated better than the control for cooperation, spontaneous interaction, and motivation. Results of the video analysis showed small but non-significant improvements in musical behavior."(Purdie et al. 1997, p.326).

The study by Nayak et al. (2000) investigated whether music therapy in early rehabilitation (4-10 sessions) affects mood using a range of VAS research tools on family, staff, therapist and self-evaluation. In relation to social interaction, the families rated the participants' social interaction on a 17-item questionnaire adapted from the social interaction subscale in the Sickness Impact Profile (Bergner, Bobbitt, Carter, & Gilson, 1981). Therapy staff used a questionnaire to report on the participants' participation in the other therapies. The questionnaire reported on cooperation, motivation, and how active the participants were in the therapy. The results of Nayak et al. (2000) indicated "that the more impaired a participant's social behavior at outset, the more likely he or she was to benefit from music therapy. The occupational and physical therapists reported at the conclusion of the interventions, that the music therapy group was significantly more involved in therapy $F(1, 14)=8.64$, $p < .01$, and tended to be more motivated to participate, $F(1, 14)=4.12$, $p=.06$ than the control group. There was no statistical significant difference between the groups in terms of staff-perceived cooperativeness during therapy sessions."(Nayak et al., 2000, p.279).

Wheeler et al. (2003) undertook an analysis of the data from the study by Nayak et al. (Nayak, et al., 2000) to find relationships between changes in mood and behavior. Findings were correlated with the amount of therapy (4-10 sessions) and form, (individual or group music therapy). This allowed Wheeler et al. (2003) to study whether varying numbers of sessions were associated with outcome. The analysis showed that mood had only been affected minimally by treatment. There was a correlation between one participant's staff/relative rated mood and the amount of therapy sessions. The number of sessions was significantly related to the amount of improvement on the Social Interaction Score scale (SIP). None or only small improvements were reported in cooperation and motivation. Group sessions appeared to have stronger effects on social interaction than individual therapy. Individual therapy did have an effect on motivation, almost reaching significance.

The research study by Gilbertson (2006) was a therapeutic narrative analysis (Aldridge & Aldridge, 2002) and a musicological analysis of significant events in music therapy with three participants with TBI. Gilbertson (2006) used two interactional polarities (isolated – integrated, and idiosyncratic – conventional) to describe the change in therapy. Gilbertson (2006, p.685) writes: "This study has identified clinically significant change in improvised music therapy in the areas of musical expression, communication, agency, emotionality, motility, and participation. […] The pattern of changes of isolated and idiosyncratic behavior toward more conventional and intergraded behavior identified in this study has led to the recognition of the significance of the concept of relationship in early rehabilitation. […] The application of music therapy can facilitate improvements in functional and psychological aspects of life. […] This study demonstrates how music therapy broadens the potential of existing treatment possibilities, in particular in the re-establishment of relationships through a change from isolated and idiosyncratic behavior towards conventional and intergraded behavior."

Another case study, by Purdie (1997) described how a 75-year-old woman with ABI benefits after a series of sessions. The nursing staff reported that the woman's behavior in the ward had improved, and that she had become less difficult, and more tolerant of staff.

Jeong and Kim (2007) conclude their study by stating that an RAS music–movement intervention is effective in improving the physical state, mood state, and personal relationships of stroke survivors in a community setting.

The studies addressing the interpersonal effect of music therapy in ABI rehabilitation have made use of both flexible and fixed designs. The findings in the studies indicate support for the following statements:

- Music therapy can help participants be more invested in their work/rehabilitation (Barker & Brunk, 1991).

- Group settings can help participants change from a passive role in the group to one of helpful leadership (Barker & Brunk, 1991).
- Music therapy can affect the mood positively (Nayak, et al., 2000)
- Music therapy is a powerful helper in improving communication, general behavior, and musical behavior (Purdie, et al., 1997).
- Music therapy can help to improve emotional stability, clarity of thought, spontaneous interaction, motivation and co-operation (Nayak, et al., 2000).
- Group sessions appear to have stronger effects on social interaction than individual therapy (Wheeler et al., 2003).
- Music therapy can move a participant towards integration and conventional interaction (Gilbertson & Aldridge, 2008, p.141)
- Individual music therapy has an impact on motivation (Wheeler et al., 2003).

All the RCT studies reported problems with randomization due to ethics and practicalities. There was also great diversity in the outcome measure used on interpersonal interaction in music therapy research; the Relationship Change Scale and Behavior Rating scale being the only standardized measures.

The next section is a review of research on interpersonal communication where the intervention is not music therapy.

2.5 Studies on interpersonal communication in neurorehabilitation

This section is a review of literature from other clinical fields than music therapy that have dealt with interpersonal communication competencies in neurological rehabilitation. The aim of the review has been to identify research methodologies and data collection instruments appropriate for this study. Therefore, the structure of this review is similar to the previous one.

The literature reviewed is identified through the literature search and search-word combinations (Interpersonal, competence, skill, neurology, and brain) and resources described in Appendix 1. The search and exclusion resulted in 19 studies on ABI and interventions addressing interpersonal interaction.

2.5.1 Interventions from other professions in studies on interpersonal communication in neurorehabilitation

The interpersonal communication interventions conducted in most of the identified studies from other allied health professions involved reinforcement of positive interactions of the person with ABI (Brotherton, Thomas, Wisotzek, & Milan, 1988; Burke & Lewis, 1986; Gajar, Schloss, Schloss, & Thompson, 1984; Godfrey & Knight, 1988; Lewis, Nelson, Nelson, & Reusink, 1988; Yuen, 1997; Zencius, Wesolowski, & Burke, 1990).

The positive reinforcement intervention in Burke and Lewis (1986) was structured around an individualized points system. When the participant performed correctly in a range of four-minute long situations, points were awarded immediately afterwards. In Gajar et al. (1984), trained observers provided instant feedback on positive/negative behaviors using a light box. In Lewis et al (1988) the therapist used three possible types of feedback during five daily conversations, 1) attention and interest, 2) systematic ignoring, and 3) correction in order to reinforce positive interaction.

Four studies implement an intervention called social skill training in order to adjust the interpersonal communication competencies of the person with ABI (Dahlberg, et al., 2007; Johnson & Newton, 1987; Sladyk, 1992; Yuen, 1997). Social skill training takes place in a group setting and involves self-assessment, feedback from peers, assertiveness training, positive self-talk, and conflict resolution (Dahlberg, et al., 2007).

Another therapy-led intervention is Interpersonal Process Recall (IPR) treatment. IPR consists of 10-15 minutes of unstructured interaction with a staff member followed by 45-50 minutes of "mutual recall" involving the subject, staff member and an inquirer. Looking at video of the initial interaction, deficient social skills are identified. Appropriate interaction skills are then rehearsed (Helffenstein & Wechsler, 1982). One study includes both the people with ABI and their families in identifying problematic interaction and comes to a decision on how to oppose those behaviors via an anger management training program (Uomoto & Brockway, 1992). The O'Reilly et al. (2000) study uses a problem-solving approach to teach social skills to the persons with ABI.

Other studies are interested in the participant's previous personality and the social adjustment following the first years of ABI. In those studies, treatment is interdisciplinary and not specifically targeted to ICC but promotes cognitive, social, and occupational skills (Finset, et al., 1995; Gomez-Hernandez, Max, Kosier, Paradiso, & Robinson, 1997; Oddy, et al., 1985; Oddy & Humphrey, 1980).

Having provided a short overview of the interventions performed in the indentified studies, the next section is a review of research designs utilized in the studies.

2.5.2 Research designs from other professions in studies on interpersonal communication in neurorehabilitation

This part of the review gives an overview of the research designs used in other clinical fields in ABI rehabilitation. The studies' designs vary from flexible single or multiple case studies to (fixed) randomized control trials. Fifteen of the nineteen identified studies are quasi-experimental (follow a fixed experimental procedure, but do not randomly assign people to treatment and/or control

groups). Two of the studies follow the RCT principal (Dahlberg, et al., 2007; Helffenstein & Wechsler, 1982). The Helffenstein et al. (1982) study allocates randomly to treatment or no treatment. Dahlberg et al. (2007) also allocate to treatment /no-treatment, but use a crossover (delayed treatment) design and have three follow-up evaluations. The Oddy and Humphrey (1980) study has a control group of non-brain-injured participants (traumatic limb fractures) looking for a relationship between cognitive performance and social skill deficits. Schloss et al. (1985) also compare their results with a group of non-brain-injured persons. The Oddy et al. (1985) study is a follow-up on both ABI and control groups from the 1980 study.

Eight of the nineteen studies are fixed case study designs (in-depth info on participants) with pre/post or multiple evaluations (Brotherton, et al., 1988; Burke & Lewis, 1986; Godfrey & Knight, 1988; Lewis, et al., 1988; Sladyk, 1992; Uomoto & Brockway, 1992; Yuen, 1997; Zencius, et al., 1990). The Yuen (1997) and Sladyk (1992) studies are also case reports utilizing a flexible design.

Most of the studies have several measurement points (see Table 9). Four of the studies measure the interpersonal consequence (Standard rehabilitation as treatment) of acquiring a brain injury with repeated measurements within the first year of rehabilitation (Brotherton, et al., 1988; Gajar, et al., 1984; Gomez-Hernandez, et al., 1997; Oddy & Humphrey, 1980).

Six studies have included the relatives or staff members of people with ABIs when evaluating ICC. These studies use either interviews or questionnaires in evaluating interpersonal communication competencies (Brotherton, et al., 1988; Dahlberg, et al., 2007; Helffenstein & Wechsler, 1982; Johnson & Newton, 1987; Oddy, et al., 1985; Oddy & Humphrey, 1980; Uomoto & Brockway, 1992).

Thirteen of the studies identified have incorporated ratings of interpersonal communication competencies by an external person. The ratings were performed either blind using video/audio (Braunling-McMorrow, Lloyd, & Fralish, 1986; Brotherton, et al., 1988; Burke & Lewis, 1986; Dahlberg, et al., 2007; Gajar, et al., 1984; Helffenstein & Wechsler, 1982; Johnson & Newton, 1987; Lewis, et al., 1988; Schloss, Thompson, Gajar, & Schloss, 1985), and/or in the clinical/daily context (Braunling-McMorrow, et al., 1986; Finset, et al., 1995; Godfrey & Knight, 1988; Helffenstein & Wechsler, 1982; Uomoto & Brockway, 1992; Zencius, et al., 1990).

In Table 9, the background information and research designs used in documenting interventions from other professions on interpersonal competencies in ABI rehabilitation are summarized. The 'specific clinical method' category was checked if the intervention applied was designed to modify interpersonal competencies. The column "SR (staff/relative) evaluation" was checked if family and/or staff evaluated the participant's interpersonal competencies. The column 'measurement point' refers to the

number of measurement points in the study. The 'control group/cross-over' and 'blind rating' boxes were checked if the study adopted these features. The 'cases' box was checked if the study had in-depth description of one or more participants.

Table 9 Research designs in documenting interventions on interpersonal competencies in ABI rehabilitation

Background info						Research methodology							
Reference	Year	Number of participants	Young=14-24, Adult,=25-59, Old=60+	Gender:	TBI / Stroke / Other / Mix	Method addressing ICC	SR evaluation	Measure points	Fixed design	Control gr./Crossover	Blind rating	Cases	Randomized allocation
Oddy et al	1980	54	YA	♀♂	T		X	4	X	X			
Oddy et al	1985	44	YA	♀♂	T		X	(1)	X	X			
Gomez-H. et al.	1997	64	YA	♀♂	M			4	X				
Finset et al	1994	54	YA	♀♂	T			2	X				
Brotherton et	1988	4	YA	♀♂	T	X	X	4	X		X	X	
Johnson et al	1987	10	YA	♀♂	T	X	X	3	X		X		
Burke et al	1986	1	Y	♂	O	X		34	X		X	X	
Lewis et al	1988	1	Y	♂	O	X		20	X		X	X	
Yuen	1997	1	A	♂	T	X		(3)				X	
Zencius et al.	1990	1	Y	♂	T	X		38	X			X	
Uomoto et al.	1992	2	YA	♂	M	X	X	8+	X			X	
Sladyk	1992	1	Y	♀	T	X		?				X	
Godfrey et al.	1988	1	A	♂	T	X		2	(X)			X	
O'Reilly et al.	2000	2	Y	♂	T	X		10	X			X	
Helffenstein et.al.	1982	16	YA	♀♂	M	X	X	3	X	X	X		X
Dahlberg et al.	2007	52	YAo	♀♂	T	X	X	5	X	X	X		X
Braunling-McMorrow et al	1986	3	YA	♀♂	T	X		18	X		X	X	
Gajar et al.	1984	2	Y	♂	T	X		20	X		X	X	
Schloss et. al	1985	2	Y	♂	T	X		31	X	X			

2.5.3 Outcome measures in studies from other professions on interpersonal communication in ABI rehabilitation

This part of the review provides an overview of the outcome measures used in documenting interpersonal communication competences in ABI rehabilitation. Outcome measures that do not address interpersonal communication were only mentioned in the summarizing schema. The nineteen identified studies have

applied interviews, questionnaires, and ratings, in gaining information about interpersonal communication competencies of people with ABI.

Five studies have used structured or semi-structured interviews with participants and/or their relatives about the social functioning of people with ABI (Brotherton, et al., 1988; Finset, et al., 1995; Gomez-Hernandez, et al., 1997; Oddy, et al., 1985; Oddy & Humphrey, 1980). A standardized interview format was used on the participants in the Gomez-Hernandes et al. (1997) study. They deployed the 'Social Functioning Exam' that has 28-items and a semi-structured format. Starr et al. (1983) finds good test and re-test validity for the Social Functioning Exam. The other interviews conducted were non-standardized and addressed social adjustment and behavior (Oddy, et al., 1985; Oddy & Humphrey, 1980), problems in social situations (Brotherton, et al., 1988), and social networks and support systems (Finset, et al., 1995).

Six studies have used questionnaires deployed on participants and relatives (Brotherton, et al., 1988; Dahlberg, et al., 2007; Helffenstein & Wechsler, 1982; Johnson & Newton, 1987; Oddy, et al., 1985; Oddy & Humphrey, 1980; Uomoto & Brockway, 1992). The Katz Adjustment Scale (KAS) is deployed in three studies (Johnson & Newton, 1987; Oddy, et al., 1985; Oddy & Humphrey, 1980). The KAS was originally developed for the psychiatric profession and is available in two forms: Self-Report and Relative Report. It covers ten areas that can be problematic in social interaction:

- Belligerence (narcissism and self-centeredness)
- Apathy (un-motivational behaviors)
- Social irresponsibility (inconsistent behavior and poor judgment)
- Orientation (memory and orientation problems)
- Antisocial behavior (decreased awareness and increased impulsivity)
- Speech-cognitive dysfunction (slowed reaction time)
- Bizarreness (lability and strange beliefs)
- Paranoid Ideation (expressed fears and dread)
- Verbal expansiveness (aggression and intimidation)
- Emotional sensitivity (self-criticism, worries, fretting) (K. A. Baker, et al., 1998).

The KAS has 127 items and uses a 4 point Likert-type scale ('almost never' to 'almost always'). For a psychiatric patient it takes 35-45 minutes to complete the questionnaire. The short form of KAS has 48 items and takes 10-15 minutes. The KAS has also been used as an observer tool on TBI participants and has been tested for correlation with the Symptom Checklist-90-Revised in Barker et al. (1998). The Cronbach alpha coefficients for the KAS when administered to people with ABI range from .78 to .94 (Goran & Fabiano, 1993).

Another standardized self-evaluation questionnaire, which was applied in one study, is the Social Anxiety and Distress Scale (SADS). It is a 28-item scale

designed to measure social anxiety. The items present social situations and are answered either true or false (Johnson et al. 1987). The SADS Cronbach alpha was been reported as .90 (Johnson & Newton, 1987).

The Interpersonal Communication Inventory (ICI) is yet another standardized questionnaire used in only one study (Helffenstein & Wechsler, 1982). The ICI has a 54-item, 3-point Likert type self-inventory. Each item has three possible answers: yes (usually)/no (seldom)/sometimes. It was developed to measure the process of communication as an element of social interaction. It is not intended to identify content, but patterns, characteristics, and styles of communication. Areas such as the ability to listen, to empathize, to understand, to deal with angry feelings, and to express oneself are explored. The inventory has five sub-groups:

1. Self-concept
2. The ability to be a good listener
3. The skill of expressing one's thoughts and ideas clearly
4. Being able to cope with one's emotions
5. The willingness to disclose oneself to others truthfully and freely

The Cronbach alpha of the ICI in a normal population reached .93 (Vealey, et al., 1998). Helffenstein and Wechsler (1982) also used the State-Trait Anxiety Scale (STAS) on the participants. The STAS is designed to assess the tendency of a subject to become anxious in a variety of specific interactions. Staff members were, in the Helffenstein et al. (1982) study, asked to fill in the Interpersonal Relationship Rating Scale (IRRS). The IRRS is a self-administered inventory that takes approximately ten minutes to fill in. It consists of 24, seven-point Likert rating scales, formulated in such a way that high ratings are 'positive' and low ratings are 'negative'. The IRRS instrument is designed so that people who know the participant well can respond. The items are constructed in order to measure attitudes and/or behaviors in the individual's relationships with others and in self-perception. The IRRS was originally developed for counseling students (Brown & Sullivan, 1979). A factor analysis of the 24 IRRS items revealed eight (six) subscales of interpersonal relationship that the IRRS assesses: 1) Inner-self, 2) Self-disclosure, 3) Reaching out to others, 4) Resourcefulness, 5) Empathy, 6-8) Helping relationship skills (Brown & Sullivan, 1979). It has not been possible to find any Cronbach alpha values on the IRRS.

In Godfrey et al. (1988), staff evaluated the participants' behavior using the Adaptive Behavior Scale (ABS). The ABS is a series of tests used to quantify the ability to live independently. The tests assess personal self-sufficiency (eating and dressing), community self-sufficiency (shopping and communicating), and personal and social responsibility (job performance and use of leisure time) (Godfrey & Knight, 1988). The Cronbach alpha is .85 for ABS part one and .79 for ABS part two (Roszkowski, 1982).

An adapted version of the Social Communication Skill Questionnaire (SCSQ) was developed by Dahlberg et al. (2007) for their study. The questionnaire is both for participants and relatives and assesses the participant's level of understanding of social communication and degree of insight regarding communicative behaviors. Dahlberg et al. (2007) added questions relevant for their study and a scoring system. Cronbach alpha values on the adapted SCSQ were not reported. Dahlberg et al. (2007) also used the Craig Handicap Assessment and Reporting technique – Short Form (CHAR-SF) social integration and occupation subscales. The social integration subscale assesses the participant's living situation in terms of number of contacts with relatives, business contacts, friends, and strangers. The occupation subscale measures hours spent working, in school, active home making, home maintenance, volunteer work, recreational activities, and other self-improving activities (Dahlberg, et al., 2007). Dahlberg et al. (2007) also deploy the Community Integration Questionnaire (CIQ) social integration and productivity subscales. The CIQ is developed for the TBI population. The two subscales (social and productivity) measures the frequency of social activities such as shopping, leisure pursuit, visiting friends or relatives, as well as productivity activities such as work, school and volunteer situations. The CIQ has 15 items.

Oddy et al. (1980) used a non-standardized/specified Brief Questionnaire on social adjustment, motor and sensory problems, and personality and cognitive deficits prior to ABI. Braunling-McMorrow et al. (1986) also constructed a questionnaire in which staff were to evaluate 15 behaviors e.g. gives compliments, is polite, gives appropriate criticism, etc.

2.5.3.1 Measures performed by rater

In this review, a rating measure is defined as an instrument that an observer uses to focus attention on predefined parameters, when evaluating the interpersonal behavior of people with ABI. The text will first focus on standardized rater tools, then non-standardized.

The Norwegian Interdisciplinary Rating Scale (NIRS) is a standardized clinical rating tool that has ICC components and was administered in the Finset et al. (1994) study. The NIRS is administered in an interdisciplinary setting and covers six functional domains: arousal, motor functioning, ADL, cognitive, emotional, and social functioning.

The Profile of Functional Impairment in Communication (PFIC) is a standardized research tool that has been validated (i.e. correlated and test re-tested (Linscott, et al., 1996)). The PFIC has been used by blinded raters in the Dahlberg et al. (2007) study. The PFIC is designed for use on people with TBI. It consists of 10 summary subscales and 84 specific behavior items. The ten summary subscales are:

1. Logical content
2. Participation

3. Quantity
4. Quality
5. Internal relation
6. External relation
7. Clarity of expression
8. Social style
9. Subject matter
10. Aesthetics

The summary sub-scales are rated based on level of impairment on a six-point likert-scale (normal, very mildly impaired, mildly impaired, moderately impaired, severely impaired, or very severely impaired), and scored 0 to 5. The 84 problematic behavior items are scored on a four-point likert-scale (not at all, occasionally, often, almost always or always) and scored as 0 to 3 (Linscott, et al., 1996).

The Behaviorally Referenced Rating System of Intermediate Social Skills (BRISS) was used in (Marsh & Knight, 1991). The BRISS is a rater tool that evaluates deficits in social behavior on both verbal and nonverbal components. It consists of 11 scales, five dealing with the nonverbal aspects of social skills (e.g. eye contact, gestures) and six dealing with verbal aspects (Language, Speech Delivery, Conversation Structure, etc.) (Flanagan, et al., 1995). Flanagan et al. (1995) report that the BRISS has good construct validity and internal consistency as well as a good inter-rater reliability, though they do not give any details.

A number of non-standardized tools (i.e. where the respective researchers have constructed subgroups and items) on interpersonal behavior or audio/video rating have been identified in this review. They are:

- Scale of Social Behavior (SSB). A blinded rater evaluates video of the participants, assessing speech fluency, voice quality, conversational fluency, topic interest, statement orientation (positive/negative), facial expression, eye contact, and body gestures, using a three point scale (Brotherton, et al., 1988).
- Social Performance (SP). A blinded rater scores video of the participants assessing: posture, gestures, gaze, facial expressions, voice volume, tone and clarity, feedback to speaker, speech content, use of questions, length and ease of speech, plus a rating on assertiveness and anxiety (Johnson & Newton, 1987).
- Target Behaviors (TB). A blinded rater counts three target behaviors in four-minute-interval video recordings. Percentage of interaction time is calculated. The TB covers loud verbal outbursts, interrupting, and nonsensical talk (Burke & Lewis, 1986).
- Target Behaviors (TB2). A blinded rater counts TB in video recordings of an ICC-training card game. The TB2 covers compliments, social

interaction, politeness, criticism, social confrontation, and question/answers (Braunling-McMorrow et al., 1986).

- Social Inappropriate Talk (SIT). A blinded rater counts SIT episodes in audio recordings of 15, two-minute-long daily conversations (Lewis, et al., 1988).
- Video Analysis tool (VA). A blinded rater assesses 15-minute-long interactions using a five point scale, assessing awareness, understanding (empathy), facilitative genuineness, self-disclosure, concreteness, acceptance of feedback, and attention (Helffenstein & Wechsler, 1982).
- Frequency Count of Verbal Behavior (FCVB). A blinded rater counts three behaviors: complimenting others, asking others questions about themselves, and telling others about self. Data is audio recordings of two daily 5-minute-long conversations (Schloss, et al., 1985).
- Response Scoring (RS). A blinded rater scores the frequency of positive and negative responses on audio-recordings of structured, mediated interaction. The observer counts episodes of: relevant statements, agreeing or not but with rationale, relevant questions (positive), no-response, length of response, off-topic, mumble, joke, or interrupt (negative) (Gajar, et al., 1984).

Helffenstein and Wechsler (1982) constructed an Independent Observer Rating Scale in the form of a behavioral checklist. Observations were made in the evenings as the participants interacted with other participants and staff in the communal area. In the Uomoto et al. (1992) study, relatives counted the number of weekly anger outbursts. Similarly, in the study by Zencius et al. (1990), clinicians counted the number of profanities used each day.

In Table 10, the research tools used in documenting interventions on interpersonal competencies in ABI rehabilitation are presented. The columns indicate author, year of publication, name of research tool, type of tool; the last column presents whether it is a non-standardized tool and what the tool assesses.

Table 10 Tools used in documenting interventions on interpersonal competencies in ABI rehabilitation

Author	Year	Research tool	Type	Assesses
Oddy et al.	1980	Interview	Semi structured	Non-standardized. Relatives interviewed about the social adjustment, behavior and memory of the subjects
		Symptom checklist	SR/self eval. quest.	Non-standardized. Personality changes and somatic, sensory, cognitive and psychiatric symptoms.
		Brief Q	SR/self elval.quest.	Non-standardized. Brief questionnaire on social adjustment, motor and sensory sequelae, and personality and cognitive deficits

Author Year	Research tool	Type	Assesses
	KAS-(R)	SR/self quest	Katz Adjustment Scale – (Relatives), covers a wide range of behaviors
Oddy et al. 1985	Interview	Semi structured	Non-standardized. Relatives interviewed about the social adjustment, behavior and memory of the subjects
	Symptom checklist	SR/self eval. quest.	Non-standardized. Personality changes and somatic, sensory, cognitive and psychiatric symptoms.
	WSRS	Self eval. quest	Wimbledon Self Report Scale assesses emotional state.
	BNP	Rating	Bond Neuro physical scale evaluates physical state.
	MHV	Test	The Mill Hill Vocabulary scale is a intelligence test
	RPM	Test	Raven's Progressive Matrices is a intelligence test
	KAS-(R)	SR/self quest.	Katz Adjustment Scale – Relatives, covers a wide range of behaviors
Gomez-H et al. 1997	GCS	Rating	Glasgow Coma Scale
	PSE	Structured interview	Present State Exam evaluates for mood and anxiety disorders
	HDRS		Hamilton Depression Rating Scale
	SFE	Interview	Social Functioning Exam is a semi structured interview that assesses satisfaction with social functioning
Finset et al. 1994	SI.ADL	Rating	Sunnaas Index of ADL deals with activities of daily living
	NIRS	Rating	Norwegian Interdisciplinary Rating Scale covers six functional domains: arousal, motor functioning, ADL, cognitive, emotional, and social functioning.
	Question air	Self eval.	Non-standardized. Subjective complaints were assessed with a 54 item questionnaire
	Interview	Structured	Non-standardized. During follow-up dealing with social network and support systems
Brotherton et al. 1988	Interview	Semi structured	Non-standardized. Family members and participants were interviewed to identify major problem situations in social interactions.
	SSB	Rating	Non-standardized. Scale of Social Behavior evaluates: speech fluency, voice quality, conversational fluency, topic interest, statement orientation (+/-), facial expression, eye contact, and body gestures
Johnson et al. 1987	KAS-R	SR eval. quest.	Katz Adjustment Scale – Relative report includes five subscales that covers a wide range of behaviors

Author	Year	Research tool	Type	Assesses
		SP	Rating	Non-standardized. Social Performance is an observational measure on: posture, gestures, gaze, facial expressions, voice volume, tone and clarity, feedback to speaker, speech content, use of questions, length and ease of speech + rating on assertiveness and anxiety
		FNE	Self eval. quest.	Fear of Negative Evaluation
		SADS	Self eval. quest.	Social Anxiety and Distress Scale
		RSE	Self eval. quest.	Rosenberg Self-esteem Scale
		BNP	Rating	Bond Neuro physical scale evaluates physical state
Burke et al.	1986	TB	Rating	Non-standardized. Three Target Behaviors are counted: loud verbal outbursts, interrupting, nonsensical talk
Lewis et al.	1988	SIT	Rating	Non-standardized. Episodes of Socially Inappropriate Talk is counted
Zencius et al.	1990	FP	Rating	Non-standardized. Frequency of Profanity is collected
Yuen	1997			
Uomoto et al.	1992	AO	SR rating	Non-standardized. The number of Anger Outbursts during a week is counted by relatives
Godfrey et al.	1988	WAIS	Test	Wechsler Adult Intelligence Scale
		WMS	Test	Wechsler Memory Scale
		ABS	Rating	Adaptive Behavior Scale – covers 24 subgroups on aspects of behavior
Marsh et al.	1991	BRISS	Rating	Behaviorally Referenced Rating System of Intermediate Social Skills – evaluates deficits in social behavior on both verbal and nonverbal components
		MDDAT	Test	Minnesota Differential Diagnosis of Aphasia Test
		NART	Test	National Adult Reading Test
Helffenstein et.al.	1982	STAS	Self Quest.	State-Trait Anxiety Scale evaluates anxiety in relation to a variety of situations
		TSCS	Self Quest.	Tennessee Self-Concept Scale assesses self concept
		ICI	Self Quest.	Interpersonal Communication Inventory – self-perceived skill level
		IRRS	Staff Rating	Interpersonal Relationship Rating Scale
		IORS	Rating	Non-standardized. Independent Observer Report Scale is used on live setting

Author	Year	Research tool	Type	Assesses
		VA	Rating	Non-standardized. Video Analysis tool dealing with: awareness, understanding (empathy), facilitative genuineness facilitative self-disclosure, concreteness, and specifies acceptance of feedback, and attention
Dahlberg et al.	2007	PFIC	Rating	Profile of Functional Impairments in Communication – assesses: logical content, participation, quantity, quality, internal and external relation, clarity of expression, social style, subject matter, and aesthetics
		SCSQ-A	SR/self Quest.	Social Communication Skills Questionnaire-Adapted
		GAS	Rating	Non-standardized. Goal Attainment Scale – a set of individual goals is listed and scored (ask questions, interrupt less, new social settings)
		CHART-SF	SR/self Quest.	Craig Handicap Assessment and Reporting Technique-Short Form social integration and occupation subscales – measure participation and community integration
		CIQ	SR/self Quest.	Community Integration Questionnaire – assesses activities such as shopping, leisure, visiting friends and family, work, etc.
		SWLS	SR/self Quest.	Satisfaction With Life Scale
Braunling-McMorrow et al.	1986	TB	Rating	Non-standardized. Target Behaviors – Compliments, Social interaction, politeness, criticism, social confrontation, and question/answers
		SSE	SR Rating	Non-standardized. Social Skill Evaluation on 15 behaviors
Gajar et al.	1984	RS	Rating	Non-standardized. Response Scoring on: relevant statement, agreeing or not but with rationale, relevant questions, no-response, length of response, off-topic, mumble, joke, or interrupt.
Schloss et al.	1985	FCVB	Rating	Non-standardized. Frequency Count of Verbal Behavior – three behaviors: complimenting others, asking others questions about themselves, telling others about self.

SR=staff/relatives, Quest.= questionnaire

2.5.4 Summary of research from other professions on interpersonal communication in ABI rehabilitation

The nineteen studies reviewed have great diversity in research design, methods, and outcomes. Only two studies follow the RCT principle. Eight standardized outcome measures on interpersonal communication have been identified (the NIRS, KAS, SCSQ-SF, CHAR-SF, IRRS, ABS, CIQ, and PFIC). Generally, the measures have only been used in one study – except the KAS, which has been used in three studies. Twenty-one non-standardized research outcomes were identified.

The strongest studies in terms of randomized control design, statistical power, and stringent inclusion and exclusion criteria, are the Dahlberg et al. (2007) and Helffenstein et al. (1982) studies. In addition, their outcome measures were sensitive enough to measure improvements in interpersonal interaction.

A summary of the results from the studies indicate that:

- Pre-ABI personality affects social recovery, post-ABI (Oddy et al, 1980).
- There was no change in the participant's physical or cognitive status from one year to five years post-ABI. Difficulty in remembering and concentrating were still the most-commonly reported persisting problems according to both the patients and their relatives (Oddy, et al., 1985).
- Weakened close personal relationships and continued fear of job loss are interrelated with depression (Gomez-Hernandez et al., 1997).
- Lack of interpersonal relationships is significantly associated with chronic, rather than acute, depression (Gomez-Hernandez et al., 1997).
- Poor social adjustment prior to TBI predicts depression at 6 months after TBI (Gomez-Hernandez et al., 1997)
- ABI symptoms such as lack of spontaneity, reduced initiative, fatigue, depressed mood, emotional indifference and apathy, correlate with reduced social network (Finset et al., 1995).
- The more severe the trauma was perceived to be, the more support was given from family and friends (Finset et al., 1995).
- Social skills training is applicable for people with ABI. Homework and family education has an effect (Brotherton et al., 1988).
- The measures used in Johnson and Newton (1987) were not sufficiently sensitive to detect the small and gradual changes made in a severely disabled group.
- When comparing systematic ignoring, attention and interest, and correction feedback - the latter condition resulted in the fewest number of inappropriate remarks (Lewis et al., 1988).
- Specialized interventions can lead to a decrease in interruption, profanity, nonsensical talk and anger outbursts, and can prompt positive statements (Uomoto & Brockway, 1992)
- It is psychosocial, and not cognitive factors, which are crucial for rehabilitation in a young severely brain injured man (Godfrey & Knight, 1988).
- Interpersonal Process Recall (IPR) treatment can result in a reduction of anxiety and an increase in general self-concept, improvement in interpersonal and communication skills, as assessed by staff (Helffenstein & Wechsler, 1982).
  In (Dahlberg, et al., 2007), the treatment had a significant effect measured with the PFIC, SCSQ-A, GAS and SWLS.

2.6 Summary of research designs and measures used in documenting interpersonal communication in people with ABI

This summary identifies general tendencies in clinical methods, research design, and data collection instruments. As stated in the beginning of this chapter the purpose of this review was to identify research methodologies and data collection instruments appropriate for this study.

2.6.1 Clinical methods in reviewed research

The clinical methods used in ABI music therapy research addressing interpersonal interaction, all make use of active music-playing. The music therapy techniques involve instrumental and vocal improvisation, the Nordoff/Robbins approach, and the Rhythmic Auditory Stimulus method. None of the music therapy studies have hypothesized that receptive music therapy methods can have an effect on interpersonal interaction.

The clinical methods used in professions other than music therapy, which address interpersonal interaction of people with ABI, primarily involve reinforcement of positive interaction. The method "social skill training", which involves self-assessment, feedback from peers, assertiveness training, positive self-talk, and conflict resolution, has also been applied in several studies.

The knowledge gained in this review of clinical methods applied in research on ICC in people with ABI, confirms my clinical experience that active music-playing affects ICC. Therefore, the clinical method applied in this study involved active music-playing and improvisation. In relation to the clinical methods applied in studies from fields other than music therapy, some of the methods described are already included in the positive psychology approach (reinforcement of positive interactions). As described in Section 1.2, the clinical method applied in this study involved both a verbal "check-in" and "check-out". On those occasions, the participants gave feedback to the group on how the session and the other participants were experienced (feedback from peers). In addition, playing pre-composed music involves attunement, self-control, assertiveness, and sometimes conflict resolution. In this way, the music therapy setting gives a "natural" setting for training and discussions about social skills. Even though the music therapy interventions were not designed to be "social skill training", some elements of that method were present.

2.6.2 Tendencies in research designs

Eighteen of the 46 identified music therapy studies with people with ABI had a flexible design and 28 had a fixed design. Thirteen studies have made use of a control group or used a cross-over design; 12 of these had randomized allocation. Twenty-eight music therapy studies have detailed case descriptions.

In Figure 2, the music therapy studies with people with ABI published between 1980 and 2008 are presented. The bars in the figure indicate whether the study had a flexible, fixed, or a fixed design with randomization. Figure 2 reveals that, from 1997 and onwards, there has been an increase in publications as well as an increase in studies with a fixed/randomized design. Between 1980 and 1996 there has been published, on average, one study per year, of which two incorporated randomization. Between 1997 and 2008, 31 studies have been published (on average, three publications per year). Ten of the studies published after 1997 have randomization incorporated into the study.

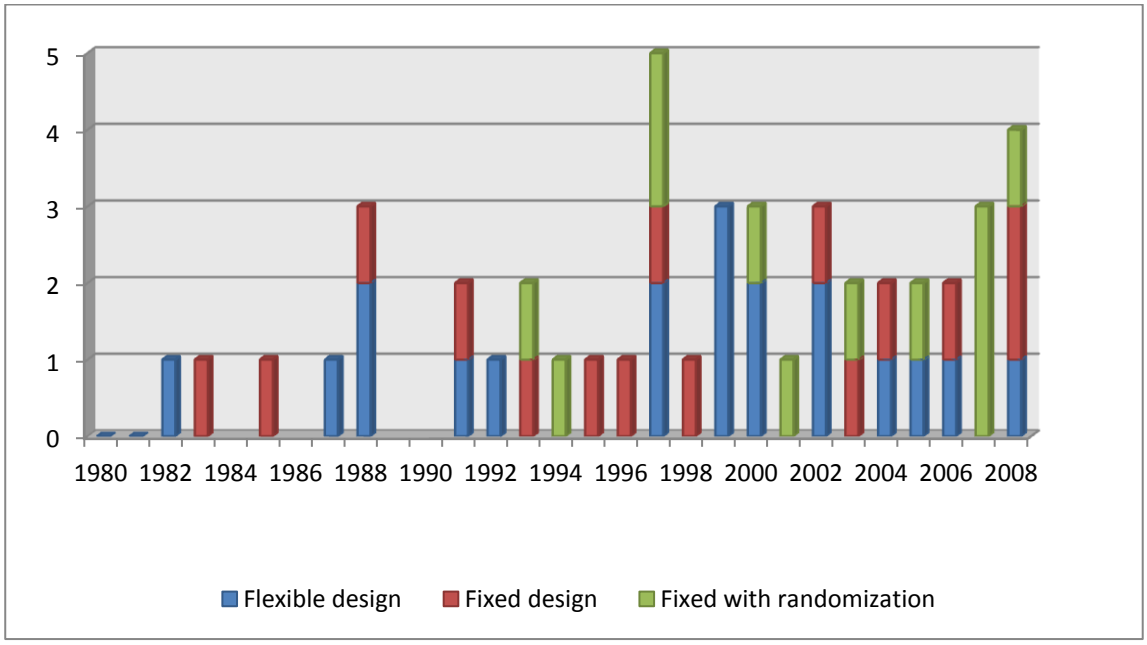


Figure 2 Research designs music therapy ABI rehabilitation studies

Seven of the identified music therapy studies with people with ABI have made use of 'blinded rating' – of which four have been published after 2005, indicating a tendency towards using that design feature. Only one study on ICC, ABI and music therapy has applied a blinded rating of music therapy sessions (Purdie et al., 1997) using their own Musical Behavior Scale (Purdie et al., 1995).

The sample size in music therapy studies correlate with the respective injury types (TBI, Stroke, Mixed group, or Other). Eighteen music therapy studies with people with ABI have only stroke survivor participants; 14 studies have participants with mixed types of injury; seven studies have participants with TBI; and six studies have participants with other types of ABI. In total, 352 participants with stroke have participated in the 18 studies giving a mean sample size of 19.5 for music therapy studies on stroke survivors. In total, 177 participants have participated in the 14, mixed-injury type studies giving a mean sample size of 12.64 for mixed ABI type research. In total, 67 participants with TBI have participated the seven studies giving a mean sample size of 9.57 for music therapy studies on TBI. Twelve participants with other types of injury

were enrolled in six studies giving a mean sample size of two for music therapy studies on other types of brain injury (these were all case studies, however).

In the studies from professions other than music therapy, fifteen out of the nineteen studies have made use of a fixed design. Two of these studies follow the RCT principal (Dahlberg, et al., 2007; Helffenstein & Wechsler, 1982). The number of measurement points used in the studies varies from 2 to 33. Eight of the studies have made use of blinded rating of interpersonal interaction. Seven of the studies with blinded rating were conducted in the 1980s; the only study in recent years applying blinded ratings in ABI ICC research is that of Dahlberg (2007).

In summary, the tendency in ABI research is toward a fixed design. Few studies have followed the RCT principle in ABI research from both music therapy and other professions. Within music therapy research, the tendency to utilize an RCT design is increasing. The blinded rating feature was used both in music therapy and in research by other professions, and this feature tends to also be increasingly used in research.

In relation to the present study, the research design tendencies advocate a fixed RCT design. This tendency complies with the clearly defined research focus in this study (ICC), enabling a fixed RCT design. The tendency of using blinded raters has also affected the design of this study and the feature has been incorporated in order to increase validity. The research setting (Høskoven) for this study meant that the participants have mixed types of ABI. The initial sample size estimation of possible participants in the study was 20. However, it has only been possible to recruit 11 participants for the RCT..

2.6.3 Communication measurement tendencies

In the review, twelve standardized instruments assessing interpersonal communication have been identified, three of which appear in music therapy research. In Nayak et al. (2000) the participants' families and staff rated social interaction using seventeen questions adapted from the social interaction subscale of the Sickness Impact Profile (SIP). In Purdie et al. (1997), an adapted version of the Neurobehavioral Rating Scale (Behavioral Rating Scale) was used in assessing everyday-life behavior of the participant. In Jeong and Kim (2007) a translated and modified version of the Relationship Change Scale (RCS) was applied. The remaining identified measurement tools in ABI music therapy research are either adapted or modified (see Section 2.4.3 for details). In research from professions other than music therapy, the standardized communication measurement tools are:

- Katz Adjustment Scale (KAS)
- Behaviorally Referenced Rating System of Intermediate Social Skills (BRISS)
- Social Communication Skills Questionnaire-adapted (SCSQ-a)

- Craig Handicap Assessment and Reporting Technique-Short Form (CHAR-SF)
- Interpersonal Relationship Rating Scale (IRRS)
- Adaptive Behavior Scale (ABS)
- Community Integration Questionnaire (CIQ)
- Interpersonal Communication Inventory (ICI)
- Profile of Functional Impairments in Communication (PFIC)

KAS is the only tool to have been applied in more than one study (three).

In a literature review on social communication interventions in TBI rehabilitation, Struchen (2005, p.105) states that the high number of different measures of communication used in ABI research is problematic and continues: "There is no acceptable standard method of assessing the interpersonal skills of persons with brain injury" (p.105). Struchen (2005) recommends researchers to administer the Assessment of Interpersonal Problem Solving Skills (AIPSS) (Donahoe et al., 1990) when the researcher wants to measure changes in receptive, processing and expressive aspects of social communication skills. If the goal is only to measure expressive aspects of communication, Struchen (2005) recommends the Profile of Functional Impairments in Communication (PFIC) (Linscott et al., 1996). The PFIC focuses on verbal expression: logical content, participation, quantity, quality, internal and external relationships, clarity of expression, social style, subject matter, and aesthetics.

The only quantitative measure on musical interaction that has been applied in ABI music therapy research is the musical behavior scale (MBC) by Purdie et al. (1997). In summary, the number of different standardized tools applied to research makes it clear that there is no commonly used tool/measure for assessing general interpersonal communication competencies in ABI research.

A major aim of this review was to identify a relevant research measure/ outcome/tool to be applied to the present study. The next section will present the process of selecting the measures of interpersonal communication. The rationale for presenting research measures before research questions is that the chosen research tool has affected the research question formulation. In addition, a major part of this study has been to adapt existing research tools to be able to measure interpersonal communication in music and everyday life in people with ABI.

2.7 Selecting measures for this study

This section describes the process of selecting outcome measures relevant for this study, based on the reviewed research tools: Firstly, the process of selecting measures of interpersonal communication competencies in everyday life, and secondly, the process of selecting measures of interpersonal communication in music.

Since ABI music therapy research has been shown to affect a range of different aspects of interpersonal communication, the research instrument for this study needed to be comprehensive – not only addressing interpersonal communication problems specific to ABI. As mentioned in Section 1.3, Spitzberg (2003) identified four instruments with a comprehensive model of interpersonal communication. Spitzberg (2003) states that Rubin and Martin (1994; 1993)'s Interpersonal Communication Competence Scale (ICCS) is the only research instrument that is not targeted at a specific participant group and has a resource-oriented understanding of communication. In the literature review, it was found that there is no standard interpersonal communication measurement tool generally applied in ABI research (nor translated into Danish). Consequently, it was decided to take a more open perspective in choosing the research instrument. Therefore, the ICCS was chosen as the main research outcome. This choice was made despite the recommendation by the neurological researcher Struchen (2005) who recommends using the AIPPS or PFIC when conducting research on communication in ABI research.

The ICCS was chosen since it is comprehensive – covering both verbal and nonverbal aspects of interpersonal communication (Section 1.3). In addition, it has a resource-oriented perspective, informing on the participant's competencies, skills, needs, or wishes instead of insufficiencies, problems, deficits, treatment, and restraints – cf. positive psychology. The tools identified in the literature review were not chosen since they either covered too many irrelevant areas, focused on relationships, did not focus on communication, or focused on ABI specific deficits.

In order to gather information from the whole context of the participants it was decided that, for the research tool to be suitable for this study, it had to investigate the participants' interpersonal communication competencies in everyday life from the perspective of the person with ABI, as well as the perspective of staff and relatives. In addition, it would be preferable if the tool had a parallel rating scale measuring musical communication, such as the musical behavioral scale developed by Purdie et al. (1997). A parallel musical communication scale would enable direct comparison between interpersonal communication competencies in music and in daily life. Furthermore, in order to increase validity it would be preferable if the tool allowed blind ratings. The processes of adapting the ICCS for these criteria are outlined in Section 3.4. Translating and adapting the Interpersonal Communication Competence Scale (ICCS) (Rubin & Martin, 1994) for inclusion into this trial weakened the validity of the results, since a Danish version of the ICCS has not been previously validated. However, no "better" alternative was available at the time. The actual translation of the ICCS is described in Section 3.4.1.
The next section is a presentation of the ICCS questionnaire.

2.7.1 Interpersonal communication competence scale (ICCS)

The ICCS has 30 items (questions) organized in 10 subscales and uses a five point Likert-scale (1 - almost never, 2 – seldom, 3 - sometimes, 4 - often, 5 - almost always). The ICCS items have been chosen from existing scales or created from construct definitions to construct a comprehensive interpersonal communication competence scale (Rubin & Martin, 1994). The items have been tested for internal reliability on 477 students (aged 18 to 70, mean 20, 92). The overall Cronbach alpha for the ICCS is .86, which means there is good internal consistency. The ten ICCS subscale alpha coefficient range from .44 (interaction management and altercentrism) to .72 (assertiveness). Because of the unacceptably low coefficients in some of the subscales, Rubin & Martin (1994) do not advocate breaking the ICCS into subscales.

The ICCS questionnaire has been tested for concurrent validity in relation to cognitive and communicative flexibility on 247 students. A two-tailed Pearson correlation analysis showed significant correlation between ICCS score and the cognitive flexibility score ($r=.49$, $p<.01$) and the communicative flexibility scale ($r=.40$, $p<.01$) (Rubin & Martin, 1994).

The ten ICCS sub-scales; Self-disclosure, Empathy, Social relaxation, Assertiveness, Interaction management, Altercentrism, Expressiveness, Supportiveness, Immediacy, and Environmental control cover the competencies used in everyday skilled interpersonal interaction, according to Rubin and Martin (1994). However, as also stated by Rubin and Martin (1994) there is an overlap between the ten competencies, e.g. Empathy is an important part of Supportiveness and Immediacy. In addition, Environmental control and Interaction management have many shared components. Since the ICCS score is accumulative, it does not matter if there is an overlap between elements in the ten subscales. Each subscale represents a part of the whole. The ten sub-scales are clarified in next ten sub-sections.

2.7.1.1 Self-disclosure

The self-disclosure competence has to do with being open and revealing personal material to others. Self-disclosure involves risk and vulnerability on the part of the person sharing the information (Rubin & Martin, 1994). All through life, self-disclosure is important in forming relationships. "Considerable evidence illustrates that, throughout adolescence and young adulthood, self-disclosure is a key feature of both friendship formation and friendship maintenance" (Samter, 2003, p.655). When exchanging increasingly intimate information, close adult friendships are formed. The rationale is that revealing personal information signals an individual's desire for closeness (Samter, 2003). Several studies using strangers indicate that people who engage in personal disclosure are better liked than people who limit disclosure to distant topics (Samter, 2003, p.655). Another function of self-disclosure is self-

clarification, where the revelation serves to learn more about one's thoughts and feelings (Hargie & Dickson, 2004). Same-gender friends avoid disclosure on certain topics, mainly those involving negative life experiences and relationship issues. The underlying motivation for such topic avoidance is the wish to protect one's self-image and autonomy. Thus, skilled disclosure is characterized by knowing when topic avoidance is functional and when it is not (Samter, 2003).

In psychotherapy, self-disclosure is described as a intervention tool used for humanizing the therapist (Yalom, 2002, p.75). In music therapy, 'self-disclosure in music' can be the a goal of therapy (James & Freed, 1989).

2.7.1.2 Empathy

Empathy is a social competence that exists across species and has to do with the ability to feel as or with others (Preston & de Waal, 2002). Empathy is defined by the phenomenal experience of mirroring ourselves onto others (Gallese, Ferrari and Alessandra in Preston and de Waal, 2002). Preston and De Wall (2002) report several studies that have found evidence that observing another person's emotional state activates parts of the neural network involved in processing that same state. This has to do with the mirror neuron system. Their argument is supported by Gallesse and Keysers (2001) and other brain scan studies of subjects having an emotion when seeing another person experiencing an emotion – they find that the brain regions used are the same. The neural circuitry critical to this mechanism is composed of frontal and parietal areas. These brain areas match the areas involved in execution of action. Further, the areas are interacting heavily with the superior temporal cortex, which is linked to the limbic system by means of an anterior sector of the human insular lobe (Preston & de Waal, 2002, p.39). In understanding the dynamics of empathy, Preston and de Waals argue for a Perception-Action-Model (PAM) and state that "attended perception of the object's state automatically activates the subject's representations of the state, situation, and object, and that activation of these representations automatically primes or generates the associated autonomic and somatic responses, unless inhibited" (Preston & de Waal, 2002, p. 4). In other words, Preston de Waals argues that empathy is more than a cognitive process. Because the data in this study is based on observations, it will follow the PAM model, using the argument that empathy can only be observed if it is followed by an emphatic response. When communicating one's empathic response one uses both verbal and nonverbal signals (Hargie & Dickson, 2004).

In everyday life, the ability to empathize is crucial when responding to emotional issues, entering new social contexts, and understanding and responding to others yield interests. People who are emphatic/accepting competently function as 'openers' in interactions and receive more disclosure from others (Hargie & Dickson, 2004). Non-emphatic response can often lead closure of communication.

The cognitive competency for empathy is very complex, since it involves frontal and parietal areas, as well as the superior temporal cortex and the limbic system. In Eisenberg and Strayer (1987, p.221), 'recognition of emotions' and 'role- taking' are described as cognitive prerequisites for empathy. Both skills involve detection abilities in recognition of verbal and nonverbal signals.

2.7.1.3 Social relaxation

Social relaxation has to do with feeling comfortable and having a low level of apprehension in everyday social interactions. Social relaxation also has to do with the ability to handle other people's negative reactions or criticism without stress (Rubin & Martin, 1994). The opposite of social relaxation is social anxiety, which can be very destructive when engaging in interpersonal interaction. Studies have shown that socially anxious people engage in fewer social interactions, are less assertive, demonstrate disrupted turn-taking abilities during social interaction, and are perceived by themselves and others as being less socially skilled (Sergin & Givertz, 2003). Social anxiety can cause communication apprehension, which can be thought of as an internally experienced feeling of discomfort that causes ineffective communication. Communication apprehension is the level of fear or anxiety related with either real or anticipated communication with another person (Daly & McCroskey, 1984). In everyday life interactions, the ability to cope with other people's oddity in a relaxed way is very important in relation to keeping a respectful interaction style. This is especially important in neurological rehabilitation settings where people often behave 'outside the box'.

2.7.1.4 Assertiveness

Assertiveness covers direct and straightforward communication of opinions, feelings, needs, and rights in a way that does not deny the personal rights of the other. Assertiveness involves standing up for one's own rights, whilst acknowledging the rights of others and in that way achieving a win-win solution (Rubin & Martin, 1994). The ability to stand up for one's rights is viewed by communication experts as an important element of 'personal communication style' (Rubin and Martin, 1994). Communication anxiety is viewed by Hargie and Dickson (2004) as the opposite of assertiveness, even though they acknowledge that assertiveness is more than the willingness to communicate and enjoyment of communication. Interacting assertively leads to control over environment, and reduces anxiety in difficult situations (Hargie & Dickson, 2004). In everyday life, assertiveness has to do with respecting the position of others, standing up for and making ones opinion clear, the ability to request or ask for favors, and the ability to refuse unreasonable requests. Assertiveness is useful when dealing with criticism. A non-assertive person may simply accept unjustifiable criticism, and the aggressive person might become indignant, while the assertive person copes with the criticism in an explorative way wanting to understand it and search for a common

understanding (Rubin & Martin, 1994). Hargie and Dickson (2004, p.293-298) describe seven sequential stages in assertive resolution:

1. The individual must engage in 'self-focused attention' where the behavior of self and others is monitored.
2. The individual must have 'knowledge of personal rights' such as the right to be treated with respect, the right to have and express feelings and opinions, the right to make mistakes, etc.
3. The individual must have 'positive beliefs about assertive behavior'.
4. The individual must 'recognize that personal rights have been infringed'.
5. The individual must experience 'dissatisfaction with the present situation'.
6. The person's repertoire of 'available assertive responses' comes into play.
7. 'Specific assessment of utility of assertive response in this situation', meaning that not all contexts are suited to assertive responses (in someone else's home or office, with the elderly, with those who are disabled, etc.).

2.7.1.5 Interaction management

The procedures of everyday interaction most often follow a ritualistic form. Managing these interaction procedures includes skills such as negotiating topics to be discussed, taking turns, beginning and ending conversations, and developing conversational topics (Rubin & Martin, 1994). The ability to follow interaction conventions is founded in early childhood and is connected to the culture (Hargie & Dickson, 2004). The ability to negotiate topics for conversation can be seen as a "form of reflexive social action in which people are concerned with the interpretation of messages and meanings in particular social and historical context" (Hargie & Dickson, 2004, p.307).

Signaling closure in everyday interaction involves the use of both verbal and nonverbal behaviors. The nonverbal signals like; breaking eye-contact, looking at watch, nodding head rapidly, placing both hands on arms of chair, etc., prepare for the verbal markers such as: "thank you for a nice talk", "goodbye", "I have to go" etc. (Hargie & Dickson, 2004). Nonverbal signals such as falling pitch at the end of a clause, dropping of voice volume, termination of hand gestures, and changes in body posture and gaze pattern, are the main cues used in everyday turn-taking to prevent over-talk and awkward pauses (Hargie & Dickson, 2004).

2.7.1.6 Altercentrism

Altercentrism (alter=other and centrism=to be centered on) is defined by interaction involvement, flexibility to the other, attentiveness to what is communicated, adaptation and responsiveness to the other's thoughts, and perceptiveness to not only what is said but also what is not said (Rubin & Martin, 1994). Burgoon and Bacue (2003, p.196) add that the nonverbal components of altercentrism involve attentive listening, avoidance of self-focused gestures, postural mirroring, and absence of interruptions.

Altercentrism is showing interest to what the other is communicating and thereby possibly motivating the other to self-disclosure and increased relationship strength (Hargie & Dickson, 2004). Altercentrism is the opposite of self-centeredness, a characteristic that often makes communication narrow (Hargie & Dickson, 2004). Cupach and Spitzberg (2007, p.163) write about lack of altercentrism: "[…] lack of altercentrism is communicated through (a) lack of kinesic proxemic attentiveness (i.e., uninvolved, uninterested, inattentive, unfocused, and unalert behaviors), and lack of vocal warmth and interest (i.e., cool, uninterested, uninvolved, unpleasant, unfriendly, and unappealing behaviors)." The consequences of an ABI (as described in Section 1.2.2) can lead to people with ABI having problems communicating altercentrism.

The ability to concentrate seems to be an important cognitive skill needed for altercentrism (i.e., needed for focusing, involvement, interest, etc.). The ability to 'read between the lines' depends on the interpretation of both the verbal and nonverbal signals requiring great cognitive effort.

2.7.1.7 Expressiveness

Expressiveness has a verbal and nonverbal component. The nonverbal component has to do with the ability to communicate feelings through facial expressions, gestures, appropriate vocal modulation, and posture shifts. The verbal component of expressiveness has to do with the ability to find and use the right words to express one's self (Rubin & Martin, 1994). Burgoon and Bacue (2003, p.196) write that the nonverbal components of expressiveness involve "animated face and body, frequent and expressive gestures (illustrators, emblems, affects display, regulators), expansive gestures, expressive voice (pitch variety, tempo variety, rapid tempo, louder voice, greater intensity)". These are in line with the nonverbal elements described in Section 1.3.

2.7.1.8 Supportiveness

Supportive communication has to do with the ability to confirm the other, to be non-judgmental, descriptive but not evaluative, open and not certain, spontaneous and not strategic, oriented towards solving a problem yet not controlling, emphatic but not remote, and equal and not superior (Rubin & Martin, 1994). In young people, relationship quality is predicted by the partner's ability to provide sensitive and effective support messages (Samter, 2003). When showing supportive behavior, one is forced to recognize that one's own ability to deal with the situation may be limited. For that reason, according to Barbee (1990, in Samter, 2003, p.657), friends often experience ambivalence when faced with the need to elicit emotional support or to provide it.

When showing supportiveness the ability to put aside or control one's own immediate needs and focus on the other seems to be crucial. The cognitive skills needed to do this have to do with mentalizing (imaginatively perceiving and interpreting behavior as conjoined with intentional mental states) the needs of others (frontal lobe) (Fonagy, 2002).

2.7.1.9 Immediacy

To be immediate is to show others that you are approachable and available for communication. Showing others immediacy has to do with nonverbal behaviors such as facing the other, direct eye contact, open stance, pleasant facial expression, conveying a feeling of interpersonal warmth. The verbal component has to do with focusing attention and comments on the other and answering questions directly (Rubin & Martin, 1994). Burgoon and Bacue (2003, p.196) add that the nonverbal components of immediacy involve "close proximity, forward lean, direct facing and body orientation, direct and frequent gaze, and touch (e.g. handshakes or incidental and brief touches in nonromantic relationships; pats, hugs, soothing contact, kissing in more intimate relationships)".

The ability to signal immediacy depends on the ability to mentalize how one is perceived by others, as described in Fanagy (2002). In addition, the ability to incorporate the mentalized knowledge into the communication is crucial.

2.7.1.10 Environmental control

Environmental control has to do with the ability to achieve predetermined goals and satisfy needs. In addition, it has to do with the ability to handle conflict settings and solve problems in a cooperative way, as well as the ability to gain compliance from others (Rubin & Martin, 1994). The ability to achieve predetermined communicative goals and satisfy needs is by Hargie and Dickson (2004) described as the purpose of skilled interpersonal communication. The tactics used in managing conflicts have to do with focusing on the issues - not on personalities, making everyone feel that they have merit, highlighting areas of agreement, and emphasizing (if in groups) the 'we' and 'us' (Hargie & Dickson, 2004).

2.7.2 Choosing method of musical analysis (IAP)

Since only two music therapy ABI studies on interpersonal communication had incorporated musical analysis which, in addition, was either a "home-made" rating scheme (Purdie, et al., 1997), or a therapeutic narrative analysis (S. Gilbertson & Aldridge, 2008), it was decided to incorporate an already established method of assessing communicative competencies in music. The process of choosing the most relevant method of analysis was performed using Bonde's (2007) five-step generic questions. The questions are a step-by-step guide into choosing the most relevant method of musical analysis. The questions and how they relate to this study are outlined below:

1 *'The trace'* - "is a recording of the music available?" (Bonde, 2007, p256).
In this study, 'the trace' was planned to be video recordings of a range of improvisation exercises. Collecting verbal comments was not a part of the planned protocol.

2 'The scope' – "Does the analysis address one short segment, some segments, or many segments?" (Bonde, 2007).

In this study, 'the scope' was to analyze all of the participants' free improvisations. There are no selection criteria, meaning that all recorded free improvisations are analyzed.

3 'Focus and purpose' – "is a description/analysis/interpretation of the music needed?" (Bonde, 2007, p.256).

Because of this study's focus on ICC, an analysis of the participants' musical communication competencies is relevant.

-"Does the analysis focus on sound, syntax, semantics or pragmatics?"

Even though pragmatics influences the participants' musical utterances and competencies, the focus in this study is on the semantics. This means that focus is on the interpretation of the participants' musical-psychological profiles of expression. Bonde (2007) refers to Brucia's (1987) Improvisation Assessment Profile if the focus is such.

-"Is the focus on the musical experience, on musical interactions, or on the relationship between the music and the experience?" (Bonde, 2007, p.256)

The focus of this study is musical (and everyday) interaction competencies. Bonde (2007) suggests Bruscia IAP, Trondalen's Intensity Profile and Pavlicevic's Music Interaction Rating scale for this type of analysis.

-"Do you have any analytical or theoretical assumptions to guide you?" (Bonde, 2007, p.256.)

Several of the interpersonal communication competencies described in Section 2.7 can be directly linked to musical communication.

-"Is a specific theoretical framework necessary and helpful?" (Bonde, 2007, p.256.).

The theoretical framework used in this study is primarily taken from the academic field of communication.

4 'The representation' – "Is a visual representation of the music necessary?"

In this study, it was planned to perform blinded video rating of the participants' communicational competencies in music. It was believed that such an analysis did not call for a visual representation of the music. If the focus were on development within the improvisation, or the meaning of the music, a microanalysis and notation would have been needed. Though an exact timeline notation using midi of the free improvisations probably would have helped in determining the communicative role of the participants (CF. Erkkilä in Wosch and Wigram (2007)). However, the recording did not include midi equipment, which would have enabled a precise time notation.

5 'The presentation' - "is it an oral or written presentation?" (Bonde, 2007, p.256.)

> Bonde (2007) recommends that in written presentations like this, the analyzed music should be made available in the appendix. Due to restrictions from the Danish data supervision (datatilsynet) it has not been possible to include the improvisations in the appendix.

Bonde's (2007) 'five step generic questions' lead the choice of improvisation analysis method in the direction of using Bruscia's (1987) IAP.

The Improvisation Assessment Profiles (IAP) were developed by Kenneth Bruscia (1987), as a systematic method for analyzing and interpreting clinical improvisation. The IAP consists of six different profiles (integration, variability, tension, congruence, salience, and autonomy), which describe the quality of musical elements in a given improvisation. Each profile is based upon a five-point scale with gradients placed on a continuum between pairs of contrasting qualities (e.g. the autonomy profile: dependent 1, follower 2, partner 3, leader 4, and resister 5. Alternatively, the variability profile: rigid 1, stable 2, variable 3, contrasting 4, and random 5) (Bruscia, 1987). In the respective IAPs (and continuums), musical elements are rated. The musical elements include phrasing, melody, harmony, style, tempo, volume, rhythm, and so on. In addition, extra musical elements such as lyrics, verbal reaction, body, motor and so on are included in the IAPs. Originally, the primary purpose of the IAPs is to generate insights that facilitate the therapeutic process (Bruscia, 1987). Researchers and clinicians have adapted and used IAP in various ways (Abrams, 2007; Frederiksen, 1999; Jacobsen, 2006; McFerran & Wigram, 2004; Stige, 1996; Wigram, 2007; Wosch, 2007). One example is Abrams (2007), who in the book Microanalysis in Music Therapy (Wosch and Wigram, 2007), describes how the combination of IAP and RepGrid can help the process of constructing a meaning to the improvised music. Abrams' method is theoretical since it has not yet been used in research or clinical work. In the same book, Wigram (2007) presents an event-based analysis, which is more aligned to Bruscia's original ideas of selecting significant parts of improvisations and counting events. In the book section, Wigram describes his use of the variability and autonomy profiles. Wosch (2007) is interested in the interactional development in the improvisations, and has developed a quantitative way of using the IAP – instead of counting events, Wosch (2007) uses time (seconds) as reference: "Instead, all three chosen scales are observed over short time-periods in order to determine the extent to which the scales change according to interpersonal content" (Wosch 2007, p.250). In other words, Wosch is interested in how the music changes during the improvisation.

To assess a participant's "communication disorders", Wigram (2007) recommended using the autonomy and variability IAP profiles. Of these two, the Autonomy profile is the one that is most relevant for this study since it assesses parts of the participant's interaction management (ability to lead the interaction), environmental control (ability to respond to and take charge of the

interaction, and the ability to shift roles), immediacy (ability to be partners), assertiveness (level of autonomy), supportiveness (ability to follow or be partner).

Bruscia (1987) defines the autonomy profile as: "The autonomy profile is a composite description of the role relationships that the participant forms when improvising with a partner (or in group). It therefore focuses only on intermusical or interpersonal relationships" (Bruscia, 1987, p444). Bruscia describes five gradients or levels of autonomy: dependent, follower, partner, leader, and resister (Bruscia, 1987). Bruscia states that the "three middle gradients lie within the usual or normal range of musical expression" (Bruscia, 1987, p.406). The two extreme (dependent and resister) levels are to be used "only when there is no doubt the activity or inactivity of an element has reached pathological proportions, and would be classified as extremely bizarre or primitive by most listeners"(Bruscia, 1987, p.420). One of the study's hypotheses is that the autonomy profile will reveal information on communicative musicality. By focusing on musical pulse, quality and narrative, (Malloch & Trevarthen, 2009) (see Section 1.6) the IAP analysis will reveal information about autonomy in the participants' communicative musicality.

In order to reveal information on autonomy in communicative musicality the scale used in rating the participant's free improvisations has been:

- Volume - setting and changing volume levels, intensity and amount of sound
- Rhythmic ground – setting tempo, meter and subdivisions
- Tonal/melodic – modality, tonality and melody
- Phrasing – length and shape, and sequencing (Bruscia, 1987)

The volume scale reveals information about the force, energy, strength, and power the participants bring into the interaction (Bruscia, 1987). When following, partnering or leading, the volume of the participant reveals his or her interactional power. In addition, volume is regarded as "quality" in communicative musicality (Malloch & Trevarthen, 2009). A high score on the IAP autonomy volume scale will indicate a high level of autonomy in the participants' communicative musicality volume competencies.

The rhythmic ground scale reveals information about the participants' ability to create a continuous state of equilibrium and provide a holding environment (Bruscia, 1987). When following, partnering, or leading, the rhythmic ground scale reveals information about the participants' musical supportiveness. In communicative musicality, pulse is seen as a regulator of timing, coordination, and anticipation of communicative expressions (Malloch & Trevarthen, 2009). A high score on the IAP autonomy rhythmic ground scale will indicate high level of autonomy in the participants' communicative musicality in timing and coordination.

The tonal/melodic scale reveals information about "the expression of a specific feeling. […] Melody adds the spatial dimension to rhythm and reveals where the feelings are in relation to the self. Melody reveals attitudes towards one's impulses."(Bruscia, 1987, p.453). Bruscia (1987) continues, "[…] tonality provides an emotional center to contain and direct their unfolding" (p. 454). "Tonality provides a gravitational force towards a point of rest within the center of the self. Unlike meter, which is a suprastructure that controls from above, tonality is an infrastructure the controls from within. Like meter, tonality presents moral values, however the values emanate from the self or internalized conscience, rather than from an external source of authority."(Bruscia, 1987, p.454). The participants' role in defining tone/melody can therefore, according to Bruscia (1987), be seen as a diversion of self-disclosure and expressiveness. In communicative musicality, tonal and melodic language is seen as a quality through time. A high score on the IAP autonomy tonal/melodic scale will indicate that the participant have a high level of autonomy in communicative musicality quality.

The phrasing scale reveals information about the participants' ability to make rhythm and melody fit together. When they do not fit, "drives are not consistent with feeling, in intensity or direction" (Bruscia, 1987, p454). The phrasing scale reveals information about musical disclosure and expressiveness. Through the lens of communicative musicality, phrasing is equivalent with the narrative. A high score on the IAP autonomy phrasing scale will indicate increased autonomy in communicative musicality narratives.

Bruscia (1987) describes five more scales that can be used in the Autonomy profile (rhythmic figure, harmonic, texture, timbre, and program/lyrics). These are not used in this study since they either overlap with the ones chosen or are irrelevant. However, the texture and timber scales would have revealed more information on the quality of the participants' communicative musicality.

When interpreting the autonomy profile results, Bruscia (1987) described issues that might be revealed:

- Awareness of self and other (and boundaries between self and other)
- Tolerance for intimacy (if the participant has boundary problems)
- If no boundary problems,
    - Selfness is expressed as leadership
    - Otherness as followership
    - Balanced interaction as partnership
- Control over self and other

Bruscia (1987) describes how a (micro) analysis using the IAP-autonomy scale can reveal information on the participants' stance towards, away from, or against self and others. Existentially, the autonomy profile has references to being–in-the-world of others (Bruscia, 1987).

2.8 Problems addressed and research questions

The presented literature on interpersonal communication, acquired brain injury, research designs and research tools has led to a set of unanswered issues. After defining the issues to be addressed in this thesis, this section will end with a presentation of the research questions.

The literature reviewed in Section 1.4 points out that psychosocial problems are the greatest challenge in the rehabilitation of people with ABI. Yet only four out of 46 identified music therapy studies have primarily focused on music therapy's effect on the psychosocial problems following an ABI. In addition, the results from previous music therapy studies suggest that music therapy can have a positive effect on social interaction skills. Specifically, in terms of better conventional and intergraded communication, increased involvement, increased motivation, increased emotional stability, spontaneous interaction, and increased ability to support others (Barker & Brunk, 1991; Gilbertson & Aldridge, 2008; Nayak et al., 2000; Purdie, 1997; Purdie et al., 1997; Jeong & Kim, 2007). Their results are in conjunction with my own clinical experience (Section 1.2.1). The literature review also reveals that there is great diversity regarding which interpersonal communication competencies music therapy in ABI rehabilitation seems to affect (e.g. support to others, involvement, emotional stability, and more conventional and integrated communication). Consequently, it would be relevant to include a general measure of interpersonal communication in order to reveal which specific interpersonal communication competencies that are affected by music therapy.

Another problem revealed in the literature review is that there are no commonly-used tools in ABI research for assessing interpersonal communication competencies in either music therapy or everyday life. From a philosophical perspective, determining whether some categories of interpersonal communication are fundamental for humans has to do with ontology (the nature of existence) (Wulff, 1990). In this thesis, Rubin and Martin's (1994) ten sub-categories of interpersonal communication competencies define the ontological perspective of interpersonal communication. In addition, Malloch and Trevarthen's (2009) theory of "communicative musicality" defines the interpersonal communication in music competencies (pulse, quality, narrative). The other philosophical perspective often mentioned in relation to ontology is epistemology, which has to do with analyzing the nature of knowledge – how do we know and how is the knowledge acquired. In this study, the ontological perspective is grounded in communication and musicology theory (Sections 1.3 and 1.6). The epistemological stance has to do with gathering knowledge on the participants' interpersonal communication competencies in music and daily life. On an epistemological level the challenge is how to collect information on the participants' ICC from as many perspectives as possible. Another issue is how

to assess the participants' nonverbal communication competencies in music or what Malloch and Trevarthen (2009) call communicative musicality.

The problems addressed in this thesis rely on a set of theories described in Chapter 1. The communicative abilities entrained in music therapy have to do with joint attention, mirroring, emotionality, empathy, turn taking, dynamics, facial expressions, voice quality, etc. According to Malloch and Trevarthen (2010) these nonverbal abilities have roots back to the first two years of our life and are developed through interaction with our caregivers. When interacting musically, in the music therapy setting, it is the theoretical framework of this project that these fundamental 'communicative competencies' are being retrained. It is assumed that communicative competencies can transfer from 'musical interactions' (via the concept of ways-of-being-with-others) (Stern, 2000) into 'everyday interactions'. This hypothesis is supported by the music therapy literature, a review of which found that music therapy has an effect on interpersonal communication in ABI rehabilitation.

It is my clinical experience that music therapy, as conducted at Høskoven, retrains everyday interpersonal communication competencies. In particular, this effect is observed when the music therapy method includes improvisation and structured music playing. Even though this effect is most profound in the first years post-ABI, this study's participants have all lived with their injury for more than five years. Having experienced the effect on ICC in people who have received standard rehabilitation for years, I aimed to discover whether music therapy (plus standard rehabilitation) has a greater effect on interpersonal communication competencies than standard rehabilitation alone.

2.8.2 Research questions

The previous sections have described clinical experiences with participants suffering from ABI; research and theory of interpersonal and musical communication; research results, designs and tools. All this information has lead to the development of a set of research questions.

The overall objective of the research has been to examine whether the musical interactional changes that appear over time in music therapy have an impact on the participant's interaction in everyday life. Another aim is to compare the interpersonal benefits of music therapy with the interpersonal benefits of standard rehabilitation.

Since this study seeks to measure the effect of music therapy, the number of therapy sessions is an important concern. The reviewed literature on music therapy, ABI, and interpersonal benefits (Section 2.4) differs in number of sessions – from three sessions to several years of therapy. However, the studies which incorporated randomization by Purdie et al. (1997) and Nayak et al. (2000) measured the effect of 4 to 10 and 12 sessions respectively, and both

found an effect of music therapy on interpersonal communication competencies. Because this study was conducted on participants that had previously received music therapy (and the effect of music therapy therefore was assumed to be modest) and because of practical considerations at the research institution and what was possible within the timeframe of the study, it was decided to measure the effect of 20 weekly music therapy sessions. Preliminary considerations resulted in the following research questions:

1. What effect does music therapy have on interpersonal communication competencies in people with acquired brain injury?
    a. What is the effect of 20 music therapy sessions on interpersonal competencies in musical improvisations?
    b. What is the effect of 20 music therapy sessions on interpersonal competencies in daily life?
    c. Is there a correlation between interpersonal competencies in music and daily life?
    d. What is the effect of 20 music therapy sessions on communicative musicality?

Since individuals interact in different ways with different people, the research outcome measure chosen for this study should ideally examine each participant's interpersonal communication competencies from as many perspectives as possible. The secondary research questions address the research tools and procedures developed for the study.

2) How can revised versions of Rubin and Martin's (1994) Interpersonal Communication Competence Scale (ICCS) reliably measure the participants' interpersonal communication competencies in both music and everyday life?
    a) Is it feasible to construct a reliable staff/relative version of the ICCS?
        i) Does the ICCS staff/relative version reveal a "real world" construct?
    b) Is it feasible to construct a reliable questionnaire on interpersonal communication competency in music for music therapist and participant, based on the ICCS?
    c) Is it feasible to construct a reliable rater tool on interpersonal communication competency in music, based on the ICCS?

3) How can the Improvisation Assessment Profile be implemented as a reliable rater tool in measuring improvisational autonomy and communicative musicality?

Chapter 3 - Methods

The aim of this chapter is to present the various methods and procedures used in this study. A randomized cross-over design was applied involving 11 persons with ABI to measure the effect of 20 group music therapy sessions on interpersonal communication competencies (ICC) in daily life and musical improvisation. The 11 participants were randomized into two interventions groups using a matched in pairs design (Robson, 2011). Group I (n=6) commenced with 20 music therapy sessions in connection with standard rehabilitation. Group II commenced with standard rehabilitation. After a wash-out period, the conditions were crossed over. The 11 participants were recruited from the Activity Center at the rehabilitation institution Høskoven in Aarhus.

ICC in daily life was measured using two questionnaires. The researcher adapted the Interpersonal Communication Competence Scale (ICCS) (Rubin & Martin, 1994) into a self-report version specifically for the target population (ICCS_PAR), and a version designed to collect ICC information on the participant from staff and relatives (ICCS_SR). In order to measure ICC in musical improvisation, four improvisation assessment exercises were performed pre and post the music therapy intervention. The music therapist leading the assessments and the participants reported their ICC experience of engaging in the musical exercises using two ICCS in music questionnaires, a ICCS_MT(herapist) and a ICCS_MTP(articiapant). Blinded raters scored the participants' musical improvisations using a newly developed musical rater version of the ICCS (ICCS_MusRat) and the Improvisation Assessment Profile – Autonomy (IAP_Aut)(Bruscia, 1987).

Participants, staff, and relatives completed the Rehabilitation Needs Questionnaire (RNQ) as a means of identifying the individual rehabilitation needs of the participants, which were then used to inform the choice of music therapy interventions. While the interpersonal communication competencies of the participants were the focus of this study, the specific interventions were not designed with these goals in mind. The interventions were tailored to meet the individual rehabilitation needs of the participants on a broader level. An additional aim of the music therapy intervention was to enable the participants to engage in a concert performance.

ANOVA calculations were applied to evaluate effect of music therapy on ICC in everyday life. A paired t-test was performed on the pre – post music therapy measures. A Pearson's correlations analysis on the measure of ICC in music and daily life was performed to establish if the participants ICC transfer from one condition to the other. Because the correlation calculation on ICC in musical improvisation and daily life does not focus on the effect of treatment, additional measures from four participants with acute ABI were included in the correlation calculations. The Blandt and Altman plot and Cohens kappa were used to evaluate rater agreement.

The Consort-group (Consolidated Standards Of Reporting Trials group) is a web resource that has made a 25-item checklist to be followed when reporting a RCT study (Moher, et al., 2010). The Consorts group's guidelines on reporting trial methods serve as headings in this chapter. Therefore, the chapter will after an introduction to research meta-theory start by describing 1) the trial design, 2) participants and interventions, 3) outcomes (measures), 4) sample size, 5) randomization, 6) blinding, and 7) statistical methods. The Consort group does not list ethical considerations as a report requirement but since ethics influenced the choice of methods and interventions used, ethical considerations are included at the end of the chapter.

3.0 Research Meta-theory

This section present a frame for understanding the theories and approaches used in gathering knowledge in this study. There will be an introduction to the theory of science and real world research. In order to adapt to the research design tendency in ABI music therapy research, answer research questions, and to address the Danish governmental request for Randomize Control Trials (Sundhedsstyrelsen, 2011) the positivistic/fixed/quantitative approach has been chosen in this study. In addition, there is a range of additional research design considerations accounted for in the next section (3.1 trial design).

Research is about collecting, interpreting, and disseminating data. How the researcher do this is determined by the matter of interest, the researcher's analysis thinking, and disseminating abilities (Robson, 2011). This section aims to clarify the research thinking used in this project. Since my focus is people in the real world (people with ABI) I have chosen to use Colin Robsons book 'Real World Research' (2011) as the prime textbook.

According to Robson (Robson, 2011) there are roughly speaking two research paradigms: the quantitative (associated with social science), and the qualitative (associated with natural science). Because the purpose of this project is to test a scientific problem, the research paradigm presented here is the rationalistic/quantitative or post-positivistic.

Robson (2011) presents thirteen typical features of quantitative social research:

1. Measurement and quantification is central.
2. Accuracy and precision is sought.
3. Focus on behaviour (i.e. on what people do or say).
4. The scientific approach is adhered to, with the same general principles as natural science.
5. A deductive logic is adopted where pre-existing theoretical ideas or concepts are tested.
6. Design of the research is pre-specified in detail at an early stage of the research process.

7. Reliability (consistency over time and with different observers) and validity (showing they measure what's intended) of measurements are important.
8. Detailed specification of procedures is provided so that replication of the study is possible
9. Statistical analysis of the data is expected.
10. Generalization of the finding is sought.
11. Objectivity is sought and distance maintained between the researcher and participants.
12. Standardization is sought in the interest of control and accuracy (i.e. stripping the situation researched from its context, or ignoring the possible effects of the context).
13. A neutral value-free position is sought"(p. 18).

In present study the thirteen features has both functioned as checklist and guidelines.

In relation to music therapy research there is a range of problems associated with the positivistic/fixed/quantitative tradition. In the music therapy research book edited by professor Barbara Wheeler (2005), professor Even Ruud (2005) elaborate on seven philosophies of science; Positivism, Phenomenology, Hermeneutics, Critical theory, Systems theories, Semiotics and Structuralism, and Postmodern Currents. The positivistic tradition are often referred to as quantitative (results are deducted from a quantitative analysis of observations) and the last six philosophies as qualitative (results come from a qualitative analysis of observations). Ruud (2005) explicate the seven philosophies of science's historical background, epistemology (how knowledge is acquired), critical issues, and their relevance to music therapy. Historically the last six philosophies have developed in social and ethnographic science as a response to the confining doctrines in the positivistic tradition. An example of the hermeneutic approach is seen in Hald (2004) where the research process is circling around the clinical practice in an ABI memory-training-group, constantly changing focus from whole to detail to whole to… etc – a process called the hermeneutic circle or spiral.

The epistemology within the positivistic empirical research tradition is based upon the 'thesis of verification', meaning that statements only have meaning when they directly or logically can be traced back to an experience (Ruud, 2005). This is in line with the reductionist idea about generalized statements, where one should be able to trace statements back to statements about particular observations.

In relation to this study, the "traced back" experience is staff and relatives, the participants', the music therapist's, and the two blinded raters' experience of the participants' ICC in music and daily life. By summing up the amount of

observations it is possible to give a generalized statement of the participants' ICC in both music and daily life. If the sample size had been greater it would have been possible to generalize to the population ABI as well, however this is not the case.

Applying the positivistic tradition did also mean that I was not able to include my hunches and interpretations or develop the research methods as the research progressed.

Another typical feature of positivism is the distinction between theory and empirical facts – consequently positivistic science should be value free (Ruud, 2005). Since the positivistic approach has roots in natural science, physics are the ideal mode of observation. Consequently, results in positivistic social science should ideally be measured with brain activation, chemistry, and movement (Ruud, 2005). The application of the positivistic tradition in real world research implies a range of problems (that the six qualitative traditions are responses to). One example of such problems is that the scientific problem has to be defined before observations are made (which is not the case in Phenomenology, Hermeneutics, etc which rely on interpretation of the observations). Another problem is the criterion of falsification, which means that a scientific problem have to be of such a nature that it is possible to prove true or false (Ruud, 2005).

In relation to this study, the scientific problem is well defined as music therapy's effect on ICC in music and daily life. The scientific problem can be reduced to: Music therapy has an effect on ICC in music and daily life in people with ABI – is it true or false? In addition, there is a correlation in ICC in music and daily life – is it true or false?

3.1 Trial design

Research designs is typically guided by the research question (Robson, 2011). A fixed design is often preferred when measuring the effect of a treatment on a predefined variable (Robson, 2011), in this case interpersonal communication competencies. A RCT design was chosen above other fixed research designs because it is the "gold standard" (Robson, 2011) of research. It is also the recommended research design detailed in a recent governmental report on ABI rehabilitation technologies in Denmark (Sundhedsstyrelsen, 2011), and ranked second (after systematic reviews of RCTs) on the Oxford Centre for Evidence-Based Medicine (OCEBM) levels of evidence (Howick, et al., 2011). In line with the OCEBM, Bradt et al. (2010)'s Cochrane review on music therapy and acquired brain injury has randomized or quasi-randomized controlled trials as inclusion criteria. An RCT was deemed the most appropriate research design to answer the research question in this trial (to measure the effect of music therapy on ICC), to ensure eligibility for inclusion in the forthcoming update of Bradt et

al. (2010) Cochrane review, and to respond to the RCT evidence-based movement in Danish communal and governmental administration.

In the literature review on design tendencies in music therapy ABI research (Section 2.6.2) it is revealed that 31 of the 46 reviewed studies were published between 1997 and 2008. Only two of the studies published between 1980 and 1996 had incorporated randomized allocation whereas ten of the studies published after 1997 had randomized allocation. The tendency in music therapy ABI research is therefore an increase of studies that have incorporated randomization.

The parallel group design is the simplest RCT design. It involves participants randomly allocated to two (or more) treatment groups. The effect of the two (or more) condition are measured and compared. The disadvantage of parallel group in relation to this project is that it requires a large number of participants, homogeneous in terms of the location and severity of brain damage, age, and symptoms, in order to reach statistical significance. The parallel group design was excluded because the site where this study took place could not supply a sufficiently large sample size. Small sample size also limits the possibilities for implementing a cluster or factorial research design. In the cluster design, the participants are grouped in clusters and then randomized to treatment. In the factorial design, the participants is allocated to a range of independent factors and sub-factors (Creswell, 2003).

Because of the small sample size available for this study, a cross-over design was selected. The cross-over design is acknowledged in medical and pharmaceutical studies as relevant when evaluating the effect of two or more treatments on a small sample size (Jones and Kenward, 2003). The main advantage is that the treatments are compared 'within-subjects', meaning that every subject receives all conditions and their response to each are compared (Jones & Kenward, 2003).

3.1.1 Cross-over design

This section goes into detail on the RCT research design chosen for this study – the cross over design. First basic knowledge, then considerations and problems associated with the cross-over design is presented followed by a presentation of how the cross-design was applied this study.

A cross-over trial is by medical statistical professor Stephen Senn (2002) defined as "[…] one in which subjects are given sequences of treatment with the objective of studying differences between individual treatments (or sub-sequences of treatment) " (Senn, 2002, p.3). In a cross-over trial participants are randomly assigned to either treatment A or B in the first period and then 'crossed over' to the other treatment in the second period (Senn, 2002). This way there will be data on both treatments A and B from each participant allowing

the participant to serve as his own control subject. In this way the between-participant variation error is eliminated (Senn, 2002). According to Senn (2002, p.7) the main reasons why a cross-over trial may be the preferred design is that a) to obtain the same number of observations fewer patients have to be recruited, and b) to obtain the same precision in estimation fewer observations have to be obtained, when compared with a parallel design. The disadvantage of conducting a cross-over trial is that participants have to be enrolled in the study for longer periods thereby increasing the risk of drop-outs. In addition, cross-over trials are not suited for conditions where the participants are expected to suffer considerable deterioration or improvement during the trial period - e.g. non-stable brain disease (deterioration) or acute ABI rehabilitation (spontaneous improvement). Cross-over trials are "most suited to investigate treatment for ongoing or chronic diseases"(Senn, 2000, p.9) where there is no known cure and the treatment is hoped to moderate symptoms.

One issue often mentioned in relation to cross-over trial is the carry-over effect. It refers to the circumstance where the effect of the first treatment period carry-over to the second period. That way data from the second treatment period is contaminated by the first treatment. Stephen Senn (2002) counter argue that participants entering a parallel group design may also still be under the influence of previous treatment and the carry-over effect is therefore not restricted to cross-over studies alone. However the carry-over effect is an issue the researcher has to counter when designing a cross-over study and in the associated statistical analyze. When designing a cross-over study a wash-out period can be applied between the two treatment conditions. The effect of the first treatment period is believed to vanish during the wash-out period. The carry-over effect may exceed the wash-out period and a statistical 'two-stage' (or more complex) test can be a applied to calculate the probability of that. In relation to music therapy research, the issue of carry-over effect is even more problematic since often the goal of music therapy is to achieve a long lasting effect. Because of the carry-over effect Bradt et al. (2010) literature review on music therapy only incorporates data from the first period of cross-over studies in their Cochrane review.

Another problem with repeated measures cross-over designs is the 'practice effects' or 'sequence effect'. The practice effect concerns the fact that participants inevitably will change during the course of multiple testing. Only the condition administered first is immune to practice effects. A solution to this problem is to employ enough testing orders to ensure the equal occurrence of each experimental condition at each stage of the study (Senn, 2002).

The cross-over design applied this study is the simplest form, AB-BA. Where 'A' is 20 music therapy sessions in connection with standard rehabilitation. 'B' is 23 to 27 weeks of standard rehabilitation. The condition 'B' was originally thought as 21 weeks, but the pragmatics (giving staff time to fill in

questionnaires) added four weeks (14 days pre and post interventions). In addition, group II's music therapy intervention was held up by Christmas holidays, therefore the second timeframe was stretched by two weeks more. Figure 3 illustrate how group I start with condition A followed by condition B and how group II receive interventions in reversed order.

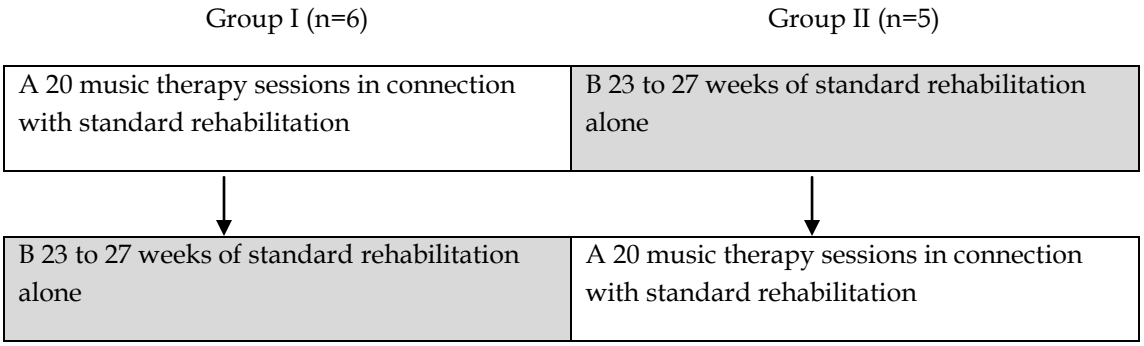


Figure 3 Cross-over AB-BA intervention

To meet the "ongoing chronic disease" inclusion criteria, the eleven participants had all lived with their ABI for more than five years, were relatively physically stable, and had not had any additional ABI the last five years. To address the carry-over effect, the design included a 1½ month wash-out period (summer holiday). Measurement points (where interpersonal communication competencies and rehabilitation needs were measured) were added pre and post each treatment condition – four measurement (time) points in all. To measure the effects of music therapy on communicative competencies in music, a music therapy assessment was conducted pre and post music therapy intervention.

The consort group (Moher, et al., 2010) recommend the inclusion of a flow-chart to track the participants activity throughout the trial (enrollment, allocation, treatment and follow-up). The flow through this trial is presented in Figure 4. The initial research plan involved a follow-up, but due to cut-backs at the research institution, a follow-up measure was not performed. The enrollment procedure for the RCTvcross-over trial is presented in Section 3.2.2. Due to ethics only participants who had lived with their ABI for more than five years were enrolled in the randomize study. The ethical rationale for not including acute injured in the randomization is that rehabilitation in the acute phase should be applied based on treatment considerations and not a study design. Questionnaire data on interpersonal communication competencies in daily life using the ICCS'(Section 3.4.3) and rehabilitation needs using the RNQ (Section 3.4.9) were collected on 18 participants at time point one.

The 11 participants who had sustained their ABI five years or more years prior, were randomized into two interventions groups (Section 3.6) that started with either treatment A or B and after a wash out period (six weeks) received the

opposite treatment. Eight of the 11 randomized participants completed all four measurements.

Seven acute injured participants were excluded from the randomization and allocated to individual rehabilitation based on treatment considerations (allocation in Figure 4). Four of the seven acute injured received condition 'A' and the last three received condition 'B'. All seven acute injured completed measures point one and two. The acute injured were for the majority transferred to rehabilitation outside Høskoven short after the first treatment period and was therefore not crossed over to the opposite treatment. Data from four acute injured participants who received music therapy is not included in the 'effect of music therapy study' but only included in the correlation calculations on ICC in daily life and music therapy.

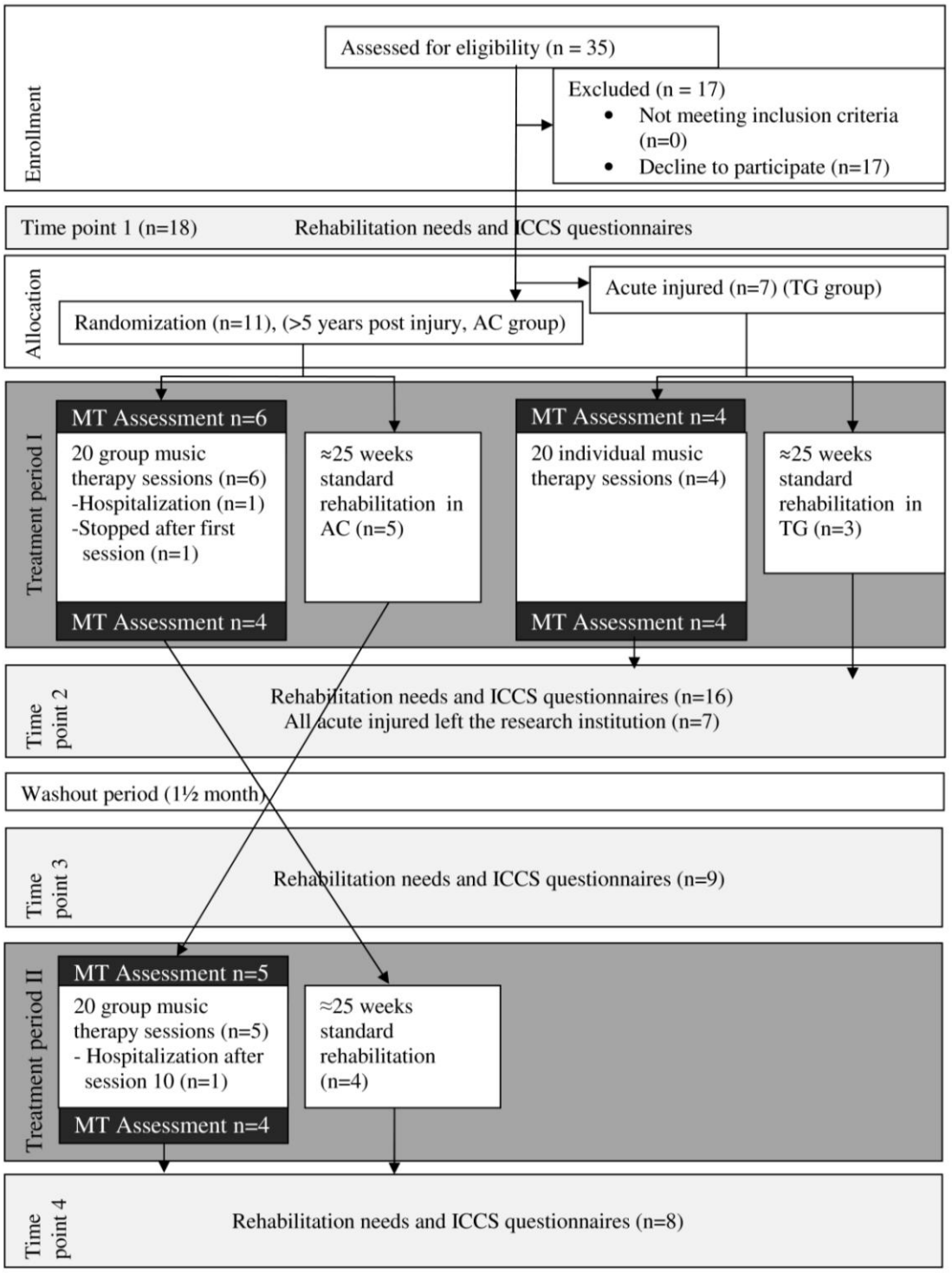


Figure 4 Participants flow through the trial

ICCS questionnaires = interpersonal Communication Competence Scale (Staff/relatives and Participant versions), AC group = Activity Center group, TG = Training Group (acute injured), MT = Music therapy

3.2 Participants and recruitment process

This section presents the setting from where participants were enrolled, the participant recruitment process, demographic data on the participants, and information on the staff/relatives providing information on the participants' everyday ICC.

3.2.1 Setting

The participants in this study were all enrolled at "Høskoven, Training-, Living-, and Activity House for people with acquired brain injury". The institution is organized under Region Midtjylland and is placed at Damagervej 26, 8260 Viby, Aarhus, Denmark. Høskoven's main function is to offer phase IV rehabilitation (physical, cognitive, and social rehabilitation after acute hospitalization) to people with moderate to severe ABI. Høskoven has several departments, but the participants in the randomized study of treatment effect came from the 'Activity Center' (AC) n=11 and were admitted full time rehabilitation between May 2009 and February 2011. The activity center is open for a maximum of 48 adults who have an ABI so severe that they can no longer maintain employment, but still need to participate in meaningful activities during the daytime.

Additional participants included in the correlation study (are ICC in music and daily life the same?) came from the 'Training Group' (TG) n=7 and were admitted full time rehabilitation in ten month periods between May 2009 and February 2011. The TG participants (acute injured) were not enrolled in the randomized study because an early intervention is critical for rehabilitation process. It would be unethical to let the acute injured wait for 25 weeks before receiving music therapy if it was estimated that the participants would benefit from music therapy. Only the participants from AC were recruited to the RCT and therefore only they are thoroughly described here.

3.2.2 Recruitment process

Two information sessions were conducted in May and June 2009 at Høskoven to inform potential participants from AC about the project. The sessions lasted from 9.30 to 12.00 and involved an introduction to the research topic (ICC), procedures (music therapy assessment sessions and questionnaires), and possible music therapy methods. Given the cognitive challenges, the presentations were interspersed with song singing and other short musical activities every 15-20 minutes. Vocabulary used was simplified to accommodate language impairment – e.g. Instead of saying "interpersonal communication competences" the phrase "the ability to communicate with others" was used. In addition, the power points included many pictures as presented in Appendix 2. In addition, five possible participants that did not attend the information session were contacted and invited to participate in the study.

3.2.3 Demographic data

Back ground information on the participants was retrieved from official documents with written consent from the participants. Collected information included gender, marital status, age at enrollment, brain injury type (TBI/hypoxic/Cerebral-hemorrhage/ Other), ICD-10 code (WHO's international classification of diseases and related health problems (World Health Organization., 2004)), Living place (residential home/training group/alone with support/ other), Injury- and baseline date (day/month/year), date of first measure. The demographic data on all the participants is presented in Table 11. The participants are listed in the rows that are shaded, are the participants who did not take part in the randomized study.

The 11 participants recruited from AC were aged from 30 to 65 (mean 51,3 - st.dv. 11,5) of whom five are men and seven women. Their ABI are caused by inflammation (n=1), hemorrhages (n=3), lack of oxygen/hypoxic (n=2), alcohol poisoning (n=1), TBI (n=3), or cancer (n=1). They have lived with their ABI from 9 to 39 years (mean 19.2 – st.dv. 9.9). Two participants were still married of whom one still lived together with the partner (with support). Five participants lived alone in their own apartments (with support). The last five participants lived at residential homes with high levels of support. Their educational level differed from primary school (n=3), craftsman (n=3), and low/ high academic level (n=5). Eight of the 11 participants had prior experience with music therapy. Because of hospitalization during the trial, two participants (one from each intervention group) left the study after 9/10 sessions. One participant left after the first session because of personal reasons. Another participant acquired an additional ABI during the wash out period (mid-way), but stayed in the study.

Table 11 Demographic data all participants

	Age	Injury	ICD-10	First measure	Living place	Education/work	Absent days MT
A	♂ 28	TBI	S06.2	25.11.09	Training Group +	Craftsman	
B	♂ 42	Hypoxic	G93.1	25.11.09	Training Group	Craftsman	
C	♀ 47	Other	B05.0	25.11.09	Alone with support	School	3
D	♀ 56	CB Hem	I61.9	25.11.09	Alone with support	Office	2
E	♂ 63	Hypoxic	G93.1	27.11.09	Other	Academic	3
F	♂ 49	CB Hem	I61.9	27.11.09	Alone with support	Craftsman	19 (left)
G	♂ 57	Other	F10.6	25.11.09	Residential home	Craftsman	1
H	♂ 65	CB Hem	I61.9	24.11.09	Residential home	Craftsman	10 (left)
I	♀ 49	TBI	S06.2	24.11.09	Residential home	School	3
J	♀ 32	Hypoxic	G93.1	25.11.09	Residential home	Office	5
K	♀ 56	TBI	S06.2	09.12.09	Residential home	Education	1
L	♂ 60	Other	DD33	10.12.09	Alone with support	Education	11 (left)
M	♀ 30	TBI	S06.2	14.12.09	Alone with support	School	1
N	♂ 24	TBI	S06.2	14.12.09	Training Group	Craftsman	
O	♂ 22	TBI	S06.2	23.03.10	Training Group	School	

	Age	Injury	ICD-10	First measure	Living place	Education/work	Absent days MT
P	♀ 46	CB Hem	I60.3	08.06.10	Training Group	Office	
Q	♂ 50	CB Hem	I69.3	13.09.10	Training Group	Craftsman	
R	♂ 60	CB Hem	I60.3	14.09.10	Training Group	Craftsman	

+ participant A was initially assigned the Training Group but was transferred to a residential home during the study

3.2.4 Staff and relatives

Staff and relatives (SR) who interacted with the participants on daily basis provided information on the participants interpersonal communication competencies in everyday life (see ICCS-SR Section 3.4.3) and rehabilitation needs (see RNQ Section 3.4.9). The assumption is that the participant may interact differently with different people, therefore, to improve reliability of the assessment, at least three SR provided information on the participants ICC. The only exceptions were participant E and H where only two staff/relatives provided information. The staffs involved were from diverse disciplines (e.g. nurse and nurse assistants, carers, pedagogues, psychomotor pedagogue, psychologist, teachers, cook, artist). All involved staff at the Activity Center was informed about the design and purpose of the study at several staff meetings in March and April 2009. To make staff acquainted with the procedures and clarify purpose of the study, Activity Center staffs filled in pilot-questionnaires and were able to ask any questions they might have at those meeting. Staff from other departments and institutions involved (n=6) had personal meetings with the researcher where they were informed about the study. The staff at the Training Group were presented with the same information and training as the staff in the Activity Center. The relatives involved in the study were provided with an information letter (Appendix 3) and a personal talk with the researcher to have precautions and concerns addressed. Eighteen staff members and three relatives/friends completed the questionnaires at the four time points in the RCT. The data collected from the Training Group involved eight staff members and three relatives.

3.3 Interventions

This section is an introduction to the standard rehabilitation and music therapy interventions applied in the RCT cross-over trial. The participants in the randomized study all came from the AC group, therefore the clinical methods used in that context are described most thoroughly. The clinical intervention used at TG are much more individualized and will be analyzed and reported on later and are not a part of this study. However, data from the TG group will be used in calculating correlation between ICC in music and daily life (research question 1-c).

3.3.1 Standard rehabilitation in AC

The rehabilitation activities at AC are organized as a day school where persons with an ABI can choose between a range of activities. Every morning from 9 to 9.30 there is an assembly with a song and a presentation of the day's activities. From 9.30 to 12.00 people attend and participate in the activities. At 12.00 people have lunch in the center's café. The afternoon activities run from 13.00 until 15.00. There are no activities on Tuesday and Friday afternoons. The ABI persons of AC can attend several activities during the week, and sometimes even shift to a new activity after lunch. The activity types are presented in Table 12.

Table 12 Activity types in standard rehabilitation

Activity name	Responsible staffs education	Days per week	Description
Green line	Pedagogue, health ass., kitchen ass., and a locksmith	2	Talk about and explore the seasons; take care of greenhouse in the spring, go on trips like swimming or fishing in the summer, picking fruit and making juice etc. in the autumn. In winter, they do workshop activities indoors such as woodcrafts and metal
Body & Health	Two psychomotor pedagogues and a nursing assistant	2	Activities are both theoretical and practical and could include; Games, singing, movement, meditation, relaxation, strength training, aerobics, and massage. Focus on topics such as; diet, mindfulness, drama, dance, music, sensory integration, aquatic theme, athletics, and sports days.
Music & Arts	A music therapist, an artist, and a psycho-motor pedagogue	1½	Activities such as; art production, image understanding, dance, body movement, singing, voice improvisation, and drumming.
Appetite	a cook and a pedagogue	4	Produce food and bread for AC café. Visit specialty shops such as fish shops, farm shops. Harvest the seasonal ingredients and follow the flow from field to fork.
IT & Multimedia	Philosopher and a teacher	4	Work with different tasks, e.g. own photo albums, games, playlists, YouTube, brochures, strengthen reading, writing and mathematical skills, producing a newspaper.
Production	Two pedagogues and helpers	2	Production of 'needle sets' for customers in the city. Also production of items in stone, wood, leather, paper or other materials

The ABI persons at AC all have an individual rehabilitation plans based on an interview conducted by one close staff and AC manger. The interviews are conducted yearly, with the main purpose of constructing rehabilitation plan and connect it with their weekly program in terms of activities and

rehabilitation goals. The eleven AC participants who were enrolled had very diverse weekly programs as indicated in Table 13.

Table 13 Participants' standard rehabilitation

Par	*Activities during a normal week*	*Amount of time in AC*
C	Body & health, and Production groups	2½ days weekly
D	Music & arts, and Body & health groups	2½ days weekly
E	IT & multimedia, and green groups	1½ days weekly
F	Green line, and body and helath	2½ days weekly
G	Production and Body & health, and Appetite groups	2½ days weekly
H	Production, and Body & helath	2½ days weekly
I	Body & health, and Production groups	2½ days weekly
J	Not signed up for any activities lines but got 'one to one' interaction whit a focus on physical activities	Approximately ½ day weekly
K	Music & art, Body and health groups	3 days weekly
L	Production	½ day weekly
M	Appetite group	One afternoon weekly

In addition, all participants lived a life that involved activities in other contexts. E.g. family life, residential homes, community activities, choir, and sports. One aspect of the study that was not controlled for is that the participants may have chosen to take part in expressive group activities at either Høskoven or elsewhere (e.g. Body & health, Music & art). It has been impossible to assemble a group of ABI persons who did not take part in other expressive activities. A counter argument is that none of the expressive activities the participants were engaged in at the research period had a public performance as a goal. In addition, the music and arts group was not defined as a music therapy group, even though a music therapist was employed to conduct the group (Maria). The central point here is that standard rehabilitation involves a variety of expressive activities that it have been impossible to control for because of the real live context of this study. The results from this study will indicate if twenty extra weekly half-day session of group music therapy have an effect on interpersonal communication competencies.

The other Høskoven department from where participants were recruited to the non-randomized study is the Training Group (TG). The TG has twelve training apartments and the rehabilitation programs there are individually planned and carried out by the interdisciplinary team. People registered in TG department have recently sustained an ABI and after the first acute hospitalization, are still in need of intensive active rehabilitation. The typical TG resident received 10 months of intensive interdisciplinary rehabilitation. Data from this part of the study is only used in the correlation analysis (between ICC in music and daily life). Since focus is not on the effect of treatment in those participants, treatment will not be presented here.

3.3.2 Designing music therapy protocol

The group music therapy conducted at Activity Centers (AC) was designed to meet participants' individual rehabilitation needs rather than specifically target interpersonal communication competencies. However, AC functions as a day facility, whereby the therapeutic approach was presented as a teaching experience rather than treatment. The intervention involved verbal interaction, physical exercises, vocal and instrumental improvisational exercises, learning lyrics and playing musical pieces - and taught instrumental and vocal skills as needed. While the intervention did not focus on intra and inter psychological development, the communication in the music therapy group format inevitably affected intra and interpersonal issues. The group music therapy program included rehearsals in preparation for performance. The performance functioned as a focal point in the therapies – the goal of the group's efforts. In addition, doing a performance placed the participants in the role of 'giver' in appose to their everyday role as 'receivers'. As mentioned in Section 1.5 it is important that the music therapist indentify if the music therapy participants with ABI have self-sensing issues. The participants who had self-sensing issues in this study were verbally guided into taking the perspective of how others might sense them in both musical and verbal communication.

In order to set individual goals of therapy and guide the music therapy intervention, the participants' individual rehabilitation needs were scored by participants, staff and relatives on a 29 item rehabilitation need questionnaire using a four point Likert scale (no need=0, small need=1, medium need=2, large need=3) before the therapy commenced. For details on the rehabilitation need questionnaire (RNQ) see Section 3.4.9. Daveson (2008), Baker and Tamplin (2006), Gilbertson (2005) and Lee & Baker (1997) all recommend a consultative approach to setting therapeutic goals for people with ABI which involves discussions with the entire rehabilitation team, the participants and relatives. The RNQ formalizes this process and enables the music therapy to be patient-centered and patient-led. The process and elements involved in designing the music therapy intervention is illustrated in Figure 5. The first step involves clarification of the rehabilitation needs via the RNQ. The identified needs then guide the focus and goals of therapy.

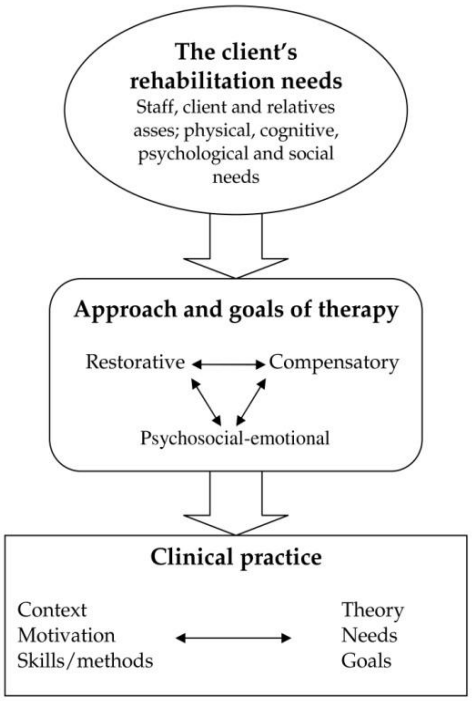


Figure 5 Steps in designing music therapy intervention

To organize the many different music therapy approaches found in the literature within this field Daveson (2008) constructed a meta-model of Music Therapy in Neuro-disability where she distinguishes between three therapeutic foci within neurorehabilitation; restorative, compensatory and psycho-social-emotional. In the center of her meta model it says; "The patient has the ability to regain function in some areas, compensate in others, yet also requires psychosocial-emotional work" (Daveson, 2008, p.4). Even though the three foci are present in most music therapy in neurological rehabilitation, the model is very useful when clarifying the goals of therapy. In Figure 5, a representation of the Daveson (2008) meta model is placed as step two in designing the music therapy intervention for this study. Whether to have a compensatory or restorative focus depend on the participant's stage of rehabilitation (Baker & Roth, 2004). In early stages of rehabilitation, focus should be restorative to ensure that all possible skills are regained (Baker & Roth, 2004). Participant and therapist can also decide to explore psychosocial-emotional issues (Daveson, 2008). In this trial, the participants had lived with their injury for more than five years therefore the compensatory strategies were the primary focus.

Step three in designing the music therapy intervention is a synergy of context and theory, the participants' motivation for music therapy and their rehabilitation needs, the therapist skills/methods available, and the goals of therapy. The music therapy in this trial included diverse approaches to accommodate for individual and group goals. The context and group format called for a "teaching style" approach. The goals and teaching style resulted in that individual psychosocial-emotional needs were only addressed when they appeared spontaneously. The theoretical stance of the conducting therapist is eclectic and based on the methods/theories in Baker and Tamplin (2006) and Bonde et al. (2002). In addition, the clinical therapists' musical background is rhythmic band music (rock, jazz, and folk) which also affected the therapy style and performance. The actual music therapy protocol is presented in the next section (3.3.3).

When the focus of the clinical practice in this trial was determined, the staff and relatives' scores on the Rehabilitation Needs Questionnaire (RNQ) where need items were scored as 'medium need' or above (2+), indicated an area that the music therapy should address. In addition, it was assumed that the participants would be most motivated to work on rehabilitation need items that they themselves had identified. To ensure the programs were focused on the most commonly occurring needs within the group, the therapy program was designed to address need items where three or more participants indicated a medium (or above) need.

The individual goal of therapy was to reduce participants' score on the RNQ, which would indicate a reduction in the number of and/or degree of rehabilitation needs as rated by SR. In the first session, the group also accepted

that as a method of reaching their individual goals, the group was to prepare and implement a (public) performance.

3.3.2.1 Overview of rehabilitations needs on medium or above

An overview of the participants' rehabilitation needs (the RNQ scorings) on medium need or above are detailed in Table 14. The left column lists the RNQ items. The two (randomly assigned) music therapy groups are listed in column two and three (with participant synonym letters below). The last three columns indicate the people responsible for assigning the needs scores rated/scored at or above medium (2+). The letters 'P' indicate when the participant identified the need, 'SR' where the staff and relatives identified the rehabilitation need. The shaded cells is where staff/relatives and participants agree that the rehabilitation need is above medium level.

Table 14 Participant and staff/relatives rehabilitation need scoring of medium and above at measure point one

Participants / *RNQ items*	MT group I						MT group II					Participant	Par./SR	SR
	L	**F**	**I**	**G**	**C**	**M**	**K**	**E**	**D**	**H**	**J**			
PHYSICAL														
Reduction of tension and pain	P		P		P						SR	3		1
Relaxation	SR	SR	PSR	SR	SR	PSR	PSR		PSR		SR		4	5
Increase endurance	SR	SR		SR	SR		SR		PSR		SR		1	6
Retrain fine motor skill in hands	P		PSR		PSR			SR	P	SR		2	2	2
Retrain motor skills in the arms / legs	PSR		PSR		PSR		PSR	PSR	PSR	SR			6	1
Retrain rhythm (walking / L-R arm)	P		PSR				SR	SR	PSR	SR		1	2	3
Retrain balance	PSR		PSR		SR		SR	PSR	PSR	PSR			5	2
Retrain voice			P		PSR			PSR	P	SR		2	2	1
Retrain respiratory functions			P		PSR		SR	SR	P			2	1	2
Readjust arousal	SR										SR			2
Overcome sleep difficulties			P			SR					SR	1		2
COGNITIVE														
Organize normal daily living	SR	SR	PSR	SR	SR		PSR	SR	P	SR	PSR	1	3	6
Increase concentration and attention	SR		P		SR		SR	SR			PSR	1	1	4
Memory skills	PSR	SR	PSR	SR	PSR		PSR	PSR		SR	PSR		6	3
Verbal communication skills	SR		SR		PSR			SR		SR			1	4
PSYCHOLOGICAL														
Emotional support			SR		P	SR	SR	SR		SR	PSR	1	1	5
Adjustment to new life situation	SR		SR		SR	SR	SR	SR	P		SR	1		7
Stress coping		PSR	SR		SR	SR		SR			SR		1	5
Focus and verbalize thoughts	SR		SR		SR		SR	SR		SR	SR			7
Increase self-confidence and self-esteem		SR	SR	SR	SR	SR	SR	PSR	P		PSR	1	2	6
Psychological issues from before injury	SR				SR	SR	P	SR			SR	1		5
Increase hopes of the future				SR	SR	SR	PSR	PSR			PSR		3	
Work on existential and spiritual themes	SR		P			SR	PSR	PSR			SR	1	2	3
SOCIAL														
Increase motivation to communicate with	SR		PSR					SR		SR			1	3

others														
Regain social competencies			SR			SR	PSR	SR			SR		1	4
Increase the ability to empathize			SR		SR	SR	PSR	PSR			PSR		3	3
Increase initiative and drive	SR			SR			P	PSR			SR	1	1	3
Motivate participation in rehabilitation	SR					P		PSR			SR	1	1	2
Mobilize energy	SR		P					SR			SR	1		3
Participants own scorings above medium	3		7		2	1	2		6			21		
Participant and SR agreeing	3	1	8		6	1	8	10	5	1	7		50	
Staff/relatives scorings above medium	14	5	8	7	12	10	9	14		10	14			103

3.3.3 Clinical music therapy protocol

Two music therapists (Maria Schmidt and Søren Hald) both qualified with a master degree in music therapy from AAU, conducted all the clinical music therapy sessions involved in this trial. Maria Schmidt conducted the improvisation exercises in all the assessment sessions (described in Section 3.4.4). Søren Hald conducted the group music therapy for the RCT cross-over trial at AC. In addition, both Søren and Maria implemented the music therapy sessions for participants in TG, either co-lead or individually lead sessions.

In both crossover groups, a supporting member of staff attended ten of the sessions. The group was informed prior to attendance and asked how they felt about the companions. No one had objections. In both groups, the staff member took part in the music making. In group II, the supporting staff took part in the concert as well.

3.3.3.1 Music therapy session format

The music therapy session format for the participants in the AC group was adjusted to the context, individual rehabilitation needs, and the group goal of performing a concert. Group I's twenty sessions were conducted on Tuesdays from 12.00 to 15.00 (Jan.5.2010 – June 2.2010) and group II's sessions were conducted on Fridays from 9.00 to 12.00. (Sept. 3.2010 – Feb 16.2011). The session activities followed an overall structure that was the same in all 20 sessions:

1. Meet for lunch (group I) or morning coffee/bread meeting (groupII) before commencing the music therapy room (30 minutes).
2. Verbal "check-in" where participants verbally shared issues present in their minds (10-20 minutes).
3. Body awareness /warm-up (10 minutes)
4. Vocal warm-up (10 minutes)
5. Structured singing and instrument/voice improvisation (25 minutes)
6. Break (10 minutes)
7. Rehearsal of songs for performance on instrument (60 minutes)
8. Verbal check-out where everybody verbally expresses how they experienced the session (15 minutes)

These activities are described in detail later in this chapter. However, the format can be seen as a process moving from the outside world into a personal room of music making, and then into the group music context as illustrated in Figure 7.

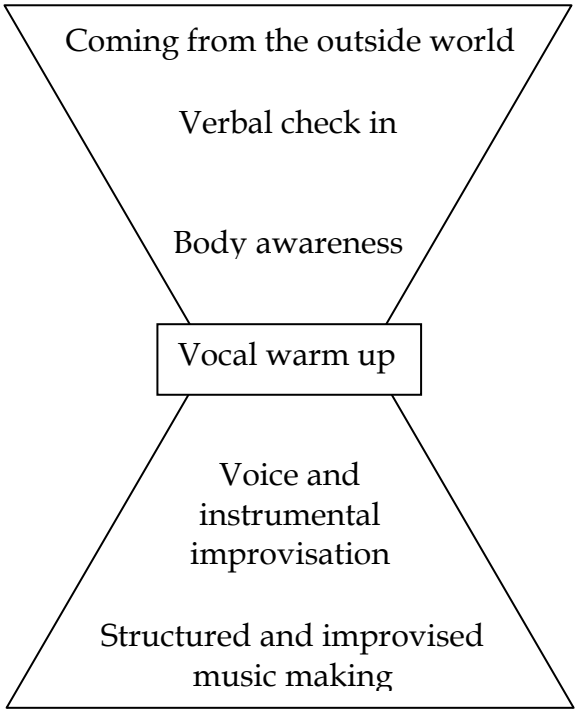


Figure 7 Illustration of music therapy format

3.3.3.2 Music therapy room

The music therapy intervention was conducted in the music therapy room at Høskoven. The room is equipped with chairs, table and a bookshelf. The room has a large selection of instruments including five djembes and other drums (including bongos, electrical drum, and congas), a drum kit with cymbals, electrical and acoustic guitars, electrical keyboard and piano, pentatonic slit drum (sometimes referred to as a humdrum) and xylophone, kaossilator which is a keyboard played on a touchpad (see Figure 6), a gong and two wind chimes, electrical bass, different shakers and hand percussion instruments, respiration instruments (flutes, harmonicas, trumpets, melodica, kazoo, etc.), microphones, PA, and CD system. The setup of the room is illustrated in Figure 8 with music therapist Maria Schmidt playing guitar and a participant playing djembe.

Figure 6 Korg Kaossilator

Figure 8 Music therapy room setup

3.3.3.3 Participants rehabilitation needs addressed in music therapy
The following paragraphs describe the participants' rehabilitation needs and how they were addressed in the group music therapy.

In both groups the therapy started with the group sitting in a circle with the therapist (Søren) asking each participant to share what they were presently thinking about (verbal check-in). During the first session, participants were engaged in a discussion around individual and group goals of therapy. After the initial presentation where everybody expressed his or her reasons and expectations for attending the music therapy, the therapist suggested performing a concert where everybody sang a song as group goal. The group decided that the participants had the right not to perform a song.

The group members approved the individual goals of music therapy set by the music therapist and were indicative of the rehabilitation needs identified by them and close staff/relatives. During later sessions, the "check-in" discussions focused on other issues such as family or leisure time issues but also psychological and existential subjects were brought up. E.g. how can my life as a person with ABI give meaning when I cannot go anywhere alone, I feel sad about being without friends, I am happy with my friends or wife, I am moving to a new apartment and it worries me, my son is doing good at sports, the cold weather and ice makes walking tricky, etc. The verbal check-in finished with the therapist offering a short summary of topics discussed and offering thoughts that connected their conversations with those raised in previous sessions or song lyrics etc.

Physical issues addressed
Following the verbal check-in, participants were invited to partake in a body warm-up starting with a stretch and a massage of one's own body, followed by whole body clapping. The body warm-up finished with participants in a standing position (or sitting if the participant was not able to stand) and actively engaging in rhythmic patterns using their hands and feet. E.g. L-foot, R-foot, clap, pause - repeated. In later sessions, the music therapist increased the complexity of the rhythmic patterns. In addition, the participants and the therapist added improvised lyrics, guitar, and singing to the body percussion.

Six participants (and seven SR) indicated a need for retraining motors skills. Three participants and three SR indicated a need for retraining rhythmic arm and leg functions. These rehabilitation needs were clinically addressed with physical musical exercises. Rhythmic Auditory Stimulation and other techniques with rhythmic movement and auditory feedback have shown promising results in improving physical functioning (Hurt, et al., 1998; Prassas, et al., 1997; A. H. Thaut, et al., 2007; Michael H. Thaut, 2005; Michael H Thaut, et al., 1993; M. H. Thaut, et al., 1997). The musical exercises used in this trial were Hands and Feet rhythms (e.g. foot-foot-clap, pause, repeat), and drumming on djembes (African rhythms, call response, improvising, and leading the group). The drumming most often started with a call-response round - first with the therapist as caller, then with the participants as callers. To help the participant frame the music, the first call was four steady beats. Sometimes the call-response exercise developed into a drum-jam where the therapist primarily served as a steady ground and the participants would play freely. In addition, the call-response types of exercises retrain short-term memory since the participants have to remember the "call" and reproduce it.

Five participants (and seven SR) indicated retraining balance as medium or above need. The group format made this difficult to address since it would require more one-on-one support. The participants that did not require physical support to stand, completed the physical exercises in a standing position. In addition, two participants (from separate intervention groups) needed to slow down their walking cadence, retrain weight shift, and straighten up in order to improve walking quality. In order to decrease walking tempo and improve posture, the therapist would sing familiar songs with a marching beat (e.g. "Jeg gik mig over sø og land", "Vi skal gå hånd i hånd gennem livet du og jeg", etc) and engage in body percussion to set a steady pulse (approximately 120 bpm) on the way to and from music therapy setting. This meant that for those two participants, the music therapy intervention started on the way to the therapy room.

Four participants and four SR indicated a need for retraining fine motor skills. This need was clinically addressed via the playing of instruments that train fine

motor skills and grip such as shakers, kaozillator (touchpad keyboard), guitar, and piano.

The need for retraining voice was indicated by four participants (and three SR). In addition, three participants (and three SR) indicated a need for retraining of respiratory functions. These needs were addressed via body and voice exercises inspired by SIPARI (Jungblut, 2005) and other choir methods. The voice warm-up would start with a long G note singing 'mmmmm', 'aaaaaaaa', 'iiiiiiiiiii', and other vowels. The exercises were accompanied with guitar or piano playing the chords C – G/b -Am7 – G7 repeated (and in steps transposed a fifth up and down). Next exercise focused on articulation and intonation. Words like mona, lola, lili (and sometimes the group member's names) were sung on different choir exercise melodies. E.g. melody: G-E-F-D-E-C-D and the chords C – Dm – C – G, or melody: C-E-G-C'-G-E-C, chords C – F – C. Later in the session, vocal improvisations that had a call-response format would be performed. The voice improvisation was based on the chords G and C9. In later sessions chord progressions from the concert songs were used as musical frame for voice improvisation (e.g. Hungry Heart: C – Am - Dm – G, or Hallelujah: C – Am – C – Am – F – G –C – G) . The participants were encouraged to express themselves freely both lyrically and musically in these exercises. This clinical method is often referred to as "frame working" (Wigram, 2004). The musical frame, described by Wigram (2004) almost always included a steady beat and repeated chords. He states: "Frame working: provide a clear musical framework for the improvised material of a participant, or group of participants, in order to create or develop a specific type of musical structure" (Wigram, 2004 , p118). The purpose in this setting was to create a secure frame for improvising and familiarize the participant to the concert songs and their tonality.

Four participants (and nine SR) identified the need for relaxation. In addition, three participants (and one SR) indicated a need for pain reduction. The relaxation and pain reduction need was clinically addressed with body stretches, massage, body warm-up, and listening exercises. Due to the group requiring time to prepare for a performance, the listening exercises were only conducted three times in the beginning of each of the music therapy sequences (because of time limitations).

Cognitive needs addressed

Six participants (and nine SR) identified a need for rehabilitation of memory skills. The participants were to learn and remember lyrics, melodies, rhythms, instruments, musical roles, structure, etc. for seven/eight songs. In addition, the introductory conversation in every session enabled retelling and remembering previous sessions, thoughts, and activities.

Four participants (and nine SR) indicated a need retrain planning skills (organize normal daily living). This need is often meet by constructing lyrics

that helps remember the normal daily activities (F. Baker & Tamplin, 2006). This approach is individual and could not be applied the group format.

Psychological needs addressed
Six participants (and three SR) indicated a need for increased hope for the future. In addition, three participants (and three SR) indicated a need for working on existential themes. To address these needs, the therapist used a positive psychology approach during the verbal discussions at the beginning and end of each session. The positive psychology approach stresses meaning and purpose, positive emotions, relationships, and accomplishment - placing emphasis on meaning and purpose as the most important for achieving a life of fulfillment (Seligman, 2011).

Three participants (and eight SR) indicated a need for increased self-confidence and self-esteem. It was assumed that leading voice, instrumental improvisations (call response and structured on chord progressions), and the accomplishment of performing and singing at a concert would affect self-confidence and self-esteem positively. Every session ended with a verbal round where the participants were encouraged to evaluate the session. The feedback from participants involved sentences such as: "I have always appreciated playing music together with others", "everybody seems to have fun and contribute with what they can in the music", "I get annoyed when X make noise on the drum kit". The therapist would acknowledge the participants' feedback and thereby support the participants' self-confidence in giving both positive and negative feedback.

Three participants (and three SR) indicated a need for increased ability to empathize with others. When there was conflicting thoughts or actions in the sessions, the therapist requested the participants to take the stance of the other participants, in order to increase the ability to empathize.

3.3.3.4 Instruments played and songs performed at the concert
During the first six sessions, the participants chose a song they wanted to sing at the concert. The amount of songs to perform at the concert was determined by the participants and time available ending up with seven songs in group I and eight songs in group II.

In group I, the participant playing bass was unable to remember shifts between verses and refrain so the therapist suggested the group adopt two songs (Don't Worry Be Happy, and Hungry Heart) where verses and refrain are built on the same chords. The repetition enabled the participant to play those songs. Another participant from group I had pre-existing guitar skills in playing guitar and played that in all seven concert songs. Teaching the guitar parts for the songs involved 15 minutes individual teaching after sessions 3,5,6,8, 9, 12, and 15. The other members from group I played kaozillator, keyboard, cajun, drum-kit, shakers, and African drums. Group I's songs that were rehearsed and

performed at the concert (2th of June 2010) comprised: Don't worry be happy, Girl of sixteen, Hungry heart, Smuk og dejlig, Solen er så rød mor, Står på en alpetop, and Stærk tobak.

In group II, one participant had basic pre-existing drum playing skills. The rest of group II had no formal musical training but were involved by singing and playing the kaozillator, keyboard, cajun, shakers, and African drums. In group II's session number 15, a participant appreciated one of the other participants by saying: "I love Ulla (synonym) because she is so kind". After a talk about the empowering nature of the statement, the therapist suggested making a song where everybody in the group, in turn, was appreciated followed by a solo by the appreciated participant. The song writing procedure was:

1. Defining what the group members appreciated in each other
2. Writing the lyrics (I love "name", because s/he is..…).

The melody was constructed based on suggestions from the therapist. The lyrics and chords are in Appendix 4. The songs played at group II's concert (16th of February 2011) were: Down town, Hallelujah, Jeg elsker sangen (groups own composition), Satisfaction, Ole sad på en knold og sang, Love me tender, Yesterday, and This is my life.

In both groups, almost all the songs performed had improvisational parts where participants engaged in instrumental or vocal solos. The kaozillator was the instrument most frequently used in performing solos. The kaozillator is played on a touch pad and has a range of pre-defined scales and instruments.

After data collection was completed, participants from both groups meet and we watched a DVD of the two concerts. In the end of the watching session, the participants got a DVD with their own concert.

In relation to music therapy theory, the focus on rehabilitation needs points at functional music therapy (F. Baker & Tamplin, 2006; Michael H. Thaut, 2005) whereas the goal of finishing with a public concert performance points at Community Music Therapy (Stige, et al., 2010). However, since the community was only involved as an audience the method cannot be defined as community music therapy. The communication and energy in the groups revolved around both addressing rehabilitation needs and preparing the concert. The preparation for the concert meant practice and rehearsals repetitively, which in return also had a positive impact on the functional goals. The participants had and experience of sharing music and thoughts while learning to agree on differing musical needs and tastes. Through this process, the participants potentially experienced meaning, identity, engagement and ultimately belonging. A fundamental feature of this type of work is the acceptance of differences of each group member. Stige ((2003) in Pavlicevic & Ansdell, 2004, p173)) call this "unity beyond uniformity" (p. 173).

In relation to working towards a public concert performance Ansdell write: "Performance occasions can be an appropriate therapeutic medium – providing a site, focus, tool or occasion for music therapy work with both individual and socio-cultural dimension of human need […]. Performance work in music therapy can keep a focus on process whilst also working for outcomes [...]. Performances create and sustain networks of relationships between and amongst people, institution and communities" (Stige, et al., 2010, p.165). The Ansdell quote supplies the rationale for having the concert as focal point alongside the participants' rehabilitation needs. It is my clinical experience that group music therapy became more focused as the groups had a common goal. In addition having a concert fitted into normal practice at Høskoven.

3.4 Research outcomes - dependent variables

This research primary focus is interpersonal communication competencies in everyday life and musical improvisation (cf. research questions Section 2.8.2). Therefore, the dependent variables are interpersonal communication competencies in daily life and music. The outcome measures used in this study are constructed to have a self-rating and a staff/relative measure on ICC in daily life based on the Interpersonal Communication Competence Scale (ICCS) by Rubin and Martin (1994). In addition, a music therapist and self-rating measure on the participants' interpersonal communication competencies in music based on the ICCS was constructed. Two methods of musical interaction analysis have been performed in this study – an Improvisation Assessment Profile (IAP) analysis and an ICCS_MusRat analysis). The ICCS has, inspired by Purdie (1997) (who adapted the Neurobehavioral Rating Scale into a musical behavioral scale) been adapted into interpersonal communication competencies in music scale (see Section 3.4.6). The Improvisation Assessment Profile (IAP) by Brusica (1987) was incorporate as an established method of evaluating ICC in music. Two blinded raters performed the IAP and ICCS_MusRat evaluation. A Rehabilitation Need Questionnaire (RNQ) was constructed in order to guide the clinical intervention.

The review of other ICC outcome tools applied ABI research is presented in Section 2.4.3 and 2.5.3. The rationale for choosing the ICCS by Rubin & Martin(1994) as main outcome is presented in Section 2.7. In summary the argumentation revolves around:

- All identified interpersonal communication measures (except the KAS) have been implemented in only one ABI study
- None of the identified measures were translated into Danish
- None of the measures identified in ABI research focus on competencies
- None of the identified measure were general constructs of interpersonal communication

The rationale for choosing IAP by Bruscia (1987) as musical rating tool is presented in Section 2.7.2. The decision of choosing the IAP measure was performed using professor Bonde's (2007) five generic questions.

Information on ICC in everyday life has in previous ABI studies been obtained using video recordings of situated interactions in both music therapy and other professions research of ABI persons ICC (see Section 2.4.3 and 2.5.3). Therefore, video recording of improvisational/communicative musical exercises is incorporated in this study also.

Data on the two dependent variables (ICC in music and ICC in daily life) was collected using four ICCS questionnaires and two rater tools:

- ICCS_Par (self rating on daily life ICC)
- ICCS_ SR (staff/relatives rating on participants' daily life ICC)
- ICCS_MT (music therapist rating of participants' ICC in music)
- ICCS_MTP (music therapy participant self rating of ICC)
- ICCS_MusRat (blinded rating of ICC in music)
- IAP (blinded rating of autonomy/communicative musicality in improvised music)

In Table 15 the research questions and the variables/outcomes associated is presented. The type of trace is presented in relation to time point of collection in the two intervention groups. The ICCS measures on daily life are collected at all four time points in the study whereas the measures on musical ICC is only collected pre and post the music therapy intervention.

Table 15 Dependent variables in the study

Research question	Variable	Outcome/trace	Time point 1	Time point 2	Time point 3	Time point 4
1-b What is the effect of 20 music therapy sessions on interpersonal competencies in daily life?	Interpersonal communication competencies in daily life	ICCS_Par; self-report (Likert scale)	Grp.I+II	Grp.I+II	Grp.I+II	Grp.I+II
		ICCS–SR; staff/relatives (Likert scale)	Grp.I+II	Grp.I+II	Grp.I+II	Grp.I+II
1-a What is the effect of 20 music therapy sessions on interpersonal competencies in musical	Four improvisational musical exercises	Video recording of: Dialogue, Follow the music therapist, Hold on to a phrase while challenged, Free improvisation.	Grp.I	Grp.I	Grp.II	Grp.II

Research question	Variable	Outcome/trace	Time point 1	Time point 2	Time point 3	Time point 4
improvisations?	Interpersonal communication competencies in music	ICCS–MT; Music therapist evaluation of participants interpersonal communication competencies in music (Likert scale)	Grp.I	Grp.I	Grp.II	Grp.II
		ICCS-MTP; Participant self-report on interpersonal communication competencies in music (Likert scale)	Grp.I	Grp.I	Grp.II	Grp.II
		ICCS_MusRat ; Blinded rating of musical exercises from pre-post MT (Likert scale)	Grp.I	Grp.I	Grp.II	Grp.II
1-d What is the effect of 20 music therapy sessions on communicative musicality?	Improvisation Assessment Profile – Autonomy	IAP blinded rating of the participant's level of autonomy in regards to Volume, Rhythmic Ground, Tonal and Melodic, and Phrasing.	Grp.I	Grp.I	Grp.II	Grp.II
	Rehabilitation needs	RNQ; Rehabilitation Needs Questionnaire - self-report, staff/ relatives (Likert scale)	Grp.I+II	Grp.I+II	Grp.I+II	Grp.I+II

The first process in preparing the ICCS (Rubin and Martin, 1994) for this study was translating it into Danish.

3.4.1 The process of translating ICCS into Danish

The decision of using the ICCS questionnaire(Rubin & Martin, 1994) (The original ICCS is in Appendix 5) necessitated a translation into Danish. The back-translation procedure is often used when translating an instrument to another language (Bullinger, Anderson, Cella, & Aaronson, 1993) and

recommended by the Danish Medical Journal (Obel et al., 2003). Bullinger et al. (1993) suggested that a back-translation and a pretest are the minimal requirements for translating an instrument.

The translation process of the ICCS started with two independent proposals for a Danish translation - one made by Professor Hanne Mette Ridder and me, and one made by Professor Lars Ole Bonde. The two Danish versions were discussed, compared, and written into one Danish version (Appendix 6). The language used was adapted to Danish culture. For example, the term "strangers" could be understood as "foreigners" in Danish, so instead the term was translated into "people I don't know". Another example is the item 28 "I accomplish my communication goals". The phrase "communication goals" is rarely used in Danish, so the item was rephrased into "I manage to express what I want". When settled on an acceptable Danish version, an academic English person (Jody Ghani) who has lived in Denmark for more than 10 years translated the Danish version back into English (Appendix 7). The translation was reviewed and small mistakes in translating the Danish word for negotiate in item 17, which by Ghani was translated into deciding, was corrected. The back translated English version was then sent to the original ICCS authors' professor Rubin and Martin for comments. They had very few comments to the back-translated version that were easily accommodated in the Danish version. See Appendix 8 for mail correspondence with Professor Rebecca Rubin.

To ensure that the ICCS could be applied ABI research the next step in the process was to obtain feedback on the questionnaire from ten music therapists working within the neurological rehabilitation field. This was conducted during a whole day meeting on the 29.06.2009. Their comments resulted in further changes (simplifications) in the Danish wording in item 8,9,20 and 26.

Since the questionnaire had been originally developed for use with non-brain injured people, the researcher piloted it with ten brain injured persons similar to those in the intervention group. The ICCS was in the pilot administered as an interview. The pilot revealed that some of the items needed further clarification or rephrasing (item 5, 13, 16, 17, 18, 22, 24). The interviewer had to ask most items twice and added a "how often do you" to the beginning of the items to compensate for the ABI persons cognitive problems. Because of the number of misunderstandings, the researcher chose to rewrite the whole ICCS so that the 'how often' was inserted into the item, thereby directing the item towards the possible answers (Almost always, Often, Sometimes, Seldom, Almost never). The new ICCS_Par version was sent to Professor Rebecca Rubin for comments (see Appendix 8). Professor Rubin added comments leading to further revision of two items. The first pilot also highlighted that the participants could not fill out the ICCS alone. When the rephrasing and rewriting was completed, the ICCS_Par was tested on two ABI persons from the first pilot that had the greatest problems understanding the items. It became clear that the items were

clear, but persons with ABI still needed an interviewer to keep them focused. The final version of ICCS_Par items (translated back to English by Hald and F. Baker) is in Table 16. The final version and layout of the Danish ICCS_Par is in Appendix 9.

Guidelines for, and the problems and advantages of administering questionnaire surveys are outlined in Wigram (2005). In short, it is recommended that the questionnaire is short, simple, and unambiguous. Items should be relevant, not leading, not too personal, and must be specific and not hypothetical (Wigram, 2007). Due to the significant cognitive impairments people with ABI present with, the need for simplicity is even more imperative. In the current study, the participants filled in the questionnaire with support from Søren Hald. Guidelines, items, and possible responses were read aloud to the participants. Participant were reread the answer possibilities if needed.

3.4.3 ICCS_Par and ICCS_SR measure

To gather information on the Participants ICC from the perspective of staff and relatives an ICCS-SR instrument was constructed based on the ICCS_Par. In most of the reviewed studies from other clinical fields than music therapy (Section 2.5.3) staff/relatives report on the participants' ICC using a range of different research tools. This study seeks to follow that trend, believing that the best way of collecting data on the participant's everyday interaction was to ask the ones who interact with the participants on a daily basis.

The staff/relative ICCS items are very similar in wording as ICCS_Par except that "you" is replaced with the name of participant and he/she. In addition, some words have been replaced to take the perspective of the staff / relative person or clarify meaning of item. In Table 16, the changed wording has been highlighted. The final questionnaire (with randomly arranged items) was written into a word document and a personal SR questionnaire was made for every participant using the search and replace function in Microsoft Word. The final version and layout of the Danish ICCS-SR, is in Appendix 10.

Table 16 ICCS_Par and ICCS_SR

	ICCS _Par (adapted from ICCS Rubin and Martin (1994))	ICCS_SR (¤=he/she, #=participant name)
	5 ALMOST ALWAYS, 4 OFTEN, 3 SOMETIMES, 2 SELDOM, and 1 ALMOST NEVER	5 ALMOST ALWAYS, 4 OFTEN, 3 SOMETIMES, 2 SELDOM, and 1 ALMOST NEVER
	Self-disclosure	
1	How often do you show friends who you really are?	How often does # show friends who ¤ really is?
2	How often do you feel that you are understood by others?	How often does # experience being understood?
3	How often do you reveal to others how you feel?	How often does # reveal to others how ¤ feels?

	ICCS _Par (adapted from ICCS Rubin and Martin (1994))	ICCS_SR (¤=he/she, #=participant name)
	Empathy	
4	How often are you able to put yourself in others' shoes?	How often is # able to take the stance of others?
5	How often do you have difficulty understanding others feelings? (R)	How often does # have difficulty understanding others feelings?(R)
6	How often do others feel that you understand them?	How often does # understand how you feel?
	Social relaxation	
7	How often is it comfortable for you, to be together with others?	How often is it comfortable for #, to be together with others?
8	How often do you feel relaxed in small groups?	How often does # seem relaxed in small groups?
9	How often do you feel insecure when you are amongst strangers? (R)	How often does # feel insecure when amongst strangers?(R)
	Assertiveness	
10	When someone has wronged you, how often would you confront the person?	When someone has wronged #, how often would ¤ confront the person?
11	How often do you have difficulty standing up for your rights? (R)	How often does # have difficulty standing up for own rights?((R)
12	How often do you stand up for your rights?	How often does # stand up for own rights?
	Altercentrism	
13	How often are conversations about your own topics? (R)	How often are conversations about #'s topics? (R)
14	How often do you let others know that you understand what they are saying?	How often does # let others know that ¤ understand what they say?
15	How often does your mind wander during conversations?	How often does # mind wander during conversations?
	Interaction Management	
16	How often do you shift from one topic to the next without problems?	How often is shift of topic in #'s conversations without problems?
17	In conversations, how often do you take charge by negotiating conversational topics?	How often is # involved in negotiating conversational topics?
18	How often would you estimate that you comprehend both what is said and what is not said in conversations with friends?	How often does # comprehend both what is said and what is not said?
	Expressiveness	
19	How often do your friends notice if you are happy or sad?	How often is it apparent if # is happy or sad?
20	How often is it hard for you to find the right words to express yourself? (R)	How often is finding the right words hard for #?(R)
21	How often do you experience being good at expressing you self verbally?	How often do you experience # being good at expressing him/herself verbally?
	Supportiveness	
22	How often is your communication supportive – not evaluative?	How often does # respond supportive – not evaluative?
23	How often do you make an effort to be equal with others?	How often does # make an effort to be equal with others?
24	How often would others describe you as warm and loving?	How often would you describe # as a warm and loving person?
	Immediacy	
25	How often do your friends feel that you care	How often do you experience that # care

	ICCS _Par (adapted from ICCS Rubin and Martin (1994))	ICCS_SR (¤=he/she, #=participant name)
	about them?	about you?
26	How often do you try to look others in their eyes when you talk to them?	How often does # try to look into your eyes when you talk?
27	How often do you tell others that you feel close to them?	How often does # tell other that ¤ feel close to them?
	Environmental control	
28	How often do you feel that you accomplish what you want to in your conversations?	How often do you experience that # communicate what ¤ wants?
29	How often can you persuade others to share your perspective?	How often can # persuade others to his/her perspective?
30	How often do you have difficulties convincing others to do what you want them to do? (R)	How often does # have difficulties convincing others to do what # them to do? (R)

The ICCS-SR questionnaire was handed to the staff and relatives and returned when they had finished it. The timeframe for filling out the questionnaire was 14 days, though some were late (time point one 25.11.09 – 07.01.10, time point two 07.06.10 - 16.07.10, time point three 17.08.10 – 24.09.10, time point four 24.02.11 – 05.03.11). If there were data missing or uncertainties, the SR person was contacted and the questionnaire corrected. The questionnaire answers were entered by hand into a Windows Excel spreadsheet.

3.4.4 Interpersonal communication competencies in music assessment exercises

In order to conduct a controlled assessment of the participant's musical communication competencies, an assessment session pre and post the music therapy intervention was undertaken. Often researchers chose 'representative excerpts' when analyzing the effect of improvised music (S. Gilbertson & Aldridge, 2008; Wosch & Wigram, 2007). When choosing representative excerpts one could imagine that the researcher choose excerpts that support the research hypothesis. By administering, the same musical exercises pre and post therapy, researcher bias in choosing representative musical excerpts from therapy are minimized. In addition, a research assistant (Maria Schmidt) conducted the improvisations which was done in order to minimize the influence from the researcher.

The assessment session was made up of four musical exercises informed by Bruscia (1987) and Wigram (2004) and comprised:

1. Dialogue (self-chosen instrument). The participants were instructed to carry out a conversation on the instrument. In addition, the participants were informed about the possibility of developing the conversation so that they "talked" simultaneously in the music. The improvisation would often start with turn taking, and then the therapist musically motivated the participant to be creative and if possible simultaneously dialogue with the therapist.

2. Follow the therapist (on piano/keyboard). The participant was instructed to musically follow the expressive state of the music therapist's music. The instructions were not to play the exact same notes as the therapist, but match the music. The therapist improvisation would start in one emotional state before moving to another (e.g. Sad to happy, angry to light, etc). The participant and therapist were playing facing each other on keyboard/electric piano.
3. Hold on to a phrase while the therapist interrupt (self-chosen instrument). The participant was instructed to construct a short phrase and maintain repeating the phrase while as the therapist began to challenge. If the participant started playing a very complex phrase considered difficult for the participant to repeat several times, the music therapist assisted the participant to shorten the phrase. The therapist started by supporting the participant's musical phase. When the participant was comfortable in playing the phrase, the therapist engaged in challenging musical responses with respect to tonal language and modified the tempo (up and down).
4. Free improvisation (self-chosen instrument). The participants were in this exercise instructed to musically express how he/she felt in the present situation. The therapist had a supportive role in the improvisation. If the music became rigid for more than two minutes, the therapist would musically motivate transitions.

The exercises were carried out in the above indicated order. Before the study initiated the exercises were rehearsed with the researcher as participant. In addition, four trial assessments were performed on ABI persons not participating in the study.

Since the music therapist performing the assessments had direct impact on the participant's communicative performance in these exercises, she was instructed to initiate communication in the dialogue and free improvisation exercises only. Communicative initiatives involve; pausing after a phrase, offering a response to a call, or developing a participant's phrases, etc. The assessing music therapist's support in exercise four involves improvisational techniques such as supporting, mirroring, and holding(Wigram, 2004). Because the data collected from the free improvisation exercise was to be subjected to an IAP-autonomy analysis, some of the improvisatory techniques described by Bruscia (1987) for that specific profile were implemented – these were making spaces, modeling, and synchronizing/ differentiating.

The assessments were conducted before (or in the week after) the first music therapy session and after the last session (the concerts). In figure 4 (the flow chart) the assessments sessions is marked with black background. The exercises were video recorded and edited using Windows moviemaker to start just before first note and finish right after the last note. The improvisations lasted from 54

seconds up to 346 seconds. For details of length of the improvisations, see Table 17. Most often, the improvisations came to a natural end without verbal or non-verbal prompting. On four occasions, the music therapist stopped the improvisations verbally when the improvisations had lasted for more than five minutes or the participant had played rigidly for more than 3 minutes.

Table 17 Length of participants' improvisations exercises (in seconds)

Pre MT	A	B	C	D	E	G	H	I	J	K	L	M	O	R	Mean	STDV
dialogue	246	97	89	95	189	187	192	158	126	153	158	211	53	125	149	54
follow	147	163	133	144	178	152	175	145	101	143	192	163	131	110	148	25
hold on	189	201	134	135	176	187	181	91	97	112	162	283	93	136	156	53
free	179	92	168	80	241	271	346	118	120	149	127	291	88	103	170	85
total	761	553	524	454	784	797	894	512	444	557	639	948	365	474	622	183
Post MT	A	B	C	D	E	G	H	I	J	K	L	M	O	R	Mean	STDV
dialogue	105	168	155	158	119	156		144	86	91		161	143	60	129	36
follow	163	176	97	167	153	184		118	92	130		137	114	89	135	34
hold on	111	184	148	127	140	258		184	146	105		150	140	139	153	41
free	150	324	119	134	188	243		146	125	100		270	268	305	198	80
total	529	852	519	586	600	841		592	449	426		718	665	593	614	136

After the four exercises, the music therapist performing the assessments and participant individually filled in a questionnaire on the participants interpersonal communication competencies in the musical assessment exercise. How the two questionnaires were developed is described in the next section.

3.4.5 Interpersonal communication competencies in music questionnaires

In order to answer research question 1-a (What is the effect of 20 music therapy sessions on interpersonal competencies in musical improvisations?) it was decided to develop a music therapist and participant questionnaire on ICC in music. Such questionnaires would also help answering research question 1-c (Is there a correlation between interpersonal competencies in music and daily life?). In order to ease the correlation analysis it was decided that the measurement on ICC in music should examine the same categories of interpersonal communication competencies as the original ICCS by Rubin and Martin (1994). Wigram and the researcher altered the ICCS items into a musical interaction questionnaire. The idea is that using related questionnaires on both musical and everyday interaction allows for direct comparison between interpersonal competencies in the two conditions. To gather information on how the participants and the music therapist performing the assessment experienced the participants' ICC in music the questionnaires was administered as the last procedure in the assessment sessions conducted pre and post the 20 music therapy sessions. The two questionnaires was named ICCS_MT

(MT=Music Therapist version) and ICCS_MTP (MTP=Music Therapy Participant).

In order to make the items relevant they were directed towards the improvisations just performed. Because the musical interaction questionnaires related to the recently conducted improvisations, the Likert-scale was change to a degree interval. The Likert scale then became: Highest degree 5, greater degree 4, medium degree 3, less degree 2, minimum degree 1.

Transforming the ten Interpersonal Communication Competencies Scale (ICCS) subscales was done by adding "in music" or "musical" to the original subscale name.

In Table 18 the conversion done by Wigram and Hald of ICCS_Par into musical communication items (ICCS_MTP) is presented. The Danish layout of the music therapist version of the ICCS_MT is in Appendix 11. In addition the Danish layout of the participant ICCS_MTP, appear in Appendix 12.

Table 18 ICCS_Par and ICCS-MTP

	ICCS_Par. version (adapted from Rubin and Martin (1994))	ICCS_MTP(articiapant) (after assessment)
	5 ALMOST ALWAYS, 4 OFTEN, 3 SOMETIMES, 2 SELDOM, and 1 ALMOST NEVER	5 HIGEST degree , 4 GREATER degree, 3 MEDIUM degree, 2 LESS degree, and 1 MINIMUM degree
	Self-disclosure	**Self disclosure in music**
1	How often do you show friends who you really are?	Did your music express how you felt?
2	How often do you feel that you are understood by others?	Did you experience, that your music was understood?
3	How often do you reveal to others how you feel?	Did you put emotions into your music?
	Empathy	**Empathy in music**
4	How often are you able to put yourself in others' shoes?	Did you understand the conditions the therapist expressed in music?
5	How often do you have difficulty understanding others feelings? (R)	Did you have difficulties understanding the feelings that the therapist played? (R)
6	How often do others feel that you understand them?	Did you make an effort to be compassionate in the music?
	Social relaxation	**Social relaxation in music**
7	How often is it comfortable for you, to be together with others?	Were you comfortable playing music with the therapist?
8	How often do you feel relaxed in small groups?	Did you feel relaxed playing music?
9	How often do you feel insecure when you are amongst strangers? (R)	Do you feel insecure when you play music with people you do not know? (R)
	Assertiveness	**Assertiveness in music**
10	When someone has wronged you, how often would you confront the person?	Did you react musically on things that annoyed you in the music?
11	How often do you have difficulty standing	Did you have difficulty in achieving

	ICCS_Par. version (adapted from Rubin and Martin (1994))	ICCS_MTP(articiapant) (after assessment)
	up for your rights? (R)	independence in the music? (R)
12	How often do you stand up for your rights?	Were you able to establish your own musical space?
	Altercentrism	**Altercentrism in music**
13	How often are conversations about your own topics? (R)	Did you play more than listen? (R)
14	How often do you let others know that you understand what they are saying?	Did yours and the therapist music complement each other?
15	How often does your mind wander during conversations?	Did you have a sense of being present while playing?
	Interaction Management	**Interaction management in music**
16	How often do you shift from one topic to the next without problems?	Was your music flexible and varied?
17	In conversations, how often do you take charge by negotiating conversational topics?	Did you both give space and take charge, playing music?
18	How often would you estimate that you comprehend both what is said and what is not said in conversations with friends?	Did you notice something that was not expressed in the music?
	Expressiveness	**Expressiveness in music**
19	How often do your friends notice if you are happy or sad?	Was it noticeable in your music how you feel?
20	How often is it hard for you to find the right words to express yourself? (R)	Was it difficult to communicate and express what you wanted in the music? (R)
21	How often do you experience being good at expressing you self verbally?	Did you experience being good at expressing yourself through music?
	Supportiveness	**Supportiveness in music**
22	How often is your communication supportive – not evaluative?	Did you follow the musical ideas of the therapist?
23	How often do you make an effort to be equal with others?	Did you and the therapist maintain an equal relationship?
24	How often would others describe you as warm and loving?	Do you think that the therapist sensed compassion and warmth in your music?
	Immediacy	**Immediacy in music**
25	How often do your friends feel that you care about them?	Do you think the therapist felt your care?
26	How often do you try to look others in their eyes when you talk to them?	Did you adapt your music to the music of the therapist?
27	How often do you tell others that you feel close to them?	Did you experience immediacy towards the therapist?
	Environmental control	**Environmental control in music**
28	How often do you feel that you accomplish what you want to in your conversations?	Did you express what you wanted in the music?
29	How often can you persuade others to share your perspective?	Were you able to draw the therapist into your musical ideas?
30	How often do you have difficulties convincing others to do what you want them to do? (R)	Was it difficult to draw the therapist into your musical space?(R)

The music therapist performing the assessments (Maria Schmidt) and the participants filled out the respective questionnaire after they had completed the

four assessment exercises. Søren Hald supported the participants in filling in the questionnaire by reading the items and answering possibilities for the participant. The questionnaire answers were entered by hand into a Windows Excel spreadsheet.

To add validity to the interpretation of the participants' musical interpersonal communication competencies, the musical exercises were rated by two music therapy students blinded to phase of treatment.

3.4.6 Blinded rating of musical assessment exercises

Two music therapy students, blinded to phase in treatment, were employed to rated the four musical assessment exercises collected before and after the 20 music therapy sessions. The blinded rating of the musical exercise was performed in order to increase reliability in answering research question 1-a (What is the effect of 20 music therapy sessions on interpersonal competencies in musical improvisations?). A new rater tool was constructed based on ICCS and inspired by Purdie (1997) who adapted the Neurobehavioral Rating Scale into a musical behavioral scale. The new rater tool has been named ICCS_MusRat (MusRat=music rater).

The items in the rater tool are linked to one of the four improvisational exercises based on the challenge of the musical exercise. E.g., the participants' musical empathy is rated in 'follow the music therapist' exercise, and assertiveness in music is rated in the 'hold on exercise' (see below for all linking of items to musical exercise). The ICCS_MT items pre-supposes interaction with the participant and was therefore changed into more visible parameters in the ICCS_MusRat in order to enable the rating procedure. Therefore, most of the original ICCS_MT were rephrased into the ICCS_MusRat. E.g. item two was originally about the therapist's understanding the participant's music, it was therefore rephrased into articulate whether the rater experienced clarity/focus in the music. Appendix 14 presents all the rephrased ICCS_MusRat items and rating schema. The Likert scale used in the rater tool have a time/amount focus (Almost all the time 90+%, A lot of the time 65-89%, Some of the time 36-64%, Little of the time 11-35%, and Almost none of the time 0-10%).

A definition of the different interpersonal communication competencies in music subscales was constructed based on ICCS definitions in (Section 2.7.1) in order to guide the raters.

3.4.6.1 Self-disclosure in music

This subscale has to do with openness in music, and ability to reveal oneself in the music. Bruscia (1987,p 561) described different levels of self-disclosure in improvised music, stating that improvised music may reveal information on physical, emotional, intellectual or social aspects of the self. When assessing

self-disclosure in the improvised music the raters evaluated the dialogue and free improvisations. Each rater had to rely on his/her sense of the participant focusing on consistency (or discrepancy) between the musical expression, emotional signaling, social context, and bodily language. The self-disclosure in music rater items are:

1 Was the participant's music congruent with body language? (free)
2 Did you experience clarity/focus in the participant's music? (dialogue)
3 Did the participant seem to reveal emotions in the music? (free)

3.4.6.2 Musical empathy

This subscale has to do with the participants' ability to musically feel with the music therapist - understanding and responding to the emotional perspective of the therapist. When assessing musical empathy the raters evaluated the 'follow the therapist' and the 'dialogue' improvisations. The raters assessed how well the participant is able to match the therapist's music, the overall expression, and ability to follow musical changes.

4 Did the participant match the rhythm of the therapist? (follow)
5 Did the participant have difficulty matching the musical style of the therapist?(R) (follow)
6 Did the participant give musical signals of understanding (copy, mirror, develop)? (dialogue)

3.4.6.3 Social relaxation in music

This subscale has to do with degree of anxiety and the feeling of comfort while playing music. When assessing social relaxation in the improvised music the raters evaluated the free improvisation and the dialogue improvisation. The raters were instructed to notice if participants' bodily expressions were tense, free, relaxed, etc.

7 Did the participant seem comfortable?(free)
8 Did the participant seem relaxed in the shared music making? (hold on)
9 Did the participant seem insecure playing music with the therapist?(R)(dialogue)

3.4.6.4 Assertiveness in music

This subscale has to do with being assertive without denying the rights of the other. When assessing assertiveness in the improvised music the raters evaluated the 'hold on' improvisation. When assessing musical assertiveness the raters were instructed to notice the participant's ability to establish stable melodic or rhythmical phrase. In addition, the participant's enjoyment of having musical independence.

10 When the therapist was challenging in the shared music, did the participant maintain playing the phrase? (hold on)
11 Did the participant get affected musically by the challenging playing of the therapist?(R) (hold on)
12 Did the participant establish musical independence? (hold on)

3.4.6.5 Altercentrism in music

This subscale has to do with; interest in the other, attentiveness, and responsiveness to their music. When assessing altercentrism in the improvised music the raters evaluated the 'hold on' and dialogue improvisations. The rater assessed the participant's attentiveness and responsiveness to the therapist's music.

13 Was the participant primarily into own music? (R)(dialogue)
14 Did the participant's music accompaniment/ relate to the therapist's?(dialogue)
15 Did the participant seem concentrated and focused? (hold on)

3.4.6.6 Interaction management in music

This subscale has to do with ritualistic procedures like taking turns, phrasing, starting and ending improvisations. When assessing interaction management in the improvised music, the raters evaluated the dialogue and free improvisations. The rater assessed the participant's ability to take turns, start and end. In addition, the participant's ability to play flexible and varied, come up with ideas in the musical dialogue, and ability to perceive changes in the music, is assessed.

16 Did the participant play in a flexible and varied way?(dialogue)
17 Did the participant develop ideas in the music?(dialogue)
18 Did the participant respond to changes in the music?(free)

3.4.6.7 Expressiveness in music

This subscale has to do with communicating state of mind non-verbally. When assessing expressiveness in the improvised music the raters evaluated the free improvisation and the 'follow the therapist' improvisations. Musically, expressiveness has to do with dynamics, tonal/melodic language, tempo, and bodily expressions. The raters were to notice the above-mentioned parameters when assessing expressiveness.

19 Did the participant's musical expression seem clear?(free)
20 Did the participant seem "stiff" in matching the therapist's music? (R)(follow)
21 Did the participant seem to be good at expressing him/her self musically?(follow)

3.4.6.8 Supportiveness in music

This subscale has to do with the ability to support the music of the other. When assessing supportiveness in the improvised music the raters evaluated the free improvisation. Being supportive in music has to do with being; spontaneous, emphatic and egalitarian. When assessing supportiveness in music the rater evaluated the role of the participant in the music – soloist or accompanist. In addition, the raters were to sense the participant's interpersonal warmth.

22 Did the participant's music relate to the musical output of therapist?(free)
23 Did the participant intend to keep an equal supporting relationship in their music making?(free)

24 Did you experience a feeling of interpersonal warmth coming from the participant?(free)

3.4.6.9 Immediacy in music

This subscale has to do with being approachable and available for musical interaction. When assessing immediacy in the improvised music the raters evaluated the free improvisation and 'follow the therapist' improvisation. When assessing immediacy the rater looked at; eye contact, ability to adopt an open stance, having a pleasant facial expression, leaning forward etc. In a more subtle level, immediacy has to do with conveying feelings of interpersonal warmth, closeness, and affiliation. On a concrete musical level, it has to do with responding to musical "questions" and having a focused attention.

25 Did the participant seem willing to participate in the improvisation?(follow)
26 Did the participant look at the therapist? (follow)
27 Did the participant seem attentive to the music of the therapist?(free)

3.6.4.10 Environmental control in music

This subscale has to do with archiving predetermined goals and satisfying needs. When assessing environmental control in the improvised music the raters evaluated the dialogue improvisation. Environmental control in music involves gaining compliance from others, and the ability to solve disrupts in a cooperative manner. In the improvisations, the rater assessed the participant's ability to signal intensions and satisfaction with own output.

28 Did the participant seem satisfied with own musical output?(dialogue)
29 Did the therapist pick up and use the participant's musical ideas?(dialogue)
30 Did the participant have difficulties signaling his/hers intentions? (R)(dialogue)

3.4.7 Training of raters

Two sixth-semester students (Cecilie Schmidt and Gitte Møller) from the music therapy education at Aalborg University were trained to undertake the ratings of the musical exercises. It was assumed that music therapy students, who were more than two years into their study, were able to comprehend the subtle layers in the musical improvisations. To prepare for the task, the raters read the article by Rubin & Martin(1994) and an introductory text on the ten ICCS-Mu subscales before the training started (Section 3.4.6). The training consisted of five two-hour sessions where video from the "assessment exercise rehearsal" were rated with the ICCS_MusRat and IAP – individual scoring were discussed. The raters also read relevant pages of Bruscia's (1987) Autonomy Improvisation Assessment Profile (Bruscia, 1987, p. 403-410, 418-421, and 444-449).

After the five training sessions, the raters were provided with a DVD containing video recordings of the 26(+2 rehearsal) assessments administered in the study (18 assessments in the randomized study and 8 with acute ABI participants).

The raters completed the rating of assessments in April-May 2011 and results were entered into an excel spreadsheet.

3.4.8 Improvisation Assessment Profile – Autonomy

To answer the research questions 1-d (What is the effect of 20 music therapy sessions on communicative musicality?) an already established method of musical interaction analysis – the Improvisation Assessment Profile (IAP) (Bruscia,1987) were employed. The IAP analysis was originally designed to reveal information on participants autonomy in improvised music. In Section 2.9 it was theorized that the chosen IAP scales reveal information about autonomy in communicative musicality. The two blinded raters conducted all IAP analyses of the participants' free improvisations.

In order to reveal information on musical autonomy in communicative musicality the scales used in rating the participant's free improvisations were:

1. Volume - setting and changing volume levels, intensity and amount of sound
2. Rhythmic ground – setting tempo, meter and subdivisions
3. Tonal/melodic – modality, tonality and melody
4. Phrasing – length and shape, and sequencing (Bruscia, 1987)

Wigram (2007) suggests the IAP-Autonomy rating as an event counting procedure. The first two training sessions with the raters revealed that the raters identified events very differently. To remove the challenge of deciding on whether an event had occurred it was decided to use the time interval approach suggested by Wosch (2007). The time intervals were lengthened from Wosch's original five seconds to ten second intervals to make the rating more fluent. The IAP rating procedures were performed after rating the participants' four exercises with the ICCS_MusRat. This meant that the raters had a pre conception of the participants' music and a first overall listening of the free improvisation. The four IAP scales were then rated in the above indicated sequence. The schema presented in Table 19 was used in rating the musical role of the participant using the dependent, follower, partner, leader, and resister terms. In order to guide the raters in when to rate, a subtle "Bing" every tenth second was added to the soundtrack. .

Table 19 IAP scoring schema

Time	0.10	0.20	0.30	0.40	0.50	1.00	1.10	1.20	1.30	1.40	1.50
Volume											
Rhythmic ground											
Tonal and melodic											
Phrasing											

The raters' IAP scorings were written into Microsoft excel. A new method of calculating the participants' IAP scores were specifically developed for this study. The method implied that the partner role is considered as the middle or "normal" in the musical interaction. A rater indication of the participants being partner in the music is scored with a zero and the neighboring roles (follower and leader) is scored as minus one or plus one respectively. The two extreme roles, dependent and resister, are scored as minus two or plus two respectively. The rating procedure meant that there is an IAP rating every ten seconds on the four chosen IAP scales all way through the improvisation. If the improvisation was 90 seconds long, there is nine scorings ranging from minus two to plus two on each of the four scales. A total scale score is calculated by adding the nine scores. A total scale score pr. minute is calculated by dividing the total scale scoring with amount of scorings (one each ten second) and then multiplied with six. In Table 20, an example of the IAP score calculation is presented. In the volume scale column, the raters' scorings of the participant's role in regards to volume in the free improvisation is presented (eight partners and one resister rating). The rating gives an autonomy in volume scale score of two (8x0 + 1x2). The volume scale score pr. minute is calculated by taking the initial scale score (two) and divided by the length of improvisation (nine ten second intervals) and then multiply with six (2/9x6). The same type of calculation is carried out on the Rhythmic ground, Tonal and Melodic, and Phrasing scale scores. The 'Total' column is an addition of the amount of scorings in the respective roles. In the bottom of the 'Total' column, the 'IAP autonomy per minute' is presented as the mean of the four scale scores pr. minute. The reason why the total 'autonomy per minute' is the mean and not a summation of the four sub scores is that not all participants played a tonal instrument. By using the mean, the choice of tonal or non-tonal instrument had no impact on the total 'autonomy per minute' score. The last column (%) is a presentation of the proportional amount in each of the five autonomy roles.

Table 20 Example of IAP scoring calculation

Free impro.	Volume	Rhythmic ground	Tonal and melodic	Phrasing	Total	%
Dependent -2	0	0	0	0	0	0,0
Follower -1	0	0	0	0	0	0,0
Partner 0	8	3	5	5	21	58,3
Leader 1	0	5	3	3	11	30,6
Resister 2	1	1	1	1	4	11,1
Scale score	2	7	5	5	19	100
Score pr. minute	1,33	4,67	3,33	3,33	3,17	

The two raters' IAP scores on each participant were calculated using a Microsoft Excel spreadsheet and was later transferred to SPSS. Two outcomes are distilled from the raters IAP ratings:

1) The 'role' ratings are summed and divided by length of improvisation giving an autonomy score per minute – one score for each of the four IAP scales. The mean of the four IAP scores were calculated into an overall "IAP autonomy per minute" score.
2) The participants' proportion of time (in percentages) in the five autonomy roles (dependent, follower, partner, leader, and resister) is calculated.

3.4.9 Rehabilitation needs questionnaire

Music therapy in neurological rehabilitation target a large spectrum of rehabilitation needs ranging from Scheibye's (1999, 2002) psychological/analytical approach, Gilbertson communicative focus (S. Gilbertson & Aldridge, 2008), Baker and Tamplin's (2006) treatment approach, and Thaut's (2007) biological motivated interventions. A rehabilitation need questionnaire was constructed (RNQ) to guide the clinical intervention in this study. In addition, the RNQ was used to set clinical goals and measure if the music therapy intervention had an effect on the participants' perceived rehabilitation need.

3.4.9.1 Rehabilitation needs definition

A white paper on rehabilitation in Denmark was published in 2004. The paper is a governmental clarification and description of rehabilitation perspectives and its potential in Denmark. Their definition of rehabilitation is: "Rehabilitation is a focused and time-bound collaborative process between a citizen, relatives, and professionals. The purpose is that the citizens who have, or are at risk of enduring significant limitations in physical, mental and / or social functioning, are able to achieve an independent and meaningful life. Rehabilitation is based on the citizen's entire life situations and interventions consist of a coordinated, coherent, and knowledge-based program". (Jensen & Møller, 2004, p.4 my translation). This definition is in line with the UN's and other North Europeans definitions of rehabilitation (Jensen & Møller, 2004).

In this context, the word 'need' is understood as something wanted or deemed necessary. 'Rehabilitation needs' are therefore defined as; something wanted or deemed necessary to address limitations in physical, mental and/or social life.

Asadi-Lari and Gray (2005) undertook an evaluation on of 31 needs assessment tools. Only one of the tools identified by the report were specifically designed for people with ABI (Southampton Needs Assessment Questionnaire (SNAQ), (Kersten, McLellan, George, & Smith, 2000). The SNAQ focuses on a person's unmet rehabilitation needs. It is comprehensive covering; 1) the effect of disability on day-to-day life, 2) the household situation, 3) the medical condition and anticipated progression, 4) the employment, social activities, 5) the hobbies and recreation, 6) the care situation, 7) the services, disability organizations, 8) the home suitability, 9) the adaptations, 10) the general mobility, mobility – wheelchairs, equipment, mobility – outdoors, 11) the

community accessibility, 12) the finances, state of affairs, hypothetical increase of income, 13) and information about the disabled person's needs, and the carers' needs. The SNAQ is administered as a semi-structured interview with the person with ABI – the article does not state how it is administered if the person has aphasia. The authors state that the "Construct validity and internal reliability of the SNAQ was good"(Asadi-Lari & Gray, 2005, p.641). Inter-rater reliability tests are not conducted and test–retest are not formally tested. The SNAQ offers a quantitative or categorical output in regards to rehabilitation needs in many aspects of life. Soryal, Sloan, Skelton, & Pentland (1992) conducted a retrospective survey rehabilitation needs of 78 patients who had sustained spontaneous hemorrhagic brain injury and compared them with the findings of traumatically brain-injured patients managed in the same unit. Although there were some neuropsychological differences between the two groups, these were not reflected in the degree of dependence in activities of daily living (ADLs), which were remarkably similar. This supports the notion that the same rehabilitation needs questionnaire can be applied to people with TBI and other forms of ABI.

The SNAQ was considered to comprehensive and since no other instrument was found suitable it was decided to make a Rehabilitation Need Questionnaire (RNQ) based on the clinical work conducted at Høskoven.

3.4.9.2 Generation of items for the RNQ

The Rehabilitation Needs Questionnaire (RNQ) was designed to identify the needs of participants with ABI, inform goal setting, and direct program planning. Criteria that informed the construction of the RNQ were created. For usability in practice, the RNQ was required to:

1. Clarify rehabilitation needs that can addressed within music therapy practice with people with moderate to severe ABI
2. Be easily administered by staff, participants and their relatives
3. Have a set protocol for applicability across all ranges of ABI severity and residual impairments.
4. Be utilized in the research for establishing matched pairs of participants prior to randomization.
5. Correspond with researched practices and methods of music therapy in neurological rehabilitation
6. Generate data that can be analyzed quantitatively

To construct items for the RNQ, a content analysis (Ansdell & Pavlicevic, 2001) of music therapy logs from 52 participants who had received music therapy at Høskoven over a 5 year period (Sept. 2003 to Sept. 2008) was conducted. The search focused on rehabilitation needs addressed in the music therapy setting at Høskoven. Needs that were of similar nature and therefore often present in the same participant would be reduced into one item. E.g. rhythmic entrainment of left/right movement in; hands, arms, and legs was conjunct in one item. The

analysis resulted in 41 items that were then classified according to four rehabilitation need categories; 1. Physical (motor skills, body functions, and arousal), 2. Cognitive (organizing, memory, language, and logic thinking), 3. Psychological (emotions, self-perception and existential themes), and 4. Social needs (needs present in social contexts). The list was sent to eight Danish music therapists working within neurorehabilitation. At two meetings with the music therapists (09.01.2009 and 29.06, 2009) the items were discussed and revised. Based on feedback and in conjunction with the literature review, the items were reduced into 29 items. Considerations in the formulation of the 29 items included rewording to simplify the vocabulary for easy administration with participants, staff, and relatives. The process also meant adding a qualitative element by letting staff, relatives and participants formulate area of endurance and relaxation need. The four categories and items were crosschecked with the literature. 1. Physical needs; Reduction of tension and pain (Scheiby, 1999), facilitate relaxation, increase endurance, retrain fine motor skill in hands (Baker & Tamplin, 2006), retrain gross motor skills in the arms and/or legs (Jeong & Kim, 2007), retrain rhythm in walking, retrain balance (Thaut et al., 2007), retrain voice, retrain respiratory functions (Baker & Tamplin, 2006), readjust arousal, and overcome sleep difficulties (Scheiby, 1999). Cognitive needs; rehabilitation ADLs, increase concentration and attention, memory skills, and verbal communication skills (Baker & Tamplin, 2006). Psychological needs; emotional support (Magee & Davidson, 2002), adjustment to new life situation (Baker et al., 2005, Durham, 2002), stress coping, focus and verbalization of thoughts, increase in self-confidence and self-esteem, psychological issues from before injury, increase hopes of the future, work on existential and spiritual themes (Scheiby, 1999, Scheiby, 2002). Social needs; increase motivation to communicate with others, regain social competencies, increase the ability to empathize, increase initiative and drive, motivate participation in rehabilitation, and mobilize energy (Gilbertson, 2005). The crosscheck of the RNQ items with literature resulted in an awareness of rehabilitation needs that were not dealt with explicit in the RNQ. E.g. problem-solving, abstract thinking, self-monitoring, and managing behavior skills (F. Baker & Tamplin, 2006). The items were however included in the RNQ in terms more general. The main purpose of the RNQ was to guide the clinical practice implemented at Høskoven. To keep the RNQ manageable, rehabilitation need items that so far had not been met directly at Høskoven's music therapy practice, were not included.

3.4.9.3 Designing the RNQ

When conducting a needs assessment Asadi-Lari and Gray (2005) found four common methods of administering: 1) as a quantitatively structured questionnaire interview, 2) self-administered questionnaire, 3) community rapid appraisal, and 4) epidemiological rapid assessment. Based on the participants' cognitive skills, the RNQ was administered as a structured

interview for ABI persons and self-administered questionnaire for staff and relatives.

The previously defined categories and items were assembled in a questionnaire (Figure 9) where informants (staff, relatives and participants) could indicate the person with ABI's level of rehabilitation needs on a four point Likert scale: Large need (3), medium need(2), small need (1) or no need (0). The informant could also indicate 'don't know' if that was the case

The RNQ was administered together with the ICCS_Par or ICCS_SR on the four measurement (time) points in the trial. Data was written into Windows Excel for visual representation and statistical analyzed in SPSS.

Rehabilitation Need Questionnaire

Client:_____

Date:_____

Evaluated by:_____

With an X please evaluate the need for:	Large need	Medium need	Small need	No need	Don't know
PHYSICAL					
Reduction of tension and pain	3	2	1	0	?
Relaxation (of:_____)	3	2	1	0	?
Increase endurance (in :_____)	3	2	1	0	?
Retrain fine motor skill in hands	3	2	1	0	?
Retrain gross motor skills in the arms and/or legs	3	2	1	0	?
Retrain rhythm (in walking /or L-R arm movement)	3	2	1	0	?
Retrain balance	3	2	1	0	?
Retrain voice	3	2	1	0	?
Retrain respiratory functions	3	2	1	0	?
Modify arousal	3	2	1	0	?
Overcome sleep difficulties	3	2	1	0	?
COGNITIVE					
Organize normal daily living	3	2	1	0	?
Increase concentration and attention	3	2	1	0	?
Memory skills	3	2	1	0	?
Verbal communication skills	3	2	1	0	?
PSYCHOLOGICAL					
Emotional support	3	2	1	0	?
Adjustment to new life situation	3	2	1	0	?
Coping with stress	3	2	1	0	?
Focus and verbalize thoughts	3	2	1	0	?
Increase self-confidence and self-esteem	3	2	1	0	?
Psychological issues from before injury	3	2	1	0	?
Increase hope of the future	3	2	1	0	?
Work on existential and spiritual themes	3	2	1	0	?
SOCIAL					
Increase motivation to communicate with others	3	2	1	0	?
Regain social competencies	3	2	1	0	?
Increase the ability to empathize	3	2	1	0	?
Increase initiative and drive	3	2	1	0	?
Motivate participation in rehabilitation	3	2	1	0	?
Mobilize energy	3	2	1	0	?

Søren Hald - Aalborg University - Høskoven - 2009

Figure 9 Rehabilitation Needs Questionnaire

3.5 Sample size

The context of the study (The Activity Center and Training Group at Høskoven, Aarhus) determined the sample size for the study. Only 18 participants volunteered to participate in the study. Two other institutions (Tagdækkervej in Hammel, and Behandlingcenter Østerskoven in Hobro) were contacted to

increase the sample size, but both intuitions declined to participate. Of the 18 participants enrolled in the study, only eleven (n=11) were enrolled into the randomized part of study. Three of these participants left the randomized part of the study - two were hospitalized and one left the study due to personal issues. Consequently only eight (n=8) participants completed all measures in the RCT.

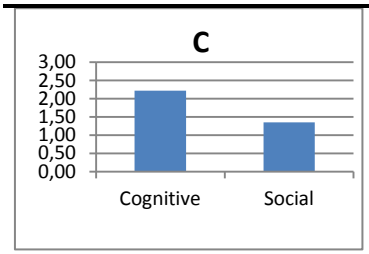
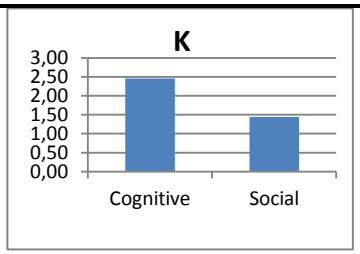
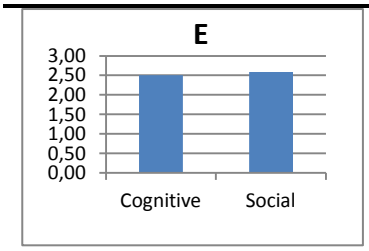
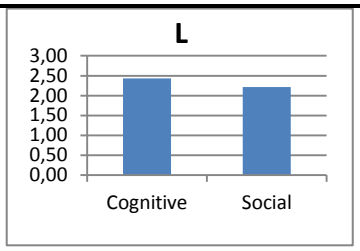
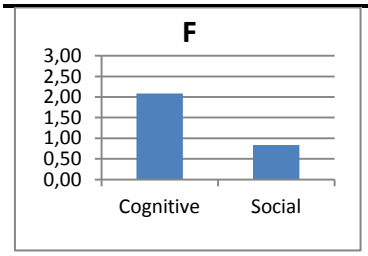
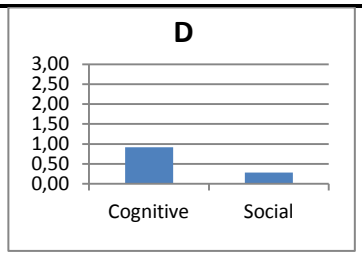
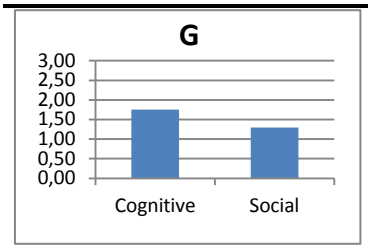
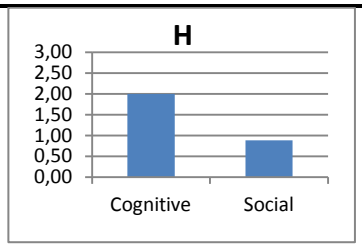
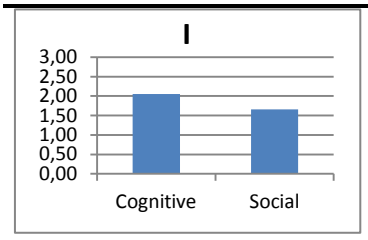
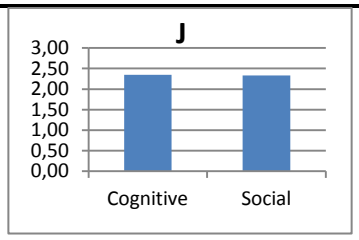
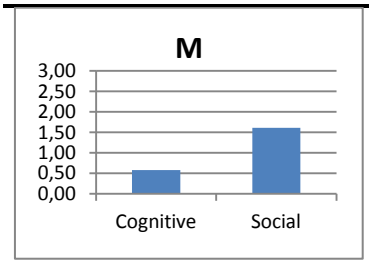
3.6 Randomization

The randomized allocation to interventions in this study was based on a matched pairs design (Robson, 2011) followed by a block allocation (Altman & Bland, 1999). The matched pairs design involves matching participants based on "some variable which is known to be related to the dependent variable on which observations are being collected in the experiment" (Robson, 2011, p.105). The number of persons in each matched pair is determined by the number of interventions tested; in this study, two interventions/participants. After the matching, each pair of participants was randomly assigned to different treatments based on a block allocation code. The block allocation procedure assures that each intervention group includes the same number of participants. The researcher constructed a random block allocation code to be used in this study. Based on lot drawing and the block allocation code, the pairs were split into Group I or II, Group I receiving treatment in sequence A-B, and Group II receiving treatment in the order B-A (A=MT+Std.rehab., B=Std.rehab.).

The dependent variable in this study was interpersonal communication competencies. The matching of participants was therefore based on the participants' social and cognitive rehabilitation needs, as rated by staff and relatives in the RNQ. The actual pairing of participants was performed in collaboration between the researchers Wigram and Ridder. The matched pairs are presented in column one in Table 21. The pairs were hereafter placed in five envelopes and randomly assigned numbers (lot drawing), which guided the block allocation. E.g. pair C,K got number four, which meant that they should be split up in the order one, two – C to Group I, K to Group II. The 11th participant was allocated based on coin-toss by Wigram.

Table 21 Matched pairs, randomization, and block allocation

Time point in procedure	1	2	3	Allocation	
	Matching participant pairs based on cognitive and social needs	Random number	Block allocation code	Grp. I	Grp. II

		4	1. one – two 2. two - one 3. two – one **4. <u>one - two</u>** 5. one – two Coin toss	C	K
		2	1. one – two **2. <u>two - one</u>** 3. two – one 4. one - two 5. one – two Coin toss	L	E
		3	1. one – two 2. two - one **3. <u>two – one</u>** 4. one - two 5. one – two Coin toss	D	F
		5	1. one – two 2. two - one 3. two – one 4. one - two **5. <u>one – two</u>** Coin toss	G	H
		1	**1. <u>one – two</u>** 2. two – one 3. two – one 4. one - two 5. one - two Coin toss	I	J
		Coin toss	1. one – two 2. two - one 3. two – one 4. one - two 5. one – two **<u>Coin toss</u>**	M	

3.7 Blinding

The two raters involved in rating the assessment exercises were blinded to intervention, participants' clinical history, and time point (pre/post music therapy). This was achieved by coding the video exercises with random numbers and letters.

3.8 Statistical methods

The statistical methods used in this study were selected based on the research questions and the data collected. Because statistical calculations rely on a range of presumptions, the "nature" of the data had to be clarified before any calculations could be made. The first part of this section analyzed the nature of the data in this study. Hereafter the statistical methods applied are presented.

In relation to research question 1-b (What is the effect of 20 music therapy sessions on interpersonal competencies in daily life?), data have been collected on four time points using the ICCS_SR and ICCS_Par. The recommended statistical method to analyze studies with repeated measurers is the analysis of variance (ANOVA) (Field, 2005). The ANOVA method is presented in Section 3.7.2. In relation to research question 1-a (What is the effect of 20 music therapy sessions on interpersonal competencies in musical improvisations?) and research question 1-d (What is the effect of 20 music therapy sessions on communicative musicality?), ICCS_MT, ICCS_MTP, ICCS_MusRat, and IAP data have been collected at two time points (pre and post music therapy intervention). The recommended statistical method to use in studies with two repeated measures is paired t-test (see 3.7.3). In relation to research question 1-c (Is there a correlation between interpersonal competencies in music and daily life?), Pearson's correlation "r" is calculated (see 3.7.4). In relation to research question 2-c (Is it feasible to construct a reliable rater tool on interpersonal communication competency in music, based on the ICCS?) and research question 3 (How can the Improvisation Assessment Profile be implemented as a reliable rater tool in measuring improvisational autonomy and communicative musicality?), the raters agreement on ICCS_MusRat and IAP ratings were assessed using Bland and Altman plots and Cohen's Kappa (Section 3.7.5). In order to answer research question 2-a-i (Does the ICCS staff/relative version reveal a "real world" construct?), a factor analysis is performed on the ICCS_SR (Section 3.7.6). In relation to research question 2-a (Is it feasible to construct a reliable staff/relative version of the ICCS?) and research question 2-b (Is it feasible to construct a reliable interpersonal communication competency in music questionnaires for music therapist and participant based on the ICCS?), the internal consistency in the newly developed ICCSs was calculated using Cronbach Alpha (Section 3.7.7).

In Table 22 the statistical hypotheses for this study are formulated. The hypotheses relate to the research questions (Section 2.8.2).

Table 22 Statistical hypotheses

1. What effect does music therapy have on interpersonal communication competencies in people with acquired brain injury?
a. What is the effect of 20 music therapy sessions on interpersonal competencies in musical improvisations? Null-hypothesis: There are no significant changes in the overall score (and sub-scales scores) on the ICCS_MT, ICCS_MTP, and ICCS_MusRat pre and post 20 music therapy sessions.
b. What is the effect of 20 music therapy sessions on interpersonal competencies in daily life? Null-hypothesis: There are no significant changes in the overall score (and sub-scales scores) on the ICCS_Par and ICCS_SR pre/post 20 music therapy sessions as compared to pre/post 25 weeks of standard rehabilitation.
c. Is there a correlation between interpersonal competencies in music and daily life? Directional-hypothesis: There is a positive correlation in the overall scores (and sub-scales scores) on the measurements of interpersonal communication competencies in music and everyday life (ICCS_Par, ICCS_SR, ICCS_MT, ICCS_MTP, and ICCS_MusRat) at time point one in the study.
d. What is the effect of 20 music therapy sessions on communicative musicality? Null-hypothesis: There are no significant changes in IAP autonomy scores (Rhythmic ground, Volume, Tonal/melodic, and Phrasing) in free improvisations pre/post 20 music therapy sessions.
2. How can revised versions of Rubin and Martins (1994) Interpersonal Communication Competence Scale (ICCS) reliably measure the participants' interpersonal communication competencies in both music and everyday life?
a. Is it feasible to construct a reliable staff/relative version of the ICCS? The hypothesis is that ICCS_SR items will be interrelated and interchangeable (Cronbach's coefficient alpha (α)=0.70 - 0.90), demonstrating internal consistency.
i. Does the ICCS staff/relative version reveal a "real world" construct? The hypothesis is that factor analyses reveal that the ICCS_SR items group into logical sub-groups
b. Is it feasible to construct a reliable questionnaire on interpersonal communication competency in music for music therapist and participant, based on the ICCS? The hypothesis is that ICCS_MT and ICCS_MTP items will be interrelated and interchangeable (Cronbach's coefficient alpha (α)=0.70 - 0.90), demonstrating internal consistency.

c. Is it feasible to construct a reliable rater tool on interpersonal communication competency in music, based on the ICCS? The hypothesis is that ICCS_MusRat items will be interrelated and interchangeable (Cronbach's coefficient alpha (α)=0.70 - 0.90), demonstrating internal consistency. In addition, the hypothesis is that the Cohen's kappa coefficient on the raters' agreement on the ICCS_MusRat is fair (K>.21).
3. How can the Improvisation Assessment Profile be implemented as a reliable rater-tool in measuring improvisational autonomy and communicative musicality? The hypothesis is that the Cohen's kappa coefficient on the raters' agreement on the IAP is fair (K>.21).

3.8.1 Nature of the data

The nature of the data determines which type of statistical calculations to use. All questionnaire data in this study are Likert scale type, normally classified as an ordinal scale type data. The ICCSs all have 30 items and a five-point scale (Almost always=5, Often=4, Sometimes=3, Seldom=2, Almost never=1). When responses to more than five (preferably eight) Likert items are summed, providing that all items use the same Likert scale and that the scale is a justifiable approximation to an interval scale, they may be treated as interval data. If the summed responses fulfill these assumptions, parametric statistical tests such as the analysis of variance can be applied (Carifio & Perla, 2007). Since the ICCS's total scores are all made up of more than 30 items, the statistical tests applied in this study were parametric. The subscales in the ICCSs are only made up of three items, which normally would hinder a parametric analysis according to Carifio and Perla (2007). However, in the ICCS_SR each participant subscale score is the mean of at least two staff/relatives evaluations. Each subscale score in the ICCS_SR is therefore based on at least six answers. This justifies applying a parametric analysis such as the ANOVA on the ICCS_SR subscales. Consequently, parametric analysis has been applied to the ICCS_SR subscale scores as well.

In this study the IAP rater scorings of autonomy were calculated using a five-point Likert scale (dependent =-2, follower=-1, partner=0, leader=1, and resister=2). The raters evaluate the participants' free improvisation every ten seconds on the Likert scale in four different musical parameters (Melodic/Tonal, Volume, Phrasing, and Rhythmic ground) (see Section 3.4.8 for details). The shortest improvisation in this study was 92 seconds (participant "I", post music therapy), which means that the IAP score is made up of nine Likert scale scorings – one every ten seconds. In addition, the score is calculated as the mean of the two raters' scorings. Therefore, parametric tests can and have been applied the IAP data as well.

3.8.1.1 Control of independent variables at pre-test

When comparing two interventions, (such as music therapy + standard rehabilitation vs. standard rehabilitation alone) the researcher ideally seeks to have two equal intervention groups in order to minimize the influence of independent variables such as age, gender, injury type and rehabilitation needs in the two groups (H. Lund & Røgind, 2004). Section 3.5 described how the participants were paired based on individual rehabilitation needs – a procedure implemented to even out differences between the two groups before the intervention was implemented. After randomization, the two intervention groups were assessed for similarities and differences. Unexpected changes in dependent variables during the trial period can be due to differences in independent variables. In order to control independent variables, a two-stage analysis was performed: 1. Levine's independent equality t-test determined whether the variance in the two groups was statistically significant; 2. An independent t-test determined whether the two groups means were statistically different. Two groups were controlled for equality on four demographic variables; age, gender, injury type, and music therapy history. Furthermore, an equality t-test analysis on scores from the Rehabilitation Needs Questionnaire (physical, cognitive, psychological, social needs, and total need) help determine if the two groups' rehabilitation needs pre first treatment were statistically different. ICCS_SR data was also analyzed for equality between groups.

3.8.1.2 Control of 'sequence effect' (and 'carry over') effect

Because of the study's AB-BA cross-over design, a range of statistical decisions were considered. This section will describe the analysis methods performed to control for 'sequence effect'. Before concluding on the effect of treatments (A vs. B), one has to evaluate whether the treatment sequence has influence on the effect of treatment – AB vs. BA. If there was a significant difference in the two groups' overall development though the study, it might be explained as a 'sequence effect' (or error I/II). Another issue to control for was a 'carry over effect' where the effect of first condition carries forward to the second condition - A to B or B to A (described in Section 3.1.1). According to Senn (2002, p52) "[…] no use can be made of cross-over differences (or for that matter period differences) for examining carry-over. […] any difference between cross-over differences within a group will be due to either random variation, patient by treatment interaction or patient by period interaction […]. Therefore comparing the differences within a given sequence tells us nothing about carry-over." Consequently the carry-over effect was only controlled with a 'wash out period'.

A paired samples t-test was used to asses for 'sequence effect' – looking at whether the AB sequence produces a significantly different result than the BA sequence. The effect of AB or BA treatment was found by subtracting the last measurements from first measurements in the two intervention groups. The t-test result indicates if the overall effects of both treatments are significantly different. If one group has significantly greater effects of treatments, it might be

due to sequence effect. In addition, the effect of the four treatments individually (Grp.I-A, Grp.I-B, Grp.II-A, and Grp.II-B) was compared pair-wise to detect if one of the groups had a greater effect of either A or B treatment. If one group had significantly different results from one treatment, order effects could be apparent.

3.8.2 Analysis of variance (ANOVA)

ANOVA is a procedure of comparing means in terms of variance with reference to a normal distribution. To test whether the effect of 20 music therapy sessions on interpersonal communication competences is significantly greater than standard rehabilitation alone, the analysis of variance (ANOVA) was applied the ICCS-SR data. Since ICC data from Staff and Relatives was collected at four time points, the repeated measure ANOVA test was used.

Repeated measures ANOVA is like the one-way ANOVA but for related groups, and is an extension of the paired t-test. The repeated measures ANOVA is also referred to as a within-subjects ANOVA or ANOVA for correlated samples (A. Lund & Lund, 2010). The repeated measures ANOVA tests and detects overall differences between related means. When using the ANOVA test the dependent variable needs to be continuous (interval or ratio) and the independent variable categorical (nominal or ordinal) (A. Lund & Lund, 2010). The analysis takes into account within participants correlation. This correlation is modeled by a so-called random effect giving each individual an unknown intercept score at baseline.

A Repeated Measures ANOVA can be applied to two types of study designs: 1) studies that focus on the changes in mean scores over three or more time points, or 2) studies that focus on the differences in mean scores in three or more conditions. The independent variable has categories called levels or related groups. Where measurements are repeated over time, such as when measuring changes in ICC due to music therapy or standard rehabilitation, the independent variable is time points in treatment. Each level is a specific time point/treatment. Hence, for this study, there are four time points. Table 23 is a schematic representation of the time-course in the repeated measures design in this study.

Table 23 Time course in collected repeated measures

Time point 1.	**Time point 2 Post MT and Std. rehab.**	**Time point 3 Pre Std. rehab. and MT**	**Time point 4 Post Std.rehab. and MT**
ICCS (SR and Par)	ICCS (SR and Par)	ICCS (SR and Par)	ICCS (SR and Par)
Grp. I Pre MT Grp. II Pre Std. rehab.	**Grp. I Post MT Grp. II Post Std. rehab.**	**Grp. I pre Std. rehab. Grp. II Pre MT**	**Grp. I Pre MT Grp. II pre Std. rehab.**

In the 'AB-BA' cross-over design, the two interventions (A=music therapy and B=Std.rehab.) are performed simultaneously and are crossed over to the other group after a wash-out period. Both groups thereby get the same two treatments but in opposite order. In order to perform an ANOVA the data have to be pooled based on treatment condition. This meant that all pre music therapy, all post music therapy, all pre Std.rehab., and all post Std.rehab. were pooled into four new categories based on treatment. Table 24 is a schematic representation of the restructured data.

Table 24 Restructured data in order to perform ANOVA analysis

Pre MT	Post MT	Pre St. rehab.	Post St. rehab.
ICCS (SR and Par)	ICCS (SR and Par)	ICCS (SR and Par)	ICCS (SR and Par)
Grp I time point 1 Grp II time point 3	Grp I time point 2 Grp II time point 4	Grp I time point 3 Grp II time point 1	Grp I time point 4 Grp II time point 2

The repeated measures ANOVA tests if there are significant differences between the population means. The null hypothesis (H_0) states that the means are equal. The alternative hypothesis (Ha) states that the related population means are not equal (at least one mean is significantly different to another mean).

For this study, the null hypothesis (H0) was that the participants' ICCS scores were the same after all treatments (pre music therapy, post music therapy, pre st.rehab., and post st.rehab.). The alternative hypothesis is that the participants' ICCS scores are significantly different after one or more treatments. A Repeated Measures ANOVA will not inform where the differences between treatments are (A. Lund & Lund, 2010). If the repeated measures ANOVA indicated that one measure (treatment) was significantly different from the others, a post-hoc test was used to identify between which treatments the differences occurred. In this study, a pairwise comparison with Bonferroni adjustment was used to detect which treatment could account for differences in scores (see Section 3.8.2.2).

With repeated measures ANOVA, there are two sources of variability: between treatments/groups variability (SSb) and within-group variability (SSw). The within-group variability (SSw) is also defined as the error variability (SSerror). The ANOVA adjusts for the number of groups and number of subjects (expressed as degrees of freedom) to compute two F ratios that relate to the variances of independent samples. Subsequently a division by the appropriate degrees of freedom, a mean sum of squares for between-groups (MSb) and within-groups (MSw) was determined and an F-statistic calculated as the ratio of MSb to MSw (or MSerror).

$$F = \frac{\text{MSb (conditions)}}{\text{MSerror}}$$

The F ratio is expected to be near 1.0 if the null hypothesis is true. In other words, the F ratio indicates how close the two groups' data are in measures, and if the F is 1.0, there is no difference between groups. The between groups F ratio (MSb) indicates the amount of overlap between the distributions in the two groups. When F is larger than one (F>1.0) the overlap is small. The main F ratio can be increased by a larger between-group difference and a smaller within-group difference. The ANOVA also calculates a p value. If the probability that the differences between the groups are due to sampling error is .05 or less ($p \leq .05$), then the null hypothesis is rejected.

Normally, the result of a Repeated Measures ANOVA is presented in the written text as F-statistic and reported as: F(dftime, dferror) = F value, p = p value. Since the statistical program used in this study (SPSS) reports the result of the repeated measures ANOVA in tabular form, I have decided to present the full data in this dissertation. This is done to give the reader an in-depth understanding of the results. Table 25 represents the type of table that will present the ANOVA calculations in the results chapter.

Table 25 Table used in presenting ANOVA results

		Sum of Squares	Degree of freedom (df)	Mean Square	F	Sig.
Measure	Between Groups	SSb	(conditions -1)	MSb	MSb / MSerror	P value
	Within Groups	SSerror	(participants – 1)	MSerror		

The F-statistic determines whether there was a significant difference between at least two means or not.

The major advantage of running a repeated measures ANOVA in comparison with an independent ANOVA is that the test is more powerful (A. Lund & Lund, 2010).

3.8.2.1 Sphericity Test

All ICCS_SR and ICCS_Par data were tested for compound symmetry using Mauchly's Test of Sphericity. The repeated measures ANOVA required 'compound symmetry' which is: (a) The variances of the dependent variable (ICCS_SR and ICCS_Par) must be the same at each measure point, (b) The correlation between the repeated measurements are equal, regardless of the time interval between measurements (A. Lund & Lund, 2010). These assumptions were in this study tested using Mauchly's Sphericity Test. The

violation of sphericity is problematic for repeated measures ANOVA, making the test too tolerant and thereby increasing the type 1 error rate (A. Lund & Lund, 2010). A value on Mauchly's Test of Sphericity of below 0.05 indicates that the assumption of sphericity is violated. When sphericity was violated the correctional adjustment called Greenhouse-Geisser was used in the following ANOVA calculations.

3.8.2.2 Bonferroni adjustment

If the repeated ANOVA test indicated a significant difference between one condition and the other conditions, all conditions were statistically compared two by two to detect the origin of the difference. However, when performing more than one statistical test in a particular study, the alpha (p value) level should be adjusted downward to counter type-one errors (when incorrectly declaring a difference/effect/relationship to be true due to chance). When performing more than one statistical test the chance of finding statistical significance due to chance fluctuation in the total experiment increases. Instead of adjusting the alpha/p-value, one can use Bonferroni adjustment in the calculation and keep an alpha of .05. Experiments on random numbers show that in five tests the chance of finding at least one difference or relationship significant equals 0.22 and in ten tests this chance increases to 0.40. When using the Bonferroni adjustment, the alpha level of each individual test is adjusted to ensure a p value of 0.05 (Field, 2005). In this study, the Bonferroni adjustment was used when comparing one treatment condition with the others (e.g. pre music therapy with post music therapy, pre std.rehab., and post std.rehab.). In the present study, the pairwise comparison with Bonferroni adjustment was performed even though the Repeated Measure ANOVA showed no significant difference. This was done in order to prepare statistical methods for future research with a lager N.

3.8.2.1 Effect size (in ANOVA and Paired t-tests)

Gold recommends researchers report effect sizes when conducting quantitative studies (B. Wheeler, et al., 2005). Effect size is a measure for the magnitude of a treatment effect. Unlike significance tests, the effect size indicators are independent of sample size. Effect size measures are used in meta-analysis studies and when conducting power analysis for studies.

The effect size recommended to report by Lund and Lund (2010) in repeated measure ANOVA is the partial eta-squared (the correlation ratio). The partial eta-squared is calculated by dividing sum of squares between groups with sum of squares between groups + sum of squares error (SSb/(SSb+SSerror). The problem with the eta-squared is that it does not tell anything about between which treatments the effect occurred.

The effect size reported when only comparing the effect of one intervention is Cohen's d. Cohen's d is calculated by dividing the difference in pre/post means with the standard deviation. In paired sample tests Cohen's d is adjusted with

the correlations in means (H. Lund & Røgind, 2004). Cohen (1988) cautiously defined effect sizes as "small if d=.2,", "medium if d=.5," and "large if d=.8", stating that "there is a certain risk inherent in offering conventional operational definitions for those terms for use in power analysis in as diverse a field of inquiry as behavioral science" (Cohen, 1988, p 25).

3.8.2.3 Proposed ANOVA analyses

In order to answer research question 1-b (What is the effect of 20 music therapy sessions on interpersonal competencies in daily life?) all measurements on ICC in daily life were subjected to a repeated measure ANOVA analysis.

The questionnaire data analyzed from all four time points were:

- ICCS_SR_* Staff and relative evaluation of ICC in daily life
  - * Dis Self disclosure
  - * Emp Empathy
  - * Soc Social relaxation
  - * Ass Assertiveness
  - * Alt Altercentrism
  - * Int Interaction management
  - * Exp Expressiveness
  - * Sup Supportiveness
  - * Imm Immediacy
  - * Env Environmental control
  - * Total Total score
- ICCS_Par_* Participant self evaluation of ICC in daily life

3.8.3 Paired t-test

In order to answer research question 1-a (What is the effect of 20 music therapy sessions on interpersonal competencies in musical improvisations?) a paired t-test was performed on all ICC in music measures in order to compare score means pre and post the music therapy intervention.

The t-test presents several values that are needed to interpret the results. The 'degree of freedom' represents the number of independent pieces of information that go into the estimate – normally the number of participants minus one. The t-value is a statistical representation of the difference between the compared means. If the t is positive, the first mean score is the largest. The t-test also gives a p value, which is a value of the significance of the null hypothesis.

3.8.3.1 Proposed paired t-tests

In this study, the blinded ratings of pre and post music therapy exercise were subjected to a paired sample t-test. The t-tested data comes from the ICCS_MusRat and IAP_Rater including tests on the subscales. In addition, the questionnaire data collected in connection with the musical exercises have been subjected to a pre-post music therapy paired t-test. The measurements were

ICCS_MT (Music therapist evaluation of participant after doing four improvisations) and ICCS_MTP (Participant self evaluation after doing four improvisations).

3.8.4 Correlation between Interpersonal Communication Competences in music and daily life

In order to answer research question 1-c (Is there a correlation between interpersonal competencies in music and daily life?) a Pearson's correlation analysis was performed on the participants' ICCS scores on music and daily life.

When performing a correlation test, one has to decide whether to perform a one-tailed or two-tailed test. Theory suggests that if the relationship between the correlated parameters is either positive or negative, one can choose to perform one-tailed analysis. The ICCS scores used in the study all increase when the participants have good competencies. Based on the theory reviewed in Chapter 1, which suggests a strong relationship exists between interpersonal communication competencies in music and everyday life. Therefore, one-tailed correlation statistic was used on the ICCS scores. All other correlation statistics performed in the study were performed using two-tailed statistics (not having any presumptions on whether the correlation is positive or negative).

3.8.4.1 Proposed correlation analysis

Research question 1-c asks if there is a correlation between interpersonal communication competencies in music and daily life. Therefore, all participant scores on ICC were subjected to a correlation analysis. The proposed correlation analysis within subjects on all subscales on the pre music therapy time point are listed below. The pre music therapy time point was chosen so as to have as little "interference" from the study as possible. The question/rationale behind each correlation analysis was explained in connection with the planned correlation.

- ICCS_ Staff Relatives vs. ICCS_ Musical Rater
  - Does staff and relatives' experience of the participants' interpersonal communication competencies in daily life correlate with the blinded raters' experience of the participant in the musical improvisations?
- ICCS Staff Relatives vs. ICCS Music Therapist
  - Does staff and relatives' experience of the participants' interpersonal communication competencies in daily life correlate with the experience of the music therapist performing the assessment right after improvising?
- ICCS Staff Relatives vs. ICCS Participant
  - Does the participant's experience of own communication competencies in daily life correlate with staff and relatives' experience of the participant in daily life.

- ICCS Staff Relatives vs. ICCS Music Therapy Participant
    - Does the staff and relatives' experience of the participant in everyday life correlate with the participant's own experience of communicating in music therapy?
- ICCS Music Therapy Participant vs. ICCS Musical Rater
    - Do participants and musical raters agree on the participants' interpersonal communication competencies in music?
- ICCS Music Therapy Participant vs. ICCS Music Therapist
    - Does the participants' experience of own competencies when improvising correlate with the music therapist performing the assessments' experience of the participant?
- ICCS Music Therapy Participant vs. ICCS Participant
    - Does the participants' experience of interpersonal communication competencies in music correlate with his or her experiences of interpersonal communication competencies in everyday life?
- ICCS Music Therapist vs. ICCS Musical Rater
    - Does the music therapist performing the assessments' experience of the participants correlate with the blinded raters?
- ICCS Music Therapist vs. ICCS Music Therapy Participant
    - Does the music therapist performing the assessments and the participants have the same experience of the participants' interpersonal communication competencies in music?
- ICCS Musical Rater vs. ICCS Participant
    - Does the participants' experience of own competencies in everyday life correlate with the music raters' experience of the participant improvising?

3.8.5 Rater limits of agreement and inter-rater reliability

In order to answer research question 2-c (is it feasible to construct a reliable rater tool on interpersonal communication competency in music, based on the ICCS?) and research question 3 (How can the Improvisation Assessment Profile be implemented as a reliable rater tool in measuring improvisational autonomy and communicative musicality?), the two blinded raters' level of agreement on the ICCS_MusRat and IAP ratings was calculated. Two methods have been chosen to evaluate rater agreement, the Bland and Altman plot and Cohen's Kappa. The Bland and Altman plot is used to assess how well two raters agree on a quantitative variable and whether their differences tend to change with the size of the measurements (Lund and Røgind, 2004). If the differences in raters' scores are within the range of acceptable differences, it can be concluded that the two raters agree well enough. The other measure of rater agreement is Cohen's Kappa which is generally thought to be a more robust measure on agreement since it takes into account the agreement occurring by chance (H. Lund & Røgind, 2004).

3.8.5.1 Bland & Altman

The Bland and Altman plot can be used to assess inter-rater reliability if differences between the ratings are normally distributed (Lund and Røgind, 2004). The x-axis in the Bland and Altman plot is constructed by taking the mean of the two raters' scores (Rater 1 + Rater 2) / 2. The Y-axis is the difference between the raters' scores (Rater 1 – Rater 2). If the differences are normally distributed, 95% of differences in ratings should lie within ± 2 x standard deviation of difference. If the differences in ratings are distributed randomly, there is no indication of one rater increasing scores more than the other. If the differences in ratings are distributed in a systematical figure (diagonal, banana, trumpet, cigar) it is an indication of the raters' scores changing in correlation with the magnitude of scoring (H. Lund & Røgind, 2004).

3.8.5.2 Cohen's Kappa

Cohen's kappa coefficient is a statistical measure of inter-rater agreement. The method is a more robust measure than the Pearson r since it takes into account the agreement occurring by chance. The Kappa is always less than or equal to 1. A value of 1 implies a perfect agreement and values less than 1 imply less than perfect agreement. In very rare situations, the Kappa can be negative. This happens when the two observers correlate less than would be expected just by chance (H. Lund & Røgind, 2004). The rule of thumb for interpreting agreement on the Kappa coefficient is: slight (K=0–0.2), fair (K=0.21–0.40), moderate (K=0.41–0.60), substantial (K=0.61–0.80), and almost perfect (K=0.81–1) (H. Lund & Røgind, 2004). Kappa does not take into account the degree of disagreement between observers, and all disagreement is treated equally as total disagreement. When the two ratings differ by a small amount on an ordered scale it should be considered a "lesser disagreement" than two scores that are far apart. In order not to count the "lesser disagreements" as misses, one can chose to calculate a weighted Kappa. Since the SPSS program is not able to calculate weighted Kappa, the statistical program "MedCalc" was used for these calculations. The weighting in the Kappa can be either linear or quadratic. When there are five categories, the weighting in the linear set is 1, 0.75, 0.50, 0.25 and 0. In the quadratic set, the weighting is 1, 0.937, 0.750, 0.437 and 0. In this study, the quadratic weighted Kappa has been chosen because the difference between scores should be weighted proportionally, and according to Maclure et al (1987), the quadratic approach is most common.

3.8.6 Factor analysis

The study has administered five newly developed, rephrased or translated questionnaires (the ICCS's) in evaluating the effect of music therapy on interpersonal communication competences in music and everyday life. The purpose of a factor analysis in this study is to discover patterns in the pattern of relationships among the ICCS items. A factor analysis seeks to discover whether the items can be explained largely or entirely in terms of a much smaller

number of variables called factors. The ICCS questionnaires already have "factors" in terms of sub-groups. Beside revealing whether the ICCS items group into logical factors, the factor analysis was also conducted to compare the ten subscales constructed by Rubin and Martin (1994) with the extracted factors from the ICCS_SR. This was done in order to answer research question 2- ai (Does the ICCS staff/relative version reveal a "real world" construct?). If the ICCS_SR questionnaire items group into subscales similar to the ones constructed by Rubin and Martin (1994), it is reasonable to conclude that the ICCS reveal a "real world" construct. Due to the small number of cases in the ICCSs (filled in questionnaires), only the ICCS_SR have been subjected to a factor analysis

3.8.6.1 Factor calculations

When doing a factor analysis there is a range of precautions to take, for example the sample size. Field (2005) recommend a sample size of over 300 cases when doing a factor analysis. Costello and Osborne (2005) have made a summary of sample sizes used in Explorative Factor Analysis, published in two years of PsychINFO articles (N=303). They investigated the subject (case) to item ratio in current practice. In their survey (40.5%) of the researchers performed analyses with subject to item ratios of 5:1 or less. In Table 26 the result of the survey by Costello and Osborne (2005, p.5) is presented

Table 26 Current Practice in Factor Analysis

Subject to item ratio	% of studies	Cumulative %
2:1 or less	14.7%	14.7%
> 2:1, ≤ 5:1	25.8%	40.5%
> 5:1, ≤ 10:1	22.7%	63.2%
> 10:1, ≤ 20:1	15.4%	78.6%
> 20:1, ≤ 100:1	18.4%	97.0%
> 100:1	3.0%	100.0%

In order to reach a sufficiently high subject (case) to item ratio, ICCS_SR data from all time points and all participants has been used in the factor analysis.

The first step in performing a factor analysis is deciding on an extraction model. According to (Costello & Osborne, 2005) one should not use the 'principal component analysis' method (which is the SPSS default choice) since it is only a data reduction method and it does not discriminate between shared and unique variance. Field (2005) states that the 'principal component analysis' and the 'factor analysis' often yield similar results. When choosing a factor analysis method one should "eye-ball" the data. If the data is generally normally distributed one is to use the 'maximum likelihood' approach, if data significantly non-normally distributed one is to use the 'principal axis factor' (Costello & Osborne, 2005).

The statistical software SPSS gives three outputs (the R-matrix, the Kaiser-Meyer-Olkin measure, and the Bartlett's test of sphericity measure) that are used in deciding whether a factor analysis is appropriate to run.

The R-matrix result is a Pearson correlation coefficient between the thirty questionnaire items and a significance score on their correlation. If any variables (items) have a majority of correlation significance greater than 0.05 and correlation coefficients greater than 0.9, the problem of singularity (the item is not well-defined or not well-behaved) can occur and the variables (items) causing the problem should be examined or eliminated (Field, 2005). Since the ICCSs have 30 items, the "majority" is in this study defined as more than 15 incidents of correlations with a significance greater than .05. The R-matrix also calculates a score on multicollinearity (where variables are highly correlated), which can also be problematic when conducting a factor analysis. If the determinant is smaller than the necessary value of 0,00001 (Field, 2005), multicollinearity is likely to appear.

If the R-matrix gives no reason not to perform the factor analysis, the second SPSS outcome, used in deciding if the factor analysis is appropriate to run, is the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy. The KMO calculates a score between 1 and 0. A score close to one indicate that the pattern of correlation is fairly compact, whereas a score near 0 indicate diffusion in the pattern of correlation. If there is diffusion in the pattern of correlation, a factor analysis is likely to be unsuitable (Field, 2005).

SPSS also calculates a value of Bartlett's test of sphericity, which tests the null hypothesis that the correlation from the R-matrix is an identity matrix. If the R-matrix were an identity matrix, all item correlations would be zero. For the factor analysis to be meaningful, there has to be some relationship between the variables. A significant Bartlett test informs us that the R-matrix is not an identity matrix (Field, 2005).

If the R-matrix, Kaiser-Meyer-Olkin measure, and the Bartlett's test of sphericity measure indicate that the dataset is suitable for a factor analysis, the first step in extracting factors is determining the 'eigenvalues' associated with each linear component (eigenvector) in the R-matrix (Field, 2005). The number of factors to extract can either be determined by the Kaiser's criterion or the 'scree test'. The 'scree test' involves examining a graph of the eigenvalues; where there is a natural break in the curve, the number of factors above the breaking point indicates the number of factors to extract. The Kaiser criterion is a criterion that specifies that only factors with an eigenvalue greater than one are to be extracted. The Kaiser's criterion is only useful if there are less than 30 variables (items) and average communalities after extraction are greater than 0.7, or when sample size exceeds 250 cases (Field, 2005).

Besides deciding on the number of factors to extract, one has to decide on the method of rotation (factor extraction). The purpose of rotation is to simplify and clarify the data structure by equalizing the factors' relative importance (Field, 2005). The SPSS software offers five methods which basically cover two types of rotation; orthongonal (varimax) – when one believes that the factors are theoretically independent, and oblique (direct oblimin) – when one believes that the factors are related to each other (Field, 2005). In this study there is a theoretical overlap in definitions of the subscales (and therefore also factors), therefore the oblique method has been applied. When conducting an oblique rotation it is possible to manipulate how well the factors are "allowed" to correlate. This is carried out by changing the delta and Kappa. But since"[…] we could not even find any explanation of when, why, or what one should change the Kappa or delta settings" (Costello & Osborne, 2005, p.3), I have decided to use the default settings of delta (0) and Kappa (4). To ease interpretation one can chose to suppress item loadings below a given size – normally 0.3 (Costello & Osborne, 2005). But since this study only has a small number of cases, the loadings limit has been set at .245.

The factor analysis discloses two matrixes to interpret; the 'pattern matrix', which reveals the factor/item loadings, and the 'factor correlation matrix', which reveals the correlation between the factors. The next step in the factor analysis is to "eye-ball" which items load onto the same factor, in order to identify common themes in the items. If the factors extracted represent some real-world construct then common themes in the item with high loadings can help explain what that construct might be. In addition, the factor extracted can be compared with the subscales constructed by Rubin and Martin (1994) (factors).

3.8.7 Internal consistency in the ICCSs and RNQ

In order to answer research question 2-a,b,c (a. Is it feasible to construct a reliable staff /relative version of the ICCS?, b. Is it feasible to construct a reliable questionnaire on interpersonal communication competency in music for music therapist and participant based on the ICCS?, c. Is it feasible to construct a reliable rater tool on interpersonal communication competency in music, based on the ICCS?) an internal consistency test using Cronbach Alpha was performed on all new ICCSs (ICCS_Par, ICCS_SR, ICCS_MT, ICCS_MTP, ICCS_MusRat).

Cronbach's alpha is a function of the number of questionnaire items and the average inter-correlation among the items. If you increase the number of items, the Cronbach's alpha will increase. The Cronbach's alpha coefficient will generally increase as the inter-correlations among test items increase, and is therefore known as an internal consistency estimate of reliability of test scores (H. Lund & Røgind, 2004). When performing a Cronbach's alpha calculation the SPSS software gives several outputs worth noticing. First the overall Cronbach's

alpha and standardized alpha are reported. Secondly, the correlation between the item and the total score from the questionnaire – called the 'Corrected Item-total Correlation' – is worth noticing. In a reliable scale, all items should correlate with the total (Field, 2005). If correlation values are less than .3 the item may be dropped, though with bigger samples, smaller correlations are acceptable (Field, 2005). Another important value is the 'Alpha if Item is deleted', which is the overall value if the specific item was deleted. If the reliability of the scale increases substantially if an item is deleted, it is worth considering.

When interpreting the alpha, Table 27 is given as a guide for establishing a ranking (H. Lund & Røgind, 2004).

Table 27 Internal consistency rating when using Cronbach alpha

Cronbach's alpha	Internal consistency
$\alpha \geq .9$	Excellent
$.9 > \alpha \geq .8$	Good
$.8 > \alpha \geq .7$	Acceptable
$.7 > \alpha \geq .6$	Questionable
$.6 > \alpha \geq .5$	Poor
$.5 > \alpha$	Unacceptable

3.8.7.1 Performed Cronbach alpha tests

In order to answer research question 2-a,b,c, all newly developed questionnaires and rating tools have been subjected to a Cronbach alpha test – ICCS (SR, Par, MT, MTP, and MusRat) in order to determine internal consistency of the scale.

3.8.8 Computer programs

Data was entered into the researcher's personal laptop using the computer program Excel 2007 for windows. The statistical program PASW statistic 18/19 (SPSS) was used for all statistical analyses, which were performed in consultation with an experienced statistician (Søren Lundbye). In addition, the statistical program MedCalc version 12.2.1.0 was used for calculating Cohen's weighted Kappa. An online calculator has been used to calculate Cohen's weighted d (effect size) - http://www.cognitiveflexibility.org/effectsize/

3.9 Ethics

All participants have been informed about the project idea and purpose through a plain language statement. Information was given both orally and in writing, and concerns about and opposition to participation were respected

Participants could at any time, and without consequences for their further rehabilitation, withdraw from the project. Colleagues and participants were informed about my plans during the research process. Appendix 3 is a translation of the information letter and Appendix 2 is the Power Point presentations from the information meetings. All data that linked to the participants are coded and the participants are given pseudonym letters. In addition, the participants were informed that due to the low sample size their identity might revealed to people they know.

The study has been reported to the regional scientific ethics committee who notified the applicant that ethical approval was not required as the population were neither considered 'patients' nor were to be given a form of intervention considered bio-medical (Appendix 19). Therefore, the study was submitted for ethical approval from the Faculty of Humanities Research Ethics Board, and was approved post hoc (the board was first formed after the study had started) (Appendix 20). The study has also been submitted to the Danish data supervision (http://www.datatilsynet.dk/). Based on their approval, I am able to store video from the study for further analysis until December 1, 2016 (Appendix 18).

Professor Cheryl Dileo (Temple University) conducted a workshop on ethics at the PhD week, AAU, October 2008. Here we discussed different scenarios for including a control group in the study on acute injured participants. Scenario one was to establish a waiting list and let it serve as a control group. The ethical problem with this solution is that there was no waiting list for music therapy at Høskoven in 2009. Those assigned to the waiting list would receive a poorer rehabilitation service than normal. Excluding them from music therapy would be unethical because it was already a part of standard rehabilitation of acute injured persons at Høskoven. Due to the relatively long course therapy in the design, the newly brain injured people in scenario one would have to wait up to 5 months before starting music therapy. This is obviously an undesirable scenario given the fact that the earlier the rehabilitation starts, the better the results (Duncan, et al., 2005). Scenario two was to recruit subjects from another rehabilitation institution to serve as the control group. The staff, relatives, and residents would have to fill out two questionnaires before and after their rehabilitation stay. The ethical problem here is that the only "outcome" for residents, staff, and relatives of the control-institution would be extra work. Another practical issue is whether it is possible to find a parallel institution to Høskoven, with exactly the same participants, with comparable diagnoses and exactly the same symptoms, gender, age group, and staff composition. Early in the process, I contacted two parallel institutions with the hope that they would be control group. However, they both declined.

Chapter 4 - Results

This chapter presents the statistical analyses and results of this study. The results are calculated based on the data collected at Høskoven, Aarhus from November 2009 until February 2011. The first section introduces the terms and abbreviations used, followed by a control of similarities of independent variables in intervention groups at time point one. The next two sections present the results from the randomized controlled crossover study. First, the effect of standard rehabilitation and music therapy on interpersonal communication competencies in everyday life as scored by staff/relatives and participants. This is followed by a presentation of the results relating to the effects of music therapy on interpersonal communication competencies in the four musical exercises, as rated by the music therapist, the music therapy participant, and the two raters (including IAP-Autonomy). In order to test the theoretical framework of interpersonal communication competencies conveying from musical to everyday interactions, the results chapter concludes with a correlation analysis of the five ICCS measures on interpersonal communication competences in music and daily life at time point one in the study.

The last part of this chapter presents the results of testing the study's reliability and validity. First, blinded rater agreement on the two tools ICCS_MusRat and IAP_Aut is presented. Thereafter, a factor analysis of the ICCS_SR questionnaire is given in detail in order to test if the ICCS_SR reveals a real world construct. Finally, results of an internal consistency analysis (Cronbach alpha) on all the newly developed questionnaires (ICCS_SR, ICCS_Par, ICCS_MT, ICCS_MTP, ICCS_MusRat) are presented.

The study has a very small sample size, which reduced the power of the study and impacted on the statistical analyses. The effect size calculations should therefore be interpreted with caution (Section 4.2 and 4.3). In the correlation calculations on interpersonal communication competencies in music and everyday life (Section 4.4), the sample size was increased to 15, which increases the power of calculations. In the last sections of the chapter, where raters' agreement, ICCS_SR factors, and Cronbach alpha are presented, the sample size was sufficiently high.

4.1 Terms, abbreviations, and independent variables

The study has made use of five adapted versions of the Interpersonal Communication Competence Scale (ICCS) (Rubin & Martin, 1994). The ICCS questionnaire completed by staff and relatives on the participants' interpersonal communication competencies in everyday life has been abbreviated to ICCS_SR. The participant completed an ICCS questionnaire on interpersonal communication competencies in everyday life, which has been abbreviated to ICCS_Par. The music therapist evaluation of the participants ICC in music after

facilitating four improvisations exercise has been abbreviated to ICCS_MT. The participants' own evaluation of ICC in music after doing four improvisations exercise has been abbreviated to ICCS_MTP. The raters' version of the ICCS used to evaluate video recordings the four musical exercises has been abbreviated to ICCS_MuRat. The ten ICCS subscales have been abbreviated into three letter words based on the first three letters of the subscale name. The rehabilitation needs questionnaire has been abbreviated into RNQ. The improvisation assessment profile performed by the raters is abbreviated into IAP. The IAP subscales have been abbreviated into three or four letter words based on the name of subscale. Table 28 outlines the abbreviations used throughout the results and discussion sections schematically.

Table 28 Research tools abbreviations

Questionnaires	
RNQ_(SR)/(Par)	Staff /Relatives or Participant self evaluation of rehabilitation needs
ICCS_SR_*	Staff and relative evaluation of ICC in daily life
ICCS_Par_*	Participant self evaluation of ICC in daily life
ICCS_MT_*	Music therapist evaluation of the participants ICC in music after doing four improvisations exercise
ICCS_MTP_*	Participant self evaluation after doing four improvisations
ICCS_Par_*	Participant self evaluation of ICC in daily life
ICCS_MT_*	Music therapist evaluation of the participants ICC in music after doing four improvisations exercises
ICCS subscales	
Dis	Self disclosure
Emp	Empathy
Soc	Social relaxation
Ass	Assertiveness
Alt	Altercentrism
Int	Interaction management
Exp	Expressiveness
Sup	Supportiveness
Imm	Immediacy
Env	Environmental control
Total	Total score
Blinded rating tools	
ICCS_MuRat_*	Blinded rater evaluation of ICC based on the four musical exercises
IAP_*	Blinded rater evaluation of autonomy in improvisation
Ryth_Gr	Rhythmic ground
Phra	Phrasing
Ton_Mel	Tonal/Melodic
Volume	Volume
Dep	Dependent
Fol	Follower

Part	Partner
Lead	Leader
Res	Resister
Total	Total scores

4.1.2 Control of independent variables at time point one

To control independent variables, a comparison of similarities and differences between the two intervention groups in the randomized study (Group I and II) was performed at time point one (TP1). The calculations were performed with the intention to treat data, meaning that that all randomized participants were included even if they did not complete the study. Four independent variables from the demographic data were analyzed: age, gender, injury type, and music therapy history. Furthermore, scores from the four subscales in the RNQ (physical, cognitive, psychological, and social needs) were used to determine if the two groups were equal before the first intervention, in terms of their rehabilitation needs. The two groups' first scores on interpersonal communication competencies in everyday life were also compared. To test whether the groups were equivalent at TP1, RNQ scores were treated using a comparison of variance equality (Levene's test), and a comparison of means (t-test).

Differences in age between the two groups were tested using an equality t-test analysis (Levene's). The test determined that the variance in age in the two groups were not significantly different. The t-test for equality of means determined that the two groups' age means were not significantly different, though the participants in Group II were on average older. Table 29 presents means, standard deviations, and equality of age by groups.

Table 29 Means, standard deviations, and equality of age by groups

Group I n=6 30 to 60 years		Group II n=5 32 to 65 years		Levene's Test for Equality of Variances		t-test for Equality of Means		
Mean age	SD	Mean age	SD	F	Sig.	t	df	Sig. (2-tailed)
48.7	10.48	54.4	13.16	.207	.660	-.806	9	.441

An independent test of equality of variance on the participants' RNQ scores (scored by staff and relatives) indicated that the two groups had significantly different variance in physical (p=.003) and psychological (p=.039) needs (Table 30). The Levene's test showed no significant difference in variance in the two groups' social (p=.089) and cognitive needs (p=.971). Before randomizing, participants were paired based on cognitive and physical needs, which would explain why there were no differences in cognitive and social needs variance in the two groups. The t-test for equality of means indicates that the groups were

not statistically different in terms of rehabilitation needs. Group I and II's RNQ means, standard deviations and equality scores are presented in Table 30.

Table 30 RNQ means, std. deviaton and equality scores at time point one

	Group I (n=6)		Group II (n=5)		Levene's Test for Equality of Variances		t-test for Equality of Means		
	Mean	SD	Mean	SD	F	Sig.	t	Df	Sig.
RNQ_SR_PHY	1.32	.70	1.84	.221	16.538	.003	-1.571	9	.151
RNQ_SR_COG	1.85	.66	2.04	.66	.001	.971	-.481	9	.642
RNQ_SR_PSY	1.69	.34	1.85	.67	5.798	.039	-.519	9	.616
RNQ_SR_SOC	1.49	.46	1.50	.96	3.630	.089	-.024	9	.981
RNQ_SR_TOTAL	6.37	1.57	7.24	2.16	.922	.362	-.777	9	.457

RNQ= rehabilitation needs questionnaire, SR=staff/relatives, PHY=physical, COG=cognitive, PSY=Psychological, SOC= social

The gender distribution within each group was comparable. After the trial period, three females and one male from each group completed all measurements, resulting in a similar gender distribution. The participants' histories of music therapy in the two groups were not similar. At the commencement of the study, three participants in Group I had previously participated in group music therapy and three participants had had no experience with music therapy. In Group II all participants had previously participated in either group or individual music therapy. The participants' types of injuries appear randomly distributed even though there were no participants with hypoxic brain injury in Group I, and no one with other types of brain injuries in Group II. The two groups' gender, musical histories, and injury types are presented in Table 31.

Table 31 Gender, musical history, and injury type at time point one

	Gender		Musical history			Injury type			
	♀ n=6	♂ n=5	No MT history	Individual MT	Group MT	CB Hem	TBI	Hypoxic	Other
Group I (n=6)	50%	50%	50%	0%	50%	17%	33%	0%	50%
Group II (n=5)	60%	40%	0%	40%	60%	40%	20%	40%	0%

The two groups showed no statistical differences in variance or mean scores on interpersonal communication competencies (ICCS_SR). The test indicates that the two groups did not differ statistically in relation to rehabilitation needs and interpersonal communication competencies.

The statistical control of independent variables between intervention groups indicated significant difference in variance in physical and psychological rehabilitation needs. No other significant differences were found.

4.1.2.1 Uncontrolled events affecting variables post commencement of the study trial

Another independent variable that might have affected the results was that participant G acquired an additional brain injury during the wash-out period. The consequence was that participant G commenced new activities and consequently had new staff reporting on rehabilitation needs and interpersonal communication competencies. His rehabilitation needs scores increased considerably after his additional injury (pre Std.tr.) (Table 32), whereas his interpersonal communication competencies measured with ICCS_SR remained "steady" (See Table 33) at the measurement right after the injury. However, at the following (and last) measurement Mr. G's ICCS_SR scores vent considerably down.

Table 32 Staff and relatives scorings of participants G rehabilitation needs

RNQ Par G	SR PHY	SR COG	SR PSY	SR SOC	SR Total	Own PHY	Own COG	Own PSY	Own SOC	Own Total
Pre MT	1.00	1.75	1.25	1.29	5.29	.22	.0	.14	.40	.77
Post MT	.67	1.00	1.00	.56	3.22	.44	.67	.83	.80	2.74
Pre Std.rehab.	2.06	1.38	2.33	1.25	7.02	.91	1.00	1.38	1.00	4.28
Post Std.rehab.	2.67	2.29	2.86	2.17	9.98	.45	.25	.38	.67	1.75

RNQ= rehabilitation needs questionnaire, SR=staff/relatives, PHY=physical, COG=cognitive, PSY=Psychological, SOC= social

4.1.3 Control of sequence effect

A 'sequence effect' analysis was performed on staff/relatives evaluation of ICC (ICCS_SR) in order to evaluate whether the treatment sequence had an influence on the effect of treatment – AB vs. BA. If there is a significant difference in the two groups' overall development though the study, it might be explained as a 'sequence effect'. A paired samples t-test was used to asses for a 'sequence effect' – seeing if the AB sequence produces a significantly different result than the BA sequence. In addition, the effect of the four treatments individually (Grp.I-A, Grp.I-B, Grp.II-A, and Grp.II-B) were compared pair-wise to detect if one of the groups had a greater effect of either A or B treatment.

The analysis of 'sequence effect' on the ICCS_SR data revealed no significant interaction. A paired samples t-test on the AB sequence (M=-4.28, SD=10.42) compared with the BA sequence (M=-1.27, SD=2.60) showed no statistically significant difference (t(3)=-.727, p=.520). A pair-wise comparison with Bonferonni adjustment of individual treatment effect showed no statistically significant differences either. Group I's effect of music therapy (M=-4.43,

SD=4.30) was compared with Group II's effect of music therapy (M=-.58, SD=2.80). Group I's effect of Std.rehab. (M=1.71, SD=14.68) was compared with Group II's effect of Std.rehab. (M=-3.06, SD=6.68).

These results suggest that the order of intervention did not influence the effect of treatment measured with the ICCS_SR.

4.2 Main result on interpersonal communication competencies in daily life

One major aim of the study was to investigate whether 20 music therapy sessions had an effect on interpersonal communication competencies (ICC) in everyday life. Two questionnaires were used to collect data on the participants' everyday life ICC. Staff and relatives completed one questionnaire, and one questionnaire was completed by the participants. Because each participant had four repeated measurements (pre/post music therapy, and pre/post Std.rehab.), a repeated measure analysis of variance (ANOVA) was used. In the pair-wise comparison, the Bonferroni adjustment was used (see Section 3.7.2).

4.2.1 Results on ICCS_SR (staff and relatives' scoring)

The results of staff and relatives' four evaluations of the participants' interpersonal communication competencies in everyday life, using the ICCS_SR, are presented in Table 33. Column one lists the participants, column two details the time point of measurement, and column three lists the treatment they were undergoing. The remaining columns are the ICCS subscales scores and ICCS total score. Each subscale score ranges from 3 to 15, with the total scores ranging from 30 to 150.

Table 33 Staff and relatives' scorings of participants using the ICCS_SR

Par	T	Treatment	Dis	Emp	Soc	Ass	Alt	Int	Exp	Sup	Imm	Env	Total
C	1	pre MT	10.0	7.0	11.0	10.3	7.0	7.7	9.7	11.0	12.7	8.7	95.0
C	2	post MT	11.0	6.7	10.7	9.3	8.0	8.3	10.3	10.7	12.7	9.7	97.3
C	3	pre std.rehab.	10.3	7.0	10.3	8.3	8.7	8.3	9.7	12.0	12.3	7.3	94.3
C	4	post std.rehab.	9.7	10.0	12.0	8.0	9.3	9.0	10.7	12.7	12.3	8.3	102.0
D	3	pre MT	10.0	10.7	12.3	7.7	10.3	9.7	10.0	12.7	12.0	8.3	103.7
D	4	post MT	10.5	10.0	12.0	8.0	8.5	11.0	10.0	12.5	13.0	10.0	105.5
D	1	pre std.rehab.	10.0	10.3	12.7	8.0	8.7	11.0	11.0	13.3	10.7	9.3	105.0
D	2	post std.rehab.	9.0	9.7	12.7	7.0	9.0	10.3	11.0	11.3	11.0	8.7	99.7
E	3	pre MT	7.0	7.5	9.5	9.0	9.0	9.5	9.5	9.5	9.5	9.5	89.5
E	4	post MT	8.7	7.7	9.7	9.7	9.0	8.3	8.3	8.3	8.3	8.7	86.7
E	1	pre std.rehab.	7.5	7.5	10.0	7.0	8.5	9.5	9.0	10.0	8.5	10.0	87.5
E	2	post std.rehab.	8.0	7.0	12.5	9.0	10.0	10.0	12.0	9.5	11.0	9.5	98.5
G	1	pre MT	8.3	10.3	10.0	7.7	8.3	11.0	9.7	10.3	8.0	9.3	93.0
G	2	post MT	9.3	12.0	12.0	9.3	8.0	10.7	11.3	12.0	9.7	9.0	103.3
G	3	pre std.rehab.	9.5	12.5	11.5	7.5	8.0	12.0	12.0	12.0	11.0	9.0	105.0
G	4	post std.rehab.	7.0	8.0	10.0	7.0	7.5	9.5	9.0	10.0	8.0	7.5	83.5
I	1	pre MT	12.2	9.6	11.0	12.2	9.8	7.8	10.0	11.6	9.4	7.8	101.4

I	2	post MT	11.2	8.2	12.2	12.4	9.6	8.8	9.8	10.8	9.8	9.0	101.8
I	3	pre std.rehab.	12.3	7.5	12.3	13.0	10.8	8.8	11.3	9.8	12.3	8.3	106.0
I	4	post std.rehab.	13.3	9.0	13.0	13.7	11.7	10.7	10.3	13.0	13.0	9.3	117.0
J	3	pre MT	7.5	8.5	7.5	11.0	9.3	11.5	12.3	9.5	9.3	8.8	95.0
J	4	post MT	9.0	8.0	9.0	10.3	8.3	10.3	11.0	10.3	11.7	10.7	98.7
J	1	pre std.rehab.	8.4	7.4	8.4	8.4	8.6	9.8	12.2	10.4	10.8	9.2	93.6
J	2	post std.rehab.	7.8	6.3	7.0	10.5	9.0	11.0	12.8	10.5	11.0	10.8	96.5
K	3	pre MT	9.0	7.7	10.7	8.0	9.7	10.3	13.0	8.7	9.7	9.7	96.3
K	4	post MT	10.5	7.5	10.0	9.5	9.5	9.0	12.0	9.0	9.0	10.0	96.0
K	1	pre std.rehab.	10.0	8.3	9.3	8.0	9.7	9.7	12.0	9.7	9.3	9.7	95.7
K	2	post std.rehab.	11.3	7.7	12.3	8.7	9.7	8.7	12.3	9.7	9.7	9.3	99.3
M	1	pre MT	7.7	9.3	7.0	8.0	7.0	9.0	11.3	10.3	11.0	10.0	90.7
M	2	post MT	9.0	8.7	7.7	8.3	7.0	10.3	12.3	12.0	10.0	10.0	95.3
M	3	pre std.rehab.	9.0	9.3	8.0	9.0	7.3	9.0	11.3	13.0	12.0	10.7	98.7
M	4	post std.rehab.	8.0	9.7	7.7	8.0	7.7	8.3	11.3	12.7	11.3	10.0	94.7

Par=participant, T=time point, DIS=self-disclosure, EMP=empathy, SOC=social relaxation, ASS=assertiveness, ALT= alter centrism, INT= interaction management, EXP= expressiveness, SUP=supportiveness, IMM=immediacy, ENV=environmental control

Group I and Group II's ICCS_SR mean scores at the four time points are presented in Figure 10. The diagram indicates that Group I increased interpersonal communication competencies from TP1 (pre MT; M=95.02, SD=4.60) to time point two (TP2, post MT; M=99.45, SD=3.74) and the increased competency was sustained at time point three (TP3) (pre std. rehab.; M=101, SD=5.50). During the standard rehabilitation condition, Group I's ICCS_SR scores decreased at time point four (TP4, post Std.rehab.; M=99.29, SD=14.04). Group II's ICCS_SR mean scores increased from TP1 (pre std. rehab.; M=95.44, SD=7.25) to TP2 (post std.treat; M=98.50, SD=1.42), then decreased at TP3 (Pre MT; M=96.13, SD=5.83) and then has a slight increase at TP4 (Post MT; M=96.71, SD=7.79).

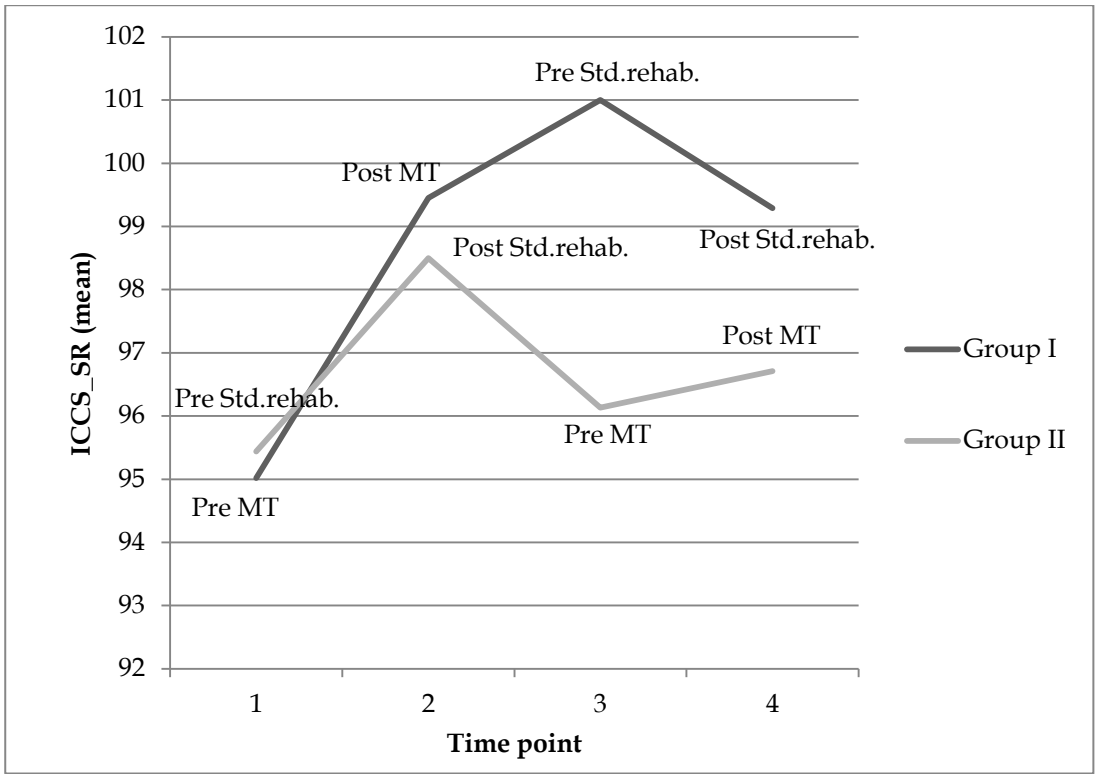


Figure 10 Line diagram of Group ICCS_SR scores based on time points

To enable an ANOVA calculation to be performed, the ICCS_SR data were pooled and grouped by treatment condition. This meant that all pre music therapy, all post music therapy, all pre Std.rehab. and all post Std.rehab. data were pooled into four new categories based on treatment. The descriptive statistics (Mean and Std. Deviation) on the four ICCS_SR treatment categories are presented in Table 34.

Table 34 Descriptive statistics on ICCS_SR

	Mean	Std. Deviation	N
Pre MT - ICCS_SR total score	95.57	4.903	8
Post MT - ICCS_ SR total score	98.08	5.850	8
Post std.tr. – ICCS_ SR total score	98.22	6.661	8
Post std.tr. – ICCS_SR total score	98.90	9.250	8

Pooled data for Groups I and II, ICCS_SR = interpersonal communication competence scale staff and relatives evaluation

The Mauchly's test of sphericity on the ICCS_SR dataset gives an approximate chi-square value of 18.562 and an associated *p*-value of .003. Consequently, it cannot be assumed that sphericity is not violated and the ANOVA calculations have to be adjusted. The Greenhouse-Geisser was used to correct the degrees of freedom for the *F*-distribution. The results from Mauchly's test of sphericity are presented in Table 35.

Table 35 Mauchly's test of sphericity on ICCS_SR

Within Subjects Effect	Approx. Chi-Square	df	Sig.	Greenhouse-Geisser
Treatment	18.565	5	.003	.416

Pooled data for groups I and II

A repeated measures ANOVA with Greenhouse-Geisser correction determined that the mean scores of interpersonal communication competences in everyday life, as measured by staff and relatives, were not significantly different between treatments (F(1.249, 8.74)=.587, P=0.5). The results of the ANOVA are presented in Table 36. The within-subjects partial eta-squared effect size for the ICCS_SR was .630.

The results from the repeated measures ANOVA on the ICCS_SR total scores indicate that none of the treatments stood out as having a statistically different effect. In relation to research question 1-b (What is the effect of 20 music therapy sessions on interpersonal competencies in daily life?) the result indicate that 20 music therapy sessions have no significant effect on interpersonal communication competencies in daily life.

Table 36 ANOVA tests of within-subjects effects (ICCS_SR)

Source		Sum of Squares	df	Mean Square	F	Sig.
Treatment	Sphericity Assumed	51.025	3	17.008	.587	.630
	Greenhouse-Geisser	51.025	1.249	40.858	.587	.500
Error(factor1)	Sphericity Assumed	608.179	21	28.961		
	Greenhouse-Geisser	608.179	8.742	69.570		

Pooled data for Groups I and II

A post hoc pairwise comparison with Bonferroni adjustment revealed a slight increase in interpersonal communication competencies from pre music therapy to post music therapy (95,57 ± 4,9 vs. 98,07 ± 4,85, respectively), which was not statistically significant (p=.690). No other interactions between treatments were detected, as shown in Table 37.

The effect size for the ICCS_SR_total pre-post music therapy was *d*=-.653. The Cohen's d effect size pre-post standard rehabilitation was *d*=-.063. The effect size values indicate that music therapy had a "medium" positive effect on interpersonal communication competencies in everyday life. If the sample size had been larger, the p-value in the pairwise comparison might have shown that the effect of music therapy was not by chance.

Table 37 Pairwise comparison with Bonferroni adjustment on ICCS_SR

(I)Treatment	(J) Treatment	Mean Difference (I-J)	Std. Error	Sig.
Pre MT	Post MT	-2.508	1.394	.690
	Pre std.rehab.	-2.650	1.801	1.000
	Post std.rehab.	-3.325	2.733	1.000
Post MT	Pre MT	2.508	1.394	.690
	Pre std.rehab.	-.142	1.095	1.000
	Post std.rehab.	-.817	3.853	1.000
Pre std.rehab.	Pre MT	2.650	1.801	1.000
	Post MT	.142	1.095	1.000
	Post std.rehab.	-.675	3.840	1.000
Post std.rehab.	Pre MT	3.325	2.733	1.000
	Post MT	.817	3.853	1.000
	Pre std.rehab.	.675	3.840	1.000

Pooled data for Groups I and II, ICCS_SR=interpersonal communication competence scale staff and relatives evaluation

The next section presents the ANOVA analyses of the ICCS_SR subscale scores.

4.2.2 Results on ICCS_SR sub-groups

The ten ICCS_SR subscales have been subjected to an ANOVA to detect whether 20 music therapy sessions or 25 weeks of standard rehabilitation have a significant effect on any of the interpersonal communication competence scale subscales. Since all measurements were based on a summation of three ICCS items and ratings from two or more staff and relatives, the sub-group scores were treated as parametric data (see Section 3.8.1).

The Mauchly's test of sphericity indicates that sphericity is violated in two of the subscale scores; Empathy (p=.006) and Social relaxation (p=.034). A Greenhous-Geisser correction was therefore used on those two ANOVA calculations.

The repeated measures ANOVA with Greenhouse-Geisser correction on ICCS_SR_EMP and ICCS_SR_SOC determined that interpersonal communication competences in everyday life as measured by staff and relatives were not significantly different between treatments on those two subscales.

- ICCS_SR_EMP F(1.42, 9.92)=.218, p=.733 Partial eta-squared ES .030
- ICCS_SR_SOC F(1.38, 9.68)=1.762, p=.221 Partial eta-squared ES .201

The repeated measures ANOVA on the eight remaining subscales indicate that none of the ICCS_SR subscales scores differed significantly.

- ICCS_SR_DIS F(3,21)=2.461, p=.091 Partial eta-squared ES .260
- ICCS_SR_ASS F(3,21)=1.895, p=.161 Partial eta-squared ES .213
- ICCS_SR_INT F(3,21)=.081, p=.970 Partial eta-squared ES .011

- ICCS_SR_ALT F(3,21)=1.968, p=.150 Partial eta-squared ES .219
- ICCS_SR_EXP F(3,21)=.679, p=.575 Partial eta-squared ES .088
- ICCS_SR_SUP F(3,21)=1.460, p=.254 Partial eta-squared ES .173
- ICCS_SR_IMM F(3,21)=.728, p=.546 Partial eta-squared ES .094
- ICCS_SR_ENV F(3,21)=1.089, p=.375 Partial eta-squared ES .135

The results from the repeated measures ANOVA on the ten ICCS_SR subscales indicate that none of the treatments stood out as statistically different. In relation to research question 1-b (What is the effect of 20 music therapy sessions on interpersonal competencies in daily life?) the results indicate that 20 music therapy sessions have no statistical significant effect on any subscales of interpersonal communication competencies in daily life as compared to standard rehabilitation alone.

A post-hoc pairwise comparison with Bonferroni adjustment revealed a slight increase in interpersonal communication competencies from pre music therapy to post music therapy on the ICCS_SR subscales Self-disclosure (8.96 ± 1.72 vs.9.9 ±1.01 (p=.111)) and Environmental control (9.01 ± 0.7429 vs. 9.63 ± 0.677 (p=.707)). On the scores from pre/post standard rehabilitation, the scores on the subscale Altercentrism increased (8.77 ± 1.04 vs. 9.23 ± 1.32, (p=.406)). None of the movements were statistically significant. If the sample size had been larger, the results on the Self-disclosure subscale and the Environmental control subscale might have been significant. However, as for now these results support the previously written answer to research question 1-b that 20 music therapy sessions seems to have no statistical significant effect on interpersonal communication competencies in daily life.

The effect sizes (Cohen's d) on the ICCS_SR subscales pre/post music therapy were; Self-disclosure d=-1.447, Empathy d=0.282, Social relaxation d=-0.550, Assertiveness d=-0.447, Altercentrism d= 0.422, Interaction management d=-0.037, Expressiveness d=0.033, Supportiveness d=-0.241, Immediacy d=-0.258, and Environmental control d=-0.631. The results indicate that music therapy had a large (positive) effect on self-disclosure competencies in the participants. The effect size values on the two subscales Social relaxation and Environmental control indicate a medium (positive) effect of music therapy on those competencies. The effect sizes on the remaining seven competency subscales reveal a small or no (both positive and negative) effect of music therapy.

The effect sizes (Cohen's d) on the ICCS_SR subscales pre/post standard rehabilitation were; Self-disclosure d=.338, Empathy d=.155, Social relaxation d=-0.370, Assertiveness d=-0.272, Altercentrism d=-0.865, Interaction management d=.049, Expressiveness d=-0.071, Supportiveness d=.062, Immediacy d=-0.037, and Environmental control d=.004. The results indicate that standard rehabilitation had a large effect on Altercentrism competencies

and a small or no effect (both positive and negative) on the remaining nine competency subscales.

4.2.3 Results on ICCS_Par (participant's own scoring)

Research question 1-b asks if 20 music therapy sessions have an effect on interpersonal communication in everyday life. Repeated measures analysis of variance (ANOVA) with Bonferroni adjustment and a pairwise comparison were used to detect if the effect was significant. The results of participant's four evaluations of own interpersonal communication competencies in everyday life (measured with the ICCS_Par) are presented in Table 38. Column one in Table 38 lists the participants, column two lists time point of measurement, and column three lists the treatment. The remaining columns are the ICCS subscales scores and ICCS total score. Each subscale scores can range from 3 to 15, with the total scores ranging from 30 to 150.

Table 38 Participants own evaluations of ICC measured with the ICCS_Par

Par	T	Treatment	DIS	SOC	ASS	ALT	EMP	INT	EXP	SUP	IMM	ENV	Total
C	1	Pre MT	15	11	9	14	11	11	8	14	15	8	116
C	2	Post MT	11	15	15	9	13	11	15	14	15	11	129
C	3	Pre std.rehab..	12	7	13	10	9	7	13	15	14	4	104
C	4	Post std.rehab.	13	7	11	12	11	14	8	14	15	11	116
D	3	Pre MT	15	12	8	9	14	12	13	13	15	11	122
D	4	Post MT	14	15	9	9	13	14	13	15	14	8	124
D	1	Pre std.rehab.	14	13	7	10	14	9	11	14	14	9	115
D	2	Post std.rehab.	15	12	9	8	12	12	11	15	15	13	122
E	3	Pre MT	10	13	11	9	8	11	12	8	11	9	102
E	4	Post MT	10	12	13	8	9	13	9	11	11	12	108
E	1	Pre std.rehab.	9	13	9	8	8	11	9	11	11	9	98
E	2	Post std.rehab.	12	13	10	10	9	12	14	12	12	11	115
G	1	Pre MT	11	14	10	10	10	9	13	13	8	11	109
G	2	Post MT	8	12	9	10	9	11	9	12	9	8	97
G	3	Pre std.rehab.	11	12	9	9	10	9	9	10	9	9	109
G	4	Post std.rehab.	12	14	11	9	12	10	10	11	13	9	97
I	1	Pre MT	15	15	12	8	13	14	14	14	13	13	131
I	2	Post MT	10	11	12	9	13	9	10	13	11	12	110
I	3	Pre std.rehab.	12	12	15	6	13	11	14	13	14	13	123
I	4	Post std.rehab.	14	10	15	8	11	10	14	10	14	13	119
J	3	Pre MT	8	12	12	11	13	14	10	9	10	11	110
J	4	Post MT	13	14	13	10	10	15	14	10	12	14	125
J	1	Pre std.rehab.	9	10	13	8	8	14	13	8	10	15	108
J	2	Post std.rehab.	9	10	11	9	12	15	11	10	8	14	109
K	3	Pre MT	14	15	13	10	9	11	14	9	12	14	121
K	4	Post MT	13	13	10	9	12	10	11	11	12	12	113
K	1	Pre std.rehab.	13	15	10	9	10	13	11	9	9	13	112
K	2	Post std.rehab.	11	14	9	11	6	11	12	8	11	12	105
M	1	Pre MT	7	7	12	10	10	11	11	12	11	9	100
M	2	Post MT	7	9	12	10	12	8	12	11	11	10	102
M	3	Pre std.rehab.	7	8	10	10	10	11	11	10	11	10	98
M	4	Post std.rehab.	7	9	11	9	10	10	10	10	9	9	94

Par=participant, T=time point, DIS=self-disclosure, EMP=empathy, SOC=social relaxation, ASS=assertiveness, ALT= alter centrism, INT= interaction management, EXP= expressiveness, SUP=supportiveness, IMM=immediacy, ENV=environmental control

The ICCS_Par means for the two groups for each of the four time points are represented in Figure 11. The diagram indicates that Group I's participants have rated their interpersonal communication competencies as decreasing from TP1 (pre MT; M=114, SD=13.09) to TP2 (post MT; M=109.50, SD=14.06) and that trend continued to TP3 (pre std. rehab.; M=105.50, SD=12.07). During the standard rehabilitation condition, Group I's ICCS_Par scores increased at TP4 (post std.treat; M=110.00, SD=11.17). Group II's ICCS_Par mean scores increased from TP1 (pre std. rehab.; M=108.25, SD=7.41) to TP2 (post std.rehab.; M=112.75, SD=7.41), then there was a slight increase at TP3 (Pre MT; M=113.75, SD=9.54) and then a greater increase at TP4 (Post MT; M=117.5, SD=8.35).

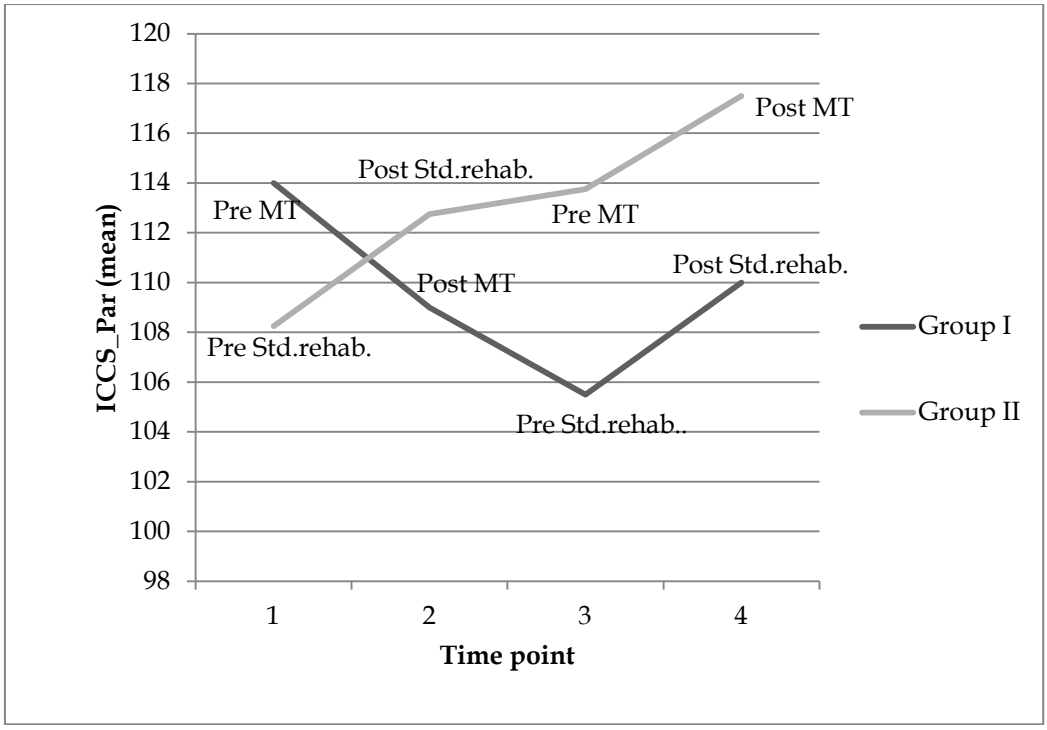


Figure 11 Graphical representation of the two groups' ICCS_Par scores

To enable an ANOVA calculation to be performed, the ICCS_Par data was pooled based on treatment, meaning that all pre music therapy, all post music therapy, all pre std.rehab., and all post std.rehab. data were pooled into four new categories based on treatment. The descriptive statistics (Mean and Std. Deviation) for the four ICCS_Par treatment categories are presented in Table 39.

Table 39 Descriptive statistics on ICCS_Par pre/post music therapy and std. rehabilitation

	Mean	Std. Deviation	N
Pre MT - ICCS_Par total score	113.8750	10.60239	8

Post MT - ICCS_ Par total score	113.5000	11.52637	8
Pre std.rehab. – ICCS_ Par total score	106.8750	9.38749	8
Post std.rehab. – ICCS_Par total score	111.3750	8.89522	8

ICCS_Par = interpersonal communication competence scale participant evaluation

The Mauchly's test of sphericity on the ICCS_Par_total dataset generated an approximate chi-square value of 7.587 and an associated p-value of .186. Consequently, it can be assumed that sphericity is not violated and the ANOVA calculations can be performed without adjustment.

The results of the repeated measures ANOVA on the ICCS_Par data are presented in Table 40. The repeated measures ANOVA analysis determined that the mean interpersonal communication competences in everyday life as self-administered by participants did not differ significantly between treatments ($F(3,21)=1.680$, $p=.202$). The within subjects partial eta-squared effect size for the ICCS_Par was .194.

The results from the repeated measures ANOVA on the ICCS_Par total scores indicate that none of the treatments stood out as having statistically different effect. In relation to research question 1-b (What is the effect of 20 music therapy sessions on interpersonal competencies in daily life?) the results indicate that 20 music therapy sessions have no significant effect on interpersonal communication competencies in daily life.

Table 40 ANOVA tests of within-subjects effects (ICCS_Par)

Source		Sum of Squares	df	Mean Square	F	Sig.
Treatment	Sphericity Assumed	248.094	3	82.698	1.680	.202
Error(factor1)	Sphericity Assumed	1033.656	21	49.222		

Pooled data for Groups I and II

Results from the pairwise comparison are presented in Table 41. The post-hoc pairwise comparison with Bonferroni adjustment revealed no statistically significant change from pre to post for neither music therapy nor standard rehabilitation alone.

Table 41 Pairwise comparison of ICCS_Par results

(I)Treatment	(J) Treatment	Mean Difference (I-J)	Std. Error	Sig.
Pre MT	Post MT	.375	4.403	1.000
	Pre std.rehab.	7.000	1.427	.010
	Post std.rehab.	2.500	3.162	1.000
Post MT	Pre MT	-.375	4.403	1.000
	Pre std.rehab.	6.625	4.075	.888
	Post std.rehab.	2.125	3.889	1.000
Pre std.rehab.	Pre MT	-7.000*	1.427	.010
	Post MT	-6.625	4.075	.888

	Post std.rehab.	-4.500	3.268	1.000
Post std.rehab.	Pre MT	-2.500	3.162	1.000
	Post MT	-2.125	3.889	1.000
	Pre std.rehab.	4.500	3.268	1.000

Pooled data for Groups I and II, ICCS_Par=interpersonal communication competence scale participant evaluation

The ICCS_Par_subscales were not subjected to the ANOVA analysis because they comprise of only three questionnaire items. Three items give the subscales insufficient power and it would be inappropriate to analyze the subscales using parametric statistics (see Section 3.7.1 for details on parametric statistics on Likert scale data).

The effect size (Cohen's d) for the total scores on ICCS_Par pre-post music therapy was d=0.03 and pre-post standard rehabilitation d=-0.487. These results indicate that there was a "small" effect from standard rehabilitation and no effect from music therapy measured with the self-administered ICCS questionnaire.

4.2.4 Summary of music therapy's effect on interpersonal communication competencies in daily life.

A repeated measures ANOVA with Greenhouse-Geisser correction determined that mean scores from the interpersonal communication competences in everyday life as measured by staff and relatives did not differ significantly between treatment conditions (pre/post std. rehab. and pre/post music therapy). A post-hoc pairwise comparison with Bonferroni adjustment revealed a slight increase in interpersonal communication competencies from pre music therapy to post music therapy on the two ICCS_SR subscales 'Self-disclosure' and 'Environmental control'. Scores from pre/post standard rehabilitation for the subscale 'Altercentrism' also showed a small increase. None of the changes in the ICCS_SR scores were statistically significant.

A repeated measures ANOVA on the participants' version of the ICCS (ICCS_Par) data determined that the mean scores from the interpersonal communication competences in everyday life, as measured by participants, did not differ significantly between treatments either (pre/post standard rehabilitation and pre/post music therapy).

The effect size values on the ICCS_SR total score indicated that music therapy had a "medium" positive effect on interpersonal communication competencies in everyday life. On the ICCS_SR subscale 'self-disclosure', the effect size value indicated a "large" (positive) effect of music therapy. The effect size values on the two subscales 'Social relaxation' and 'Environmental control' indicated a "medium" (positive) effect of music therapy. The effect size values on the ICCS_SR also indicated that standard rehabilitation had a "large" effect on Altercentrism competencies.

The effect size values on the ICCS_Par total scores indicated that there was a "small" effect from standard rehabilitation and no effect from music therapy.

4.3 Main results on interpersonal communication competencies in music

Research question 1-a sought to determine whether 20 music therapy sessions were effective in improving the interpersonal communication competencies in music. The study draws on four tools to evaluate the participants' ICC performance in the assessment sessions; the ICCS_MT (music therapist), the ICCS_MTP (music therapy participant), the ICCS_MusRat (Raters), and the IAP_Aut profile scored by the blinded raters. A paired t-test was used to determine whether the improvement in the respective ICCS and IAP scores was due to chance or treatment.

4.3.1 Results on ICCS_MT (music therapist evaluation)

The music therapist conducting the four assessment exercises completed a questionnaire (the ICCS_MT) on the participants' performance immediately post assessment session. All the ICCS_MT scores are presented in Appendix 21. A paired-samples t-test was performed on the ICCS_MT data to establish if the participants' interpersonal communication competencies in the music changed from pre music therapy to post music therapy.

There was a significant difference in the total scores for ICCS_MT_total pre music therapy (M=99.5, SD=6.63) and ICCS_MT_total post 20 music therapy sessions (M=110.37, SD=15.05); t(7)=-2.37, p=.049, d=-1.048. The results suggest that the participants' interpersonal communication competencies in music increased from pre music therapy to post music therapy. The total score on the ICCS_MT indicates that the hypothesis of 20 music therapy sessions having an effect on interpersonal communication competencies in music is confirmed.

The ICCS_MT_Total pre/post music therapy scores are represented in the box plot (Figure 12). In Figure 12 the outlier ("12") is participant J who improvised attentively to the therapist, and very musically, in the last assessment.

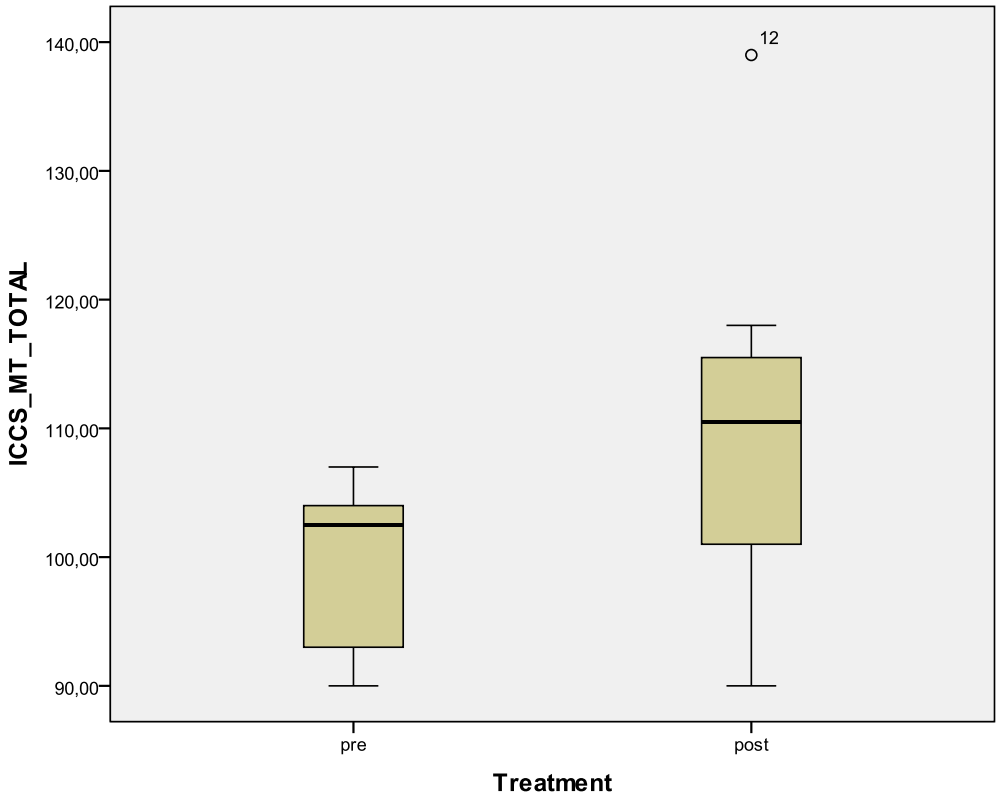


Figure 12 Box plot of music therapist's scoring of participants' interpersonal communication competencies in music pre/post music therapy

In Table 42, results from the paired t-test on the ICCS_MT total and subscales are presented. The results indicate a significant increase from pre to post music therapy in Self disclosure in music (t(7)=-4.33, p=.003, d=-1.723), Social relaxation in music (t(7)=-2.39, p=.048, d=-0.849), Assertiveness in music (t(7)=-2.51, p=.040), and Expressiveness in music (t(7)=-3.55, p=.009). Results from the remaining ICCS_MT subscales t-test, means, standard deviations, and effect size are presented in Table 42 and 43. The remaining six subscales all show positive development, but none were significant.

The results indicate that the music therapy participants became more relaxed in the musical exercise, increased self-disclosure, assertiveness and expressiveness in the musical improvisations. In relation to research question 1-a, results suggest that 20 music therapy sessions had a significant effect on the mentioned interpersonal communication competencies in music.

Table 42 Paired sample t-test on the ICCS_MT_total and subscales

	T	df	Sig. (2-tailed)	Cohen's d
ICCS_MT_TOTAL	-2.374	7	.049	-1.048
ICCS_MT_DIS	-4.333	7	.003	-1.723
ICCS_MT_EMP	-.473	7	.651	-0.169
ICCS_MT_SOC	-2.393	7	.048	-0.849
ICCS_MT_ASS	-2.510	7	.040	-0.897

ICCS_MT_INT	-1.263	7	.247	-0.449
ICCS_MT_EXP	-3.550	7	.009	-1.296
ICCS_MT_SUP	-1.330	7	.225	-0.484
ICCS_MT_IMM	-1.214	7	.264	-0.825
ICCS_MT_ENV	-1.433	7	.195	-0.551
ICCS_MT_ALT	-1.369	7	.213	-0.535

Pooled data for Groups I and II, ICCS=Interpersonal Communication Competence Scale, MT=music therapist evaluation, DIS=self-disclosure in music, EMP=empathy in music, SOC=social relaxation in music, ASS=assertiveness in music, ALT= alter centrism in music, INT= interaction management in music, EXP= expressiveness in music, SUP=supportiveness in music, IMM=immediacy in music, ENV=environmental control in music.

Table 43 Descriptive statistics on ICCS_MT_total and subscales

	Mean	N	Std. Deviation	Std. Error Mean
ICCS_MT_TOTAL pre	99.50	8	6.633	2.345
ICCS_MT_TOTAL post	110.38	8	15.052	5.322
ICCS_MT_DIS pre	9.00	8	0.756	0.267
ICCS_MT_DIS post	10.63	8	1.302	0.460
ICCS_MT_EMP pre	10.75	8	2.315	0.818
ICCS_MT_EMP post	11.38	8	2.973	1.051
ICCS_MT_SOC pre	12.13	8	1.959	0.693
ICCS_MT_SOC post	12.88	8	2.031	0.718
ICCS_MT_ASS Pre	9.88	8	1.727	0.611
ICCS_MT_ASS Post	11.38	8	1.996	0.706
ICCS_MT_INT pre	8.13	8	1.126	0.398
ICCS_MT_INT post	9.00	8	1.414	0.500
ICCS_MT_EXP pre	8.75	8	1.669	0.590
ICCS_MT_EXP post	10.25	8	1.982	0.701
ICCS_MT_SUP pre	10.00	8	1.690	0.598
ICCS_MT_SUP post	11.25	8	2.493	0.881
ICCS_MT_IMM pre	10.38	8	0.518	0.183
ICCS_MT_IMM post	11.38	8	2.669	0.944
ICCS_MT_ENV pre	10.75	8	1.035	0.366
ICCS_MT_ENV post	11.63	8	1.847	0.653
ICCS_MT_ALT pre	9.75	8	0.886	0.313
ICCS_MT_ALT post	10.630	8	1.847	0.653

Pooled data for Groups I and II, ICCS=Interpersonal Communication Competence Scale, MT=music therapist evaluation, DIS=self-disclosure in music, EMP=empathy in music, SOC=social relaxation in music, ASS=assertiveness in music, ALT= alter centrism in music, INT= interaction management in music, EXP= expressiveness in music, SUP=supportiveness in music, IMM=immediacy in music, ENV=environmental control in music.

The effect size values presented in Table 42 indicate that 20 music therapy sessions had a "large" effect on musical self-disclosure, social relaxation in music, assertiveness in music, expressiveness in music, and immediacy in music. Two subscales show "medium" effect (environmental control and altercentrism). The three remaining subscales show "small" or "no" effect.

This presentation of ICCS_MT results concludes with a short report on the differences in the two intervention groups' pre/post music therapy scores.

Group I had a pre music therapy mean of 98.25 (SD=6.55), which increased to a mean score of 104.75 (SD=3.73) post music therapy. Group II had a pre music therapy mean score of 100.75 (SD=7.46) and post music therapy mean of 116.00 (SD=18.49). The results suggest that the music therapist performing the assessments rated the greatest increase in ICC in music therapy for Group II, which can be explained through participant 12's large change in scores at the post music therapy assessment.

The next section is a presentation of the two raters' evaluation of the participants' ICC in music.

4.3.2 Results on ICCS_MusRat (blinded raters)

The blinded raters evaluated the participants' performance in four assessment exercises using the ICCS_MusRat (see Appendix 22 for a presentation of the scores). A paired-samples t-test was used to detect whether differences in the participants' interpersonal communication competencies in the music were statistically different from pre music therapy to post music therapy.

Results show that there is no significant difference in the total ICCS_MusRat scores from pre (M=114.18, SD=12.97) to post music therapy (M=116.75, SD=12.82); $t(7)=-0.660$, $p=.530$, $d=-0.233$. The total scores on the ICCS_MusRat indicate that the H0 hypothesis of 20 music therapy sessions having an effect on interpersonal communication competencies in music is confirmed.

The ICCS_MusRat_Total pre/post music therapy scores are represented in the box plot (Figure 13) – The outlier "12" is participant J who performed exceptionally well in the last assessment. The results from the t-test are detailed in Table 44 and in the descriptive statistics in Table 45.

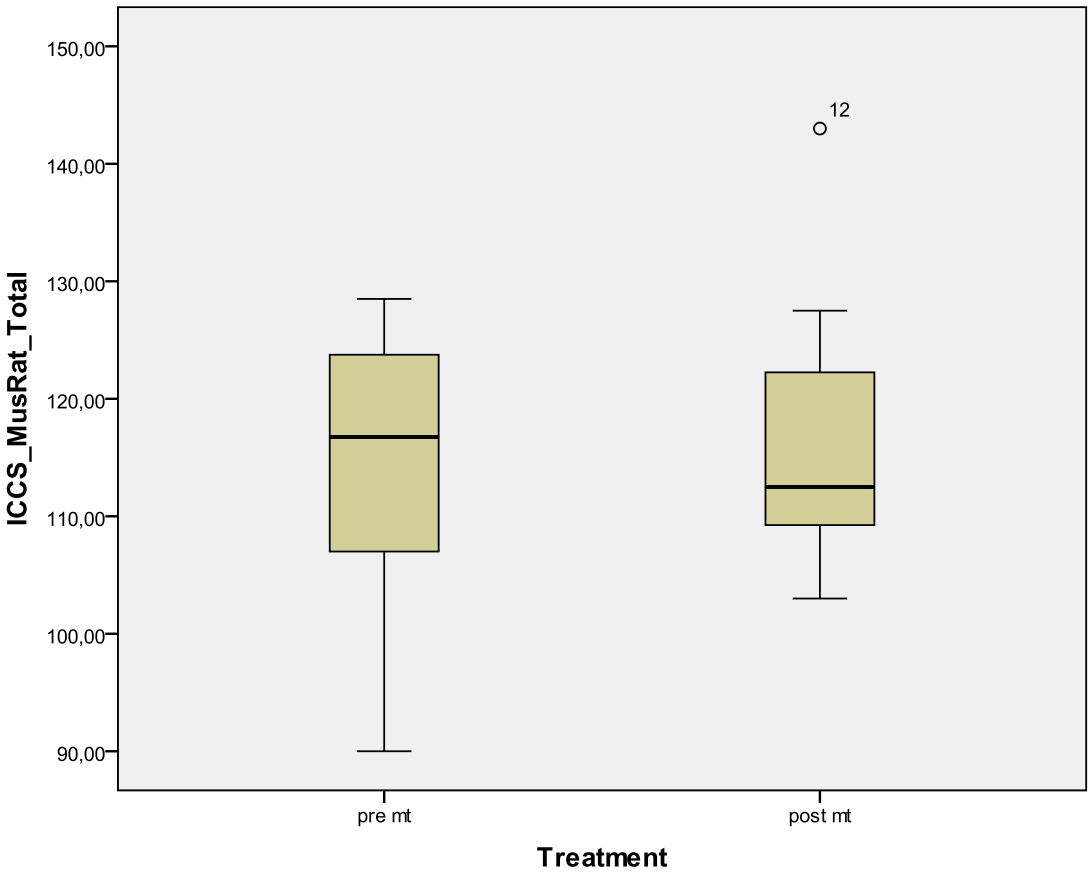


Figure 13 Box plot of blinded raters' ICCS_MusRat scoring of participants' pre/post music therapy (pooled data for Groups I and II)

The paired sample t-test on the ICCS_MusRat_subscales yielded no significant results either (Table 44). The effect size for the pre/post changes to the 'Immediacy in music' subscale reached a medium level (d>.5) (Table 44).

Table 44 Paired sample T-test on the ICCS_MusRat_total and subscales

	t	df	Sig. (2-tailed)	Cohen's d
ICCS_MusRat_Total	-.660	7	.530	-0.233
ICCS_MusRat_DIS	-.129	7	.901	-0.048
ICCS_MusRat_EMP	.659	7	.531	0.235
ICCS_MusRat_SOC	-1.357	7	.217	-0.481
ICCS_MusRat_ASS	.606	7	.564	0.218
ICCS_MusRat_INT	-1.377	7	.211	-0.498
ICCS_MusRat_ALT	-.725	7	.492	-0.257
ICCS_MusRat_EXP	.595	7	.571	0.211
ICCS_MusRat_SUP	-.893	7	.401	-0.316
ICCS_MusRat_IMM	-1.382	7	.210	-0.507
ICCS_MusRat_ENV	-.456	7	.662	-0.161

Pooled data for Groups I and II, ICCS=Interpersonal Communication Competence Scale, MusRat=blinded musical rater evaluation, DIS=self-disclosure in music, EMP=empathy in music, SOC=social relaxation in music, ASS=assertiveness in music, ALT= alter centrism in music, INT= interaction management in music, EXP= expressiveness in music,

SUP=supportiveness in music, IMM=immediacy in music, ENV=environmental control in music.

Table 45 Descriptive statistics ICCS_MusRat_ total and subscales

	Mean	N	Std. Deviation	Std. Error Mean
ICCS_MusRat_Total pre	114.19	8	12.970	4.585
ICCS_MusRat_Total post	116.75	8	12.820	4.533
ICCS_MusRat_DIS pre	12.19	8	1.831	0.647
ICCS_MusRat_DIS post	12.25	8	1.389	0.491
ICCS_MusRat_EMP pre	10.31	8	3.172	1.122
ICCS_MusRat_EMP post	9.69	8	2.828	0.999
ICCS_MusRat_SOC pre	13.63	8	1.126	0.398
ICCS_MusRat_SOC post	13.94	8	1.178	0.417
ICCS_MusRat_ASS pre	11.75	8	2.535	0.896
ICCS_MusRat_ASS post	11.19	8	3.058	1.081
ICCS_MusRat_INT pre	10.13	8	2.560	0.905
ICCS_MusRat_INT post	11.25	8	2.018	0.713
ICCS_MusRat_ALT pre	12.19	8	1.534	0.542
ICCS_MusRat_ALT post	12.75	8	1.711	0.605
ICCS_MusRat_EXP pre	10.50	8	2.521	0.891
ICCS_MusRat_EXP post	10.19	8	2.404	0.850
ICCS_MusRat_SUP pre	9.44	8	2.456	0.868
ICCS_MusRat_SUP post	10.50	8	2.330	0.824
ICCS_MusRat_IMM pre	10.94	8	1.635	0.578
ICCS_MusRat_IMM post	11.69	8	2.086	0.738
ICCS_MusRat_ENV pre	13.13	8	1.126	0.398
ICCS_MusRat_ENV post	13.31	8	1.132	0.400

Pooled data for Groups I and II, ICCS=Interpersonal Communication Competence Scale, MusRat=blinded musical rater evaluation, DIS=self-disclosure in music, EMP=empathy in music, SOC=social relaxation in music, ASS=assertiveness in music, ALT= alter centrism in music, INT= interaction management in music, EXP= expressiveness in music, SUP=supportiveness in music, IMM=immediacy in music, ENV=environmental control in music.

Group I had a pre music therapy ICCS_MusRat mean of 106.13 (SD=13.08) and changed to a mean score of 109.75 (SD=4.63). Group II started with a mean score of 122.25 (SD=6.93) and reached a mean of 123.75 (SD=15.21). These results indicate that Group II generally had better ICC in music, both pre and post music therapy, than Group I.

4.3.3 Results on ICCS_MTP (Music therapy Participant)

The participants evaluated their own interpersonal musical communication competencies using the ICCS_MTP right after the four assessment exercises. All ICCS_MTP scores are presented in Appendix 23. A paired-samples t-test was used to test whether the participants interpersonal communication competencies in music increased from pre music therapy to post music therapy.

Results from the test showed no significant difference in the total scores for ICCS_MTP pre (M=112.50, SD=15.03) to post 20 music therapy sessions

(M=112.13, SD=18.99); t(7)=-.156, p=.880, d=0.068 (See Table 46 for details). The results suggest that the participants rated their interpersonal communication competencies in music as the same pre music therapy and post music therapy. The total scores on the ICCS_MTP indicate that the H0 hypothesis of 20 music therapy sessions having an effect on interpersonal communication competencies in music is confirmed.

The paired sample t-test on the ICCS_MTP_subscales yielded no significant results either (Table 46). Interestingly the participants rated their own empathy competencies almost identically pre to post music therapy.

Table 46 Paired sample t-test on the ICCS_MTP_total and subscales

	t	df	Sig. (2-tailed)	Cohen's d
ICCS_MTP_TOTAL	.156	7	.880	0.068
ICCS_MTP_DIS	.683	7	.516	0.261
ICCS_MTP_EMP	.000	7	1.000	0.000
ICCS_MTP_SOC	.781	7	.460	0.293
ICCS_MTP_ASS	.205	7	.844	0.073
ICCS_MTP_INT	1.106	7	.305	0.396
ICCS_MTP_EXP	-.196	7	.850	-0.071
ICCS_MTP_SUP	-.552	7	.598	-0.195
ICCS_MTP_IMM	-.734	7	.487	-0.260
ICCS_MTP_ENV	-1.178	7	.277	-0.434
ICCS_MTP_ALT	1.210	7	.265	0.428

Pooled data for Groups I and II, ICCS=Interpersonal Communication Competence Scale, MTP=music therapy participant, DIS=self-disclosure in music, EMP=empathy in music, SOC=social relaxation in music, ASS=assertiveness in music, ALT= alter centrism in music, INT= interaction management in music, EXP= expressiveness in music, SUP=supportiveness in music, IMM=immediacy in music, ENV=environmental control in music.

Table 47 Descriptive statistics on ICCS_MTP_ total and subscales

	Mean	N	Std. Deviation	Std. Error Mean
ICCS_MTP_TOTAL pre	112.50	8	15.033	5.315
ICCS_MTP_TOTAL post	112.13	8	18.992	6.715
ICCS_MTP_DIS pre	12.38	8	2.134	0.754
ICCS_MTP_DIS post	12.13	8	2.532	0.895
ICCS_MTP_EMP pre	11.25	8	2.315	0.818
ICCS_MTP_EMP post	11.25	8	2.435	0.861
ICCS_MTP_SOC pre	12.50	8	2.449	0.866
ICCS_MTP_SOC post	11.88	8	3.270	1.156
ICCS_MTP_ASS pre	9.50	8	2.928	1.035
ICCS_MTP_ASS post	9.25	8	2.375	0.840
ICCS_MTP_INT pre	9.50	8	1.512	0.535
ICCS_MTP_INT post	8.88	8	1.808	0.639
ICCS_MTP_EXP pre	10.88	8	2.900	1.025
ICCS_MTP_EXP post	11.13	8	3.834	1.355
ICCS_MTP_SUP pre	11.25	8	2.252	0.796
ICCS_MTP_SUP post	11.75	8	2.375	0.840
ICCS_MTP_IMM pre	11.88	8	1.808	0.639

ICCS_MTP_IMM post	12.38	8	1.996	0.706
ICCS_MTP_ENV pre	11.50	8	2.778	0.982
ICCS_MTP_ENV post	12.38	8	2.134	0.754
ICCS_MTP_ALT pre	11.88	8	1.126	0.398
ICCS_MTP_ALT post	11.13	8	0.991	0.350

Pooled data for Groups I and II, ICCS=Interpersonal Communication Competence Scale, MTP=music therapy participant, DIS=self-disclosure in music, EMP=empathy in music, SOC=social relaxation in music, ASS=assertiveness in music, ALT= alter centrism in music, INT= interaction management in music, EXP= expressiveness in music, SUP=supportiveness in music, IMM=immediacy in music, ENV=environmental control in music.

4.3.4 Results on IAP autonomy scales

In order to answer research question 1-d (What is the effect of 20 music therapy sessions on communicative musicality?), blinded raters evaluated the participants' performance in the free improvisation assessment exercises (pre/post music therapy) using terms from Bruscia's (1987) Improvisation Assessment Profile (IAP) autonomy. Calculation of the IAP scorings was described in Section 3.4.8. In Table 48, the individual participants' pre/post music therapy IAP scores on the four scales; Volume, Rhythmic ground, Tonal/melodic, and Phrasing, are presented. The participants' IAP autonomy scores per minute and the percentage of time for which the participants participated in the different roles are also presented in Table 48. In Table 49, descriptive statistics on the pooled data from both groups is presented.

In Table 48, it is revealed that none of the participants were rated as dependent. 'Eye-balling' the data disclosed that the five participants that played a tonal instrument during the pre music therapy assessment also played a tonal instrument during the post music therapy assessment (tonal/melodic column). Any difference observed in tonal/melodic autonomy total scores pre/post music therapy was therefore not due to missing or additional data.

A paired sample t-test was conducted on the pooled data (Table 50) to determine whether the participants IAP scores per minute had changed from pre to post music therapy. Results indicated that there was no significant difference from pre (M=2.5, SD=.54) to post music therapy (M=2.3, SD=1.51); t(7)=.341, p=.743, d=0.132. The results suggest that the participants' autonomy in the free improvisation exercise did not change significantly from pre to post music therapy. The total scores on the IAP_Aut_total score/minute indicate that the H0 hypothesis of 20 music therapy sessions having an effect on communicative musicality is confirmed.

A paired t-test on the individual IAP_Aut subscales (Volume, Rhythmic ground, Tonal/melodic, and Phrasing) revealed no significant difference either. The Tonal/ melodic scale yielded the greatest difference between pre (M=1.98, SD=1.71) and post music therapy (M=1.49, SD=1.69) although differences were not significant (t-statistics; t(7), 1.23, p=.26, d=.433). The remaining t-test results are detailed in Table 50. The statistics on the IAP_Aut_ subscales indicate that

the H0 hypothesis of 20 music therapy sessions having an effect on communicative musicality is confirmed.

Table 48 Individual participant's IAP autonomy scores pr. minute and role total

Par		Volume	Rhythmic ground	Tonal/melodic	Phrasing	**Total pr. min.**	Dependent	Follower	Partner	Leader	Resister
C	Pre MT	2.01	2.37	3.65	3.31	**2.83**	0%	0%	52.76%	47.24%	0%
C	Post MT	0.55	0.55	1.64	3.55	**1.57**	0%	5.68%	62.50%	31.82%	0%
D	Pre MT	2.25	2.63	3.75	3.00	**2.91**	0%	0%	51.56%	48.44%	0%
D	Post MT	1.85	2.77	3.00	3.69	**2.83**	0%	0%	52.88%	47.12%	0%
E	Pre MT	1.88	2.5	0	1.63	**2**	0%	4.17%	59.72%	34.72%	1.39%
E	Post MT	1.14	1.47	0	0.34	**0.99**	0%	11.6%	65.79%	17.2%	5.41%
G	Pre MT	2.00	0.78	0	2.67	**1.81**	0%	1.23%	67.90%	30.25%	0.62%
G	Post MT	3.75	3.38	0	5.88	**4.33**	0%	0.69%	49.31%	27.08%	22.92%
I	Pre MT	3.64	0	0	3.11	**3.38**	0%	0%	56.44%	30.87%	12.69%
I	Post MT	2.20	3.40	0	3.40	**3**	0%	0%	51.11%	47.78%	1.11%
J	Pre MT	0	2.18	3.00	3.27	**2.11**	0%	0%	64.77%	35.23%	0%
J	Post MT	0.67	-0.25	1.19	0.94	**0.64**	0%	6.89%	79.41%	9.86%	3.85%
K	Pre MT	2.00	2.20	2.20	3.00	**2.7**	0%	6.11%	45.56%	45.56%	2.78%
K	Post MT	0.33	0.33	1.33	1.00	**0.81**	0%	0%	86.57%	13.43%	0%
M	Pre MT	0	-0,27	3,27	6	**2,25**	0%	1,14%	60,23%	38,64%	0%
M	Post MT	2,11	4,44	4,78	5,67	**4,25**	0%	0%	37,5%	54,17%	8,33%

IAP= improvisation assessment profile

Table 49 Paired samples statistics on IAP scores

	Mean	N	Std. Deviation	Std. Error Mean
Volume pre MT	1.72	8	1.20	.426
Volume post MT	1.58	8	1.14	.403
Rhythmic ground pre MT	1.55	8	1.19	.420
Rhythmic ground post MT	2.01	8	1.72	.607
Tonal/Melodic pre MT	1.98	8	1.71	.604
Tonal/Melodic post MT	1.49	8	1.69	.596
Phrasing pre MT	3.25	8	1.23	.437
Phrasing post MT	3.06	8	2.13	.752
IAP total score/minute pre MT	**2.50**	**8**	**.54**	**.190**
IAP total score/minute post MT	**2.30**	**8**	**1.51**	**.533**
Follower Pre MT	1.58%	8	2.32	.819
Follower post MT	3.11%	8	4.43	1.567
Partner pre MT	57.37%	8	7.32	2.587
Partner post MT	60.63%	8	16.34	5.778
Leader pre MT	38.87%	8	7.32	2.589
Leader post MT	31.06%	8	17.07	6.036
Resister pre MT	2.19%	8	4.36	1.540
Resister post MT	5.20%	8	7.78	2.750

Pooled data for Groups I and II

The mean of the four IAP_Aut scale scores (Volume, Rhythmic ground, Tonal/melodic, and Phrasing) pre/post music therapy are represented in the line diagram in Figure 14. The lines in the diagram indicate that the participants demonstrated an increased ability to be partners (and reduced ability to be leaders) when establishing volume, tonal and melodic stance, and in defining phrases from pre to post music therapy. The diagram also suggests that the participants became more independent in establishing rhythmic ground.

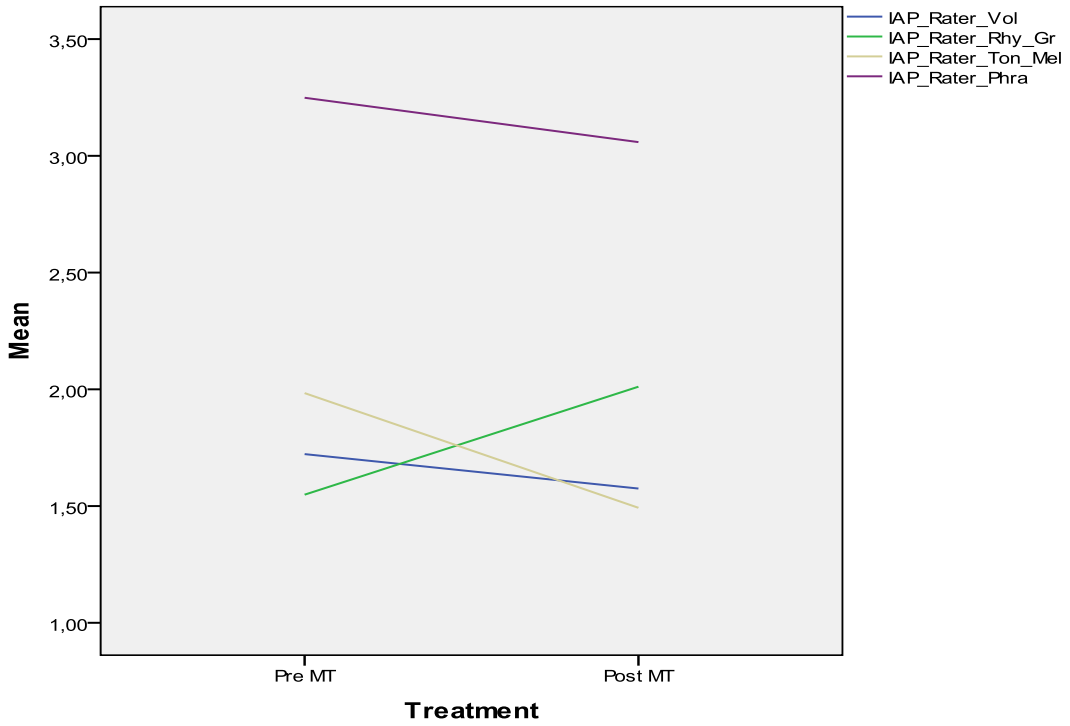


Figure 14 Line diagram on IAP scores (Volume, Rhythmic ground, Tonal/melodic, and Phrasing) pre/post music therapy (pooled data for Groups I and II)

A paired t-test on the percentage of time playing as partner in the free improvisation pre (M=57.37%, SD=7.32) to post music therapy (M=60.63%, SD=16.34) indicate a non significant development; t(7), -.459, p=.660, d=-0.168. The paired t-test on percentage of time as leader in the free improvisation pre (M=38.87%, SD=16.34) to post music therapy (M=31.06%, SD=17.07) indicate a non-significant change; t(7),1.226, p=.260, d=.473. The two other roles (resister and follower) showed the same tendency. The statistics on the percentages of time in the different IAP autonomy roles indicate that the H0 hypothesis of 20 music therapy sessions having an effect on communicative musicality is confirmed.

Table 50 Paired sample t-test on the IAP_Aut_ Score/minute and subscales

	t	df	Sig. (2-tailed)	Cohen's d

IAP_Total_ Score/minute	.341	7	.743	0.132
IAP_Rater_ Rhythmic ground	-.477	7	.648	-0.169
IAP_Rater_ Tonal/Melodic	1.226	7	.260	0.433
IAP_Rater_ Phrasing	.304	7	.770	0.120
IAP_Rater_Volume	.280	7	.787	0.099
IAP_Rater_ % Follower	-.917	7	.390	-0.345
IAP_Rater_ % Partner	-.459	7	.660	-0.168
IAP_Rater_ % Leader	1.226	7	.260	0.473
IAP_Rater_ % Resister	-.875	7	.411	-0.316

Pooled data for Groups I and II, IAP=improvisation assessment profile

4.3.5 Summary of music therapy's effect on interpersonal communication competencies in music

Four tools were developed for evaluating the participants' ICC performance in the assessment sessions; the ICCS_MT (music therapist), the ICCS_MTP (music therapy participant), the ICCS_MusRat (Raters), and the IAP_Aut profile scored by blinded raters. Paired t-tests were used to determine whether the development in the respective ICCS and IAP scores was due to chance or treatment. There was a significant difference in the total scores for the music therapist evaluation pre to post music therapy, suggesting that the participants' overall interpersonal communication competencies in music developed from pre to post music therapy. Further, the pre to post differences were significant for subscales "Self disclosure in music", "Social relaxation in music", "Assertiveness in music", and "Expressiveness in music". Generally, the effect size for the music therapist evaluation of interpersonal communication competencies in music was high. The results indicate that the music therapist performing the assessments experienced that the music therapy participants became more relaxed in the musical exercise and in addition, increased self-disclosure, assertiveness, and expressiveness in the musical improvisations.

A paired t-test on the blinded raters' evaluation of the participants' performance in four assessment exercises pre/post music therapy, using the ICCS_MusRat, showed no significant difference in the total scores. This result suggests that the participants' development in interpersonal communication competencies in music from pre music therapy to post music therapy could have occurred by chance. Alternatively, the result could suggest that the raters were not able to detect if there were changes in ICC during the music exercises. The paired sample t-test on the subscales in the ICCS_MusRat yielded no significant results, though the effect size on the raters' evaluation of "Immediacy in music" reached a medium level.

A paired t-test on the participants' evaluation of their own interpersonal musical communication performance right after the four assessment exercises showed no significant difference in the total scores pre/post music therapy. The results suggest that the participants did not experience that their interpersonal

communication competencies in music developed from pre music therapy to post music therapy.

The median of the four IAP_Aut /minute scores (Volume, Rhythmic ground, Tonal/melodic, and Phrasing) pre/post music therapy implies that the participants, post music therapy, demonstrated an increase in partnering in establishing volume, tonal and melodic stance, and in defining phrases, though the results are not significant. The results also suggest (even though not significant) that the participants generally demonstrated greater leadership behavior through establishing rhythmic ground.

4.4 Correlation in interpersonal communication in music and daily life

The research question 1-c asks if a correlation exists between participants' interpersonal communication competencies in music and their interpersonal communication competencies in everyday life. The correlation analysis was conducted on data from one measure point only – pre music therapy – and therefore included data from the acute injured and the participants who did not complete the study, resulting in a sample size of 15 (N=15). All participants' scores on the five scales on interpersonal communication competencies (the ICCS filled in by staff/relatives, participants, music therapist, music therapy participant, and musical rater) were subjected to a correlation analysis. High ICCS scores represent good interpersonal communication competencies. As presented in the theoretical frame (Chapter 1) there may be a correlational relationship between interpersonal communication competencies in music and those in everyday life. It is therefore reasonable to suggest a positive relationship between interpersonal communication competencies in music and everyday life. Consequently a directional hypothesis was presented in Section 3.8 and one-tailed correlation statistic was performed on the ICCS scores to test the theory.

The correlation analyses have been performed on all ICCS scales and results, as detailed in Table 51. Column one lists the ICCS subscale, the top row indicating if the 'ICCS' measures everyday life or music. The second row's first three columns are the ICCS measures on musical interaction by music therapist, music therapy participant, and musical raters. The last two columns are the ICCS measures on everyday interaction by participant, and staff/relatives. The 20 columns below the second row are the four correlating ICCS measures. In each row the correlation significance (p-value) and Pearson's "r" on the two correlated ICCS measurements are presented. To give an overview, the cells where correlations are significant ($p<.05$) are white with red font – the weaker the correlation significance, the darker the color. Negative correlations are marked with the darkest colour and the text is in white font. By 'eye-balling' Table 51 it can be seen that the music therapists' scorings had the strongest

positive correlation with the other measures. Further, the participants' own evaluations of interpersonal communication competencies in everyday life had the weakest correlation with the other measures.

The correlation analyses performed aimed to answer research question 1-c (Is there a correlation between interpersonal communication competencies in music and daily life?). Because of the participants' residual impairments in cognition, staff and relatives' evaluation of the participants' ICC in everyday life were regarded as the most valid and reliable scores. For the same reason, the music therapist's and the blinded raters' scores on ICC in music (ICCS_MT and ICCS_MusRat) were regarded as the most valid scores on the participants' ICC in music. Moreover, the raters' scores on ICC in music were the only "true" measure on ICC in music since the interaction between the improvisations was edited out of the rated video. It must be assumed that the interactions between the musical improvisations affected the ratings of music therapists who were performing the assessment. In addition, the music therapist performing the assessments had an experience of the participants from the everyday life setting, which can have affected her ratings of participants' ICC in music.

In Table 51 it is revealed that staff and relatives' evaluation of the participants' ICC in everyday life correlated significantly with the music therapist's evaluation of the participants' ICC in music on the ICCS total score ($p<.001$) and on five subscales; empathy ($p=.006$), assertiveness ($p=.005$), altercentrism ($p=.022$), expressiveness ($p=.033$), and supportiveness ($p=.023$). These results indicate a relationship in ICC on some aspects of musical and everyday life communication competencies.

Staff and relatives' evaluation of ICC in everyday life correlated significantly with the blinded raters' evaluation of ICC in music on only one ICCS subscale; expressiveness ($p=.043$). The total score on the two ICCSs had a correlation significance of $p=.066$ and the remaining nine subscales had a correlation significance level ranging from $p=.159$ to $p=.430$ (see Table 51). These results indicate a modest relationship in interpersonal communication competencies in musical and everyday life interaction.

The participants' own evaluation of ICC in everyday life correlated significantly with staff and relatives' evaluation of ICC in everyday life on three subscales; Self-disclosure ($p=.001$), Social relaxation ($p=.012$), and Immediacy ($p=.018$) (see Table 51). The results suggest that the participants have a realistic understanding of their own ICC in everyday life in regards to self-disclosure, social relaxation, and immediacy.

The participants' own evaluation of interaction management competencies in everyday life correlated with the music therapist's and blinded raters' evaluation of interaction management in music ($p=.001$ and $p=.017$

respectively). The participants' own evaluation of supportiveness in music and everyday life correlated as well (p=.018) (see Table 51). These results suggest a correlation in interaction management in music and everyday life – at least as rated by participants, music therapist, and blinded raters.

The blinded musical raters' evaluation of the participants' ICC in music correlated significantly with those of the music therapist's (p=.007) as well as seven of the subscales; Self-disclosure (p=.018), Social relaxation (p=.033), Assertiveness (p=.011), Altercentrism (p=.035), Expressiveness (p=.008), Immediacy (p=.038), and Environmental control (p=.005) (see Table 51). This result suggests that the two musical ICCSs measure the same thing.

The blinded music raters' evaluation of the participants' ICC in music correlated significantly with the participants' own evaluation (p=.007) and on four subscales; self-disclosure (p=.002), Empathy (p=.034), Immediacy (p=.007), and Environmental control (p=.020). These results indicate a correlation between ICCs in music and everyday life on those four subscales of interpersonal communication competencies.

Table 51 Summary of correlation r and p values on ICCS measurements

		ICCS in music												ICCS in everyday life							
		Music therapist (MT)				MT Participant (MTP)				Musical Rater (MusRat)				Participant (Par)				Staff and Relatives (SR)			
		MTP	MusRat	Par (daily life)	SR (daily life)	MT	MusRat	Par (daily life)	SR (daily life)	MT	MTP	Par (daily life)	SR (daily life)	MT (music)	MTP (music)	MusRat (music)	SR	MT (music)	MTP (music)	MusRat (music)	Par
Total score	r	.622	.636	-.057	.766	.622	.619	-.391	.376	.636	.619	-.215	.408	-.057	-.391	-.215	.335	.766	.376	.408	.335
	p	.007	.005	.420	.000	.007	.007	.075	.084	.005	.007	.221	.066	.420	.075	.221	.111	.000	.084	.066	.111
Self-disclosure	r	.663	.546	-.138	.233	.663	.708	-.139	-.036	.546	.708	.065	.213	-.138	-.139	.065	.724	.233	-.036	.213	.724
	p	.004	.018	.312	.202	.004	.002	.311	.449	.018	.002	.408	.223	.312	.311	.408	.001	.202	.449	.223	.001
Empathy	r	.231	.215	-.220	.628	.231	.483	.047	.243	.215	.483	-.272	.050	-.220	.047	-.272	.035	.628	.243	.050	.035
	p	.204	.220	.215	.006	.204	.034	.434	.191	.220	.034	.163	.430	.215	.434	.163	.450	.006	.191	.430	.450
Social relax.	r	-.010	.487	.119	.351	-.010	-.384	-.110	.016	.487	-.384	-.103	-.170	.119	-.110	-.103	.576	.351	.016	-.170	.576
	p	.486	.033	.337	.100	.486	.079	.348	.478	.033	.079	.358	.273	.337	.348	.358	.012	.100	.478	.273	.012
Assertiveness	r	-.167	.587	.069	.642	-.167	-.093	-.414	-.447	.587	-.093	.155	.145	.069	-.414	.155	.182	.642	-.447	.145	.182
	p	.276	.011	.403	.005	.276	.371	.063	.048	.011	.371	.291	.303	.403	.063	.291	.258	.005	.048	.303	.258
Altercentrism	r	.028	.480	.120	.526	.028	-.401	.102	.014	.480	-.401	-.156	.194	.120	.102	-.156	-.056	.526	.014	.194	-.056
	p	.461	.035	.335	.022	.461	.069	.359	.481	.035	.069	.389	.244	.335	.359	.289	.421	.022	.481	.244	.421
Interaction Manag.	r	-.249	.403	.749	.123	-.249	-.039	-.302	-.031	.403	-.039	.549	.140	.749	-.302	.549	-.139	.123	-.031	.140	-.139
	p	.186	.068	.001	.331	.186	.445	.137	.457	.068	.445	.017	.310	001	.137	.017	.310	.331	.457	.310	.310
Expressiveness	r	.323	.611	-.245	.682	.323	.289	.174	.090	.611	.289	.012	.458	-.245	.174	.012	-.130	.682	.090	.458	-.130
	p	.120	.008	.190	.003	.120	.148	.267	.375	.008	.148	.484	.043	.190	.267	.484	.323	.003	.375	.043	.323
Supportiveness	r	.501	.322	-.143	.522	.501	.417	-.451	-.296	.322	.417	-.382	.170	-.143	-.451	-.382	.415	.522	-.296	.170	.415
	p	.029	.121	.306	.023	.029	.061	.046	.142	.121	.061	.080	.272	.306	.046	.080	.062	.023	.142	.272	.062

Immediacy	r	.092	.471	.140	.398	.092	.622	.170	.159	.471	.622	.078	.277	.140	.170	.078	.544	.398	.159	.277	.544
	p	.372	.038	.309	.071	.372	.007	.272	.285	.038	.007	.392	.159	.309	.272	.392	.018	.071	.285	.159	.018
Enviro. Ctrl	r	.319	.636	.000	-.005	.319	.535	-.139	.250	.636	.535	-.005	.072	.000	-.139	-.005	-.165	.005	.250	.072	-.165
	p	.123	.005	.500	.493	.123	.020	.311	.184	.005	.020	.494	.400	.500	.311	.494	.278	.493	.184	.400	.278

The modest correlation between the ICCS_SR and ICCS_MusRat total scores are visually represented in Figure 15 and show that the participants generally scored higher on the ICCS music rater scale (M=114.19, SD=12.97) than on the staff relative scale (M=95.57, SD=4.90).

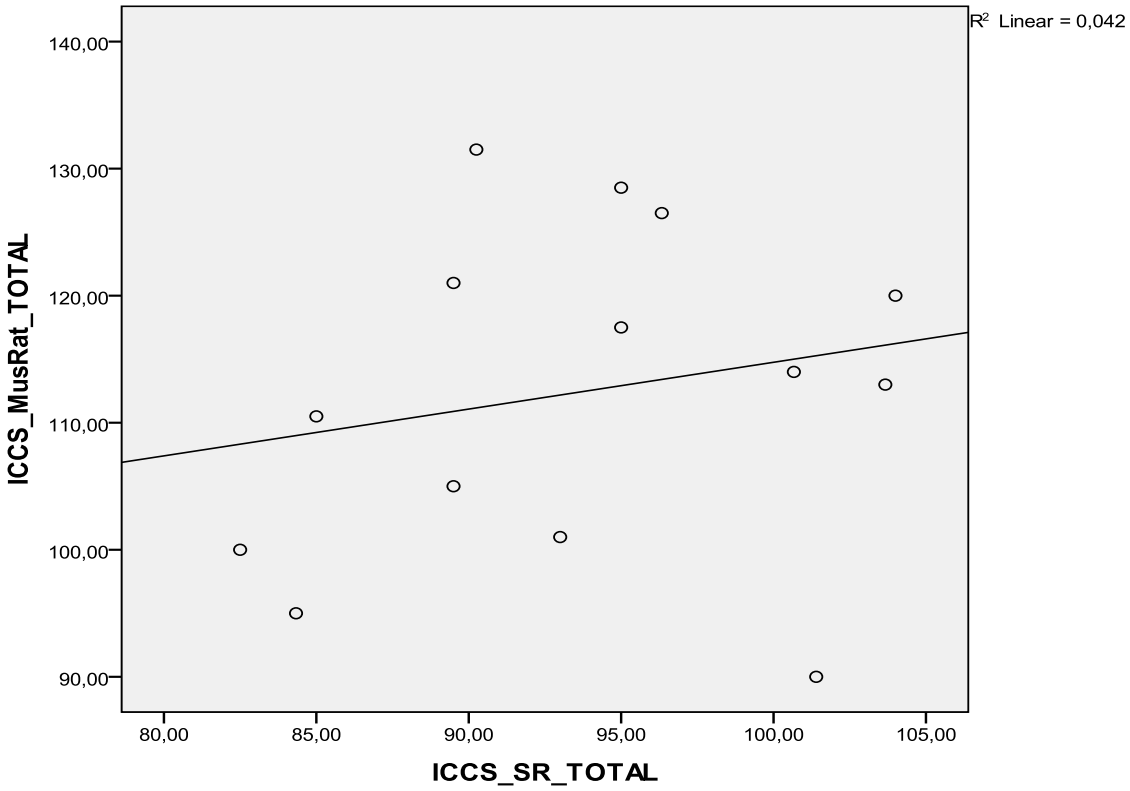


Figure 15 Blinded rater evaluation of ICC in music compared with staff and relatives evaluation of ICC in everyday life.

In summary, the blinded musical raters' and staff /relatives' everyday ratings were in need of a greater sample size in order for the correlations to reach statistical significance. However, the results show significant correlation on the "Expressiveness" subscale and approached significance on the total score and on the "Immediacy" subscale. The result suggests that the participants' level of expressiveness in musical improvisation and everyday life correlate. In relation to the directional hypothesis, which suggests a positive correlation in the overall scores (and sub-scales scores) on the measurements of interpersonal communication competencies in music and everyday life (ICCS_Par, ICCS_SR, ICCS_MT, ICCS_MTP, and ICCS_MusRat) at time point one in the study, the results are not conclusive.

4.5 Rater agreement on IAP and ICCS_MusRat

This section is about the raters' agreement on the newly developed ICCS_MusRat tool and the IAP scoring. Twenty-eight assessment sessions were rated using the ICCS_MusRat improvisation-rating tool and the proposed IAP scoring procedures. All 28 assessments were used in assessing the consistency and validity of the rating tools. The applied rater agreement analysis' is the Bland and Altman plot and Cohen's Kappa.

4.5.1 Blinded raters agreement on the ICCS_MusRat

Two methods were used to assess how well the blinded raters agreed on their scorings of the participants' four improvisations (dialogue, follow the music therapist, hold on to musical phrase, and free improvisation) using the ICCS_MusRat: 1) Bland and Altman plots and 2) Cohen's Kappa (weighted).

4.5.1.1 Bland and Altman plot on ICCS_MusRat

Bland and Altman plot assesses how well two raters agree, and whether the differences in raters' scores tends to change with the size of the measurements. Only the Bland and Altman plot on ICCS_MusRat total score is presented here.

In the Bland and Altman plot, the X-axis represents the raters' mean scores (raters 1 and 2) and the Y-axis plots the difference between the raters. Limits are calculated as two times the standard deviation of difference. If the differences are normally distributed, 95% of differences in ratings should lie within two standard deviations of the mean difference.

The Bland and Altman plot on the two raters ICCS_MusRat_total scores is presented in Figure 16. It shows that 96 %(27 out of 28) of the differences in ratings are within limits defined by ± 2 x std. deviation of difference. The one agreement difference that is outside the limits is marked with the red circle. Since the difference median is negative, the plot also reveals that Rater I tends to give lower scores than Rater II. The spread distribution of differences in rater scores suggests that there are no tendencies towards the raters changing scores with the size of the measurements.

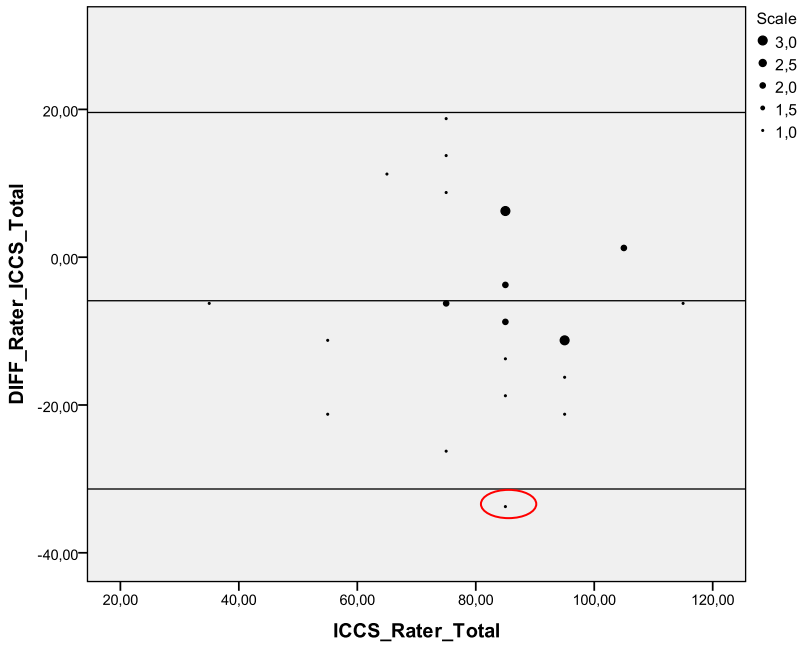


Figure 16 Bland and Altman plot on ICCS_MusRat total scores

The Bland and Altman plots on the ICCS_MusRat subscales reveal almost the same picture as the ICCS_MusRat total score. In four of the subscales; social relaxation, interaction management, environmental control, and immediacy, all score differences (or 100%) are within limits of ± 2 x std. deviation of difference. In the three subscales; self-disclosure, assertiveness, and altercentrism, there is only one score difference outside limits (or 96% within limits). In the last three subscales; expressiveness, supportiveness, and empathy, there are two score differences outside the limits (or 93 % within the limits). The distribution of difference in raters' subscales scorings generally looks spread.

A visual inspection of Q-Q plots of differences in the ICCS_MusRat scorings indicated a normal distribution of differences. Therefore, a Pearson correlation analysis was performed which resulted in significant ($r(26)=.539$ to .732, $p<.004$) correlations between the two raters' total scores and all subscale scores. Since the Pearson is not a robust indication of rater correlation, Cohen's Kappa was calculated on the two rater's ratings.

4.5.1.2 Cohen's Kappa (weighted) on ICCS_MusRat items and subscales

Cohen's Kappa was used to calculate how well the two blinded raters agreed on their assessment of each item in the ICCS_MusRat (see Section 3.7.5.2). The interpretations of agreement in the Kappa coefficients are: agreement is slight (K=0–0.2), fair (K=0.21–0.40), moderate (K=0.41–0.60), substantial (K=0.61–0.80), and almost perfect (K=0.81–1). The weighted Kappa coefficients on the two raters' scores on each item in the ICCS_MusRat are presented in Table 52 (the darker the color the lesser the agreement in scoring).

In Table 52 it is revealed that the overall Cohen's Kappa for the ICCS_MusRat is .597. In the ICCS_MusRat subscales, four items (q8, q15, q 28, q29) have a 'slight' agreement between the raters (Cohen's kappa coefficient from .0 to .2), four items (q1, q2, q7, q 25) have a 'fair' agreement between the raters (Cohen's kappa coefficient from .21 to .40), ten items (q3, q5, q9, q10, q11, q12, q17, q21, q23, q30) have a 'moderate' agreement between the raters (Cohen's kappa coefficient from .41 to .60), and eleven items (q4, q6, q14, q16, q18, q19, q20, q22, q24, q26, q27) have a 'substantial' agreement between the raters (Cohen's kappa coefficient from .41 to .60). Only one item (q 13) has an almost perfect agreement between the raters.

Table 52 Weighted Cohen's Kappa on blinded raters use of ICCS_MusRat

Item/question		Cohen's Kappa W
	Subscale Self disclosure in music	.566
1	Was the participant's music congruent with body language? (free)	.300
2	Did you experience clarity/focus in the participants' music? (dialog)	.305
3	Did the participant seem to reveal emotions in the music? (free)	.542
	Subscale Empathy in music	.702
4	Did the participants match the rhythm of the therapist? (follow)	.631
5	Did the participants have difficulty matching the musical style of the therapist? (follow)	.529
6	Did the participants give musical signals of understanding (copy, mirror, develop)? (dialog)	.684
	Subscale Social relaxation in music	.340
7	Did the participant seem comfortable?(free)	.364
8	Did the participant seem relaxed in the shared music making? (hold on)	.152
9	Did the participant seem insecure playing music with the therapist?(dialog)	.497
	Subscale Assertiveness in music	.556
10	When the therapist was challenging in the shared music, did the participant maintain playing phrase? (hold on)	.427
11	Did the participant get affected musically by challenging playing of the therapist?(R) (hold on)	.560
12	Did the participant establish musical independence? (hold on)	.515
	Subscale Altercentrism in music	.602
13	Was the participant primarily into own music? (R)(dialog)	.801
14	Did the participant's music accompaniment/ relate to the therapist's?(dialog)	.730
15	Did the participant seem concentrated and focused? (hold on)	.112
	Subscale Interaction management in music	.715
16	Did the participant play in a flexible and varied way?(dialog)	.638
17	Did the participant develop ideas in the music?(dialog)	.597
18	Did the participant respond to changes in the music?(free)	.785
	Subscale Expressiveness in music	.581
19	Did the participant's musical expression seem clear?(free)	.604

20	Did the participant seem "stiff" in matching the therapist's music? (R)(follow)	.605
21	Did the participant seem to be good at expressing him/her self musically?(follow)	.416
	Subscale Supportiveness in music	.690
22	Did the participant's music relate to the musical output of therapist?(free)	.609
23	Did the participant intend to keep an equal supporting relationship in their music making?(free)	.469
24	Did you experience a feeling of interpersonal warmth coming from the participant?(free)	.724
	Subscale Immediacy in music	.597
25	Did the participant seem willing to participate in the improvisation?(follow)	.309
26	Did the participant look at the therapist? (follow)	.704
27	Did the participant seem attentive to the music of the therapist?(free)	.602
	Subscale Environmental control in music	.352
28	Did the participant seem satisfied with own musical output?(Dialog)	.191
29	Did the therapist pick up and use the participant's musical ideas?(dialog)	.012
30	Did the participant have difficulties signaling his/hers intentions? (R)(dialog)	.469
	ICCS_MusRat_Total	.597

The results support the hypothesis of Cohen's Kappa on raters' agreement on the ICCS_MusRat more than fair (k>.21).

4.5.2 Blinded rater agreement on IAP rating

This section presents the results on how well the blinded raters agree on their IAP_autonomy scorings of the participants' free improvisation. The four IAP_aut profiles scored are volume, melodic/tonal ground, rhythmic ground, and phrasing. The procedures used in scoring and calculating the profiles were described in Section 3.4.8. The blinded rater agreement was assessed using Bland and Altman plots and Cohen's Kappa (weighted).

4.5.2.1 Bland and Altman on IAP scorings

The Bland & Altman plot of the two raters' IAP_total scores is presented in Figure 17. It shows that 93 %(26 out of 28) of the differences in ratings were within limits (± 2 x std. deviation of difference). The two differences that are outside the limits are marked with red circles. Since the difference median is negative, the plot also reveals that Rater I tends to assess the participants more as followers (-1) and partners (0) than Rater II. The equal distribution of differences in rater scores (on both sides of the mean) suggests that there were no tendencies towards the raters changing scores with the size of the measurements.

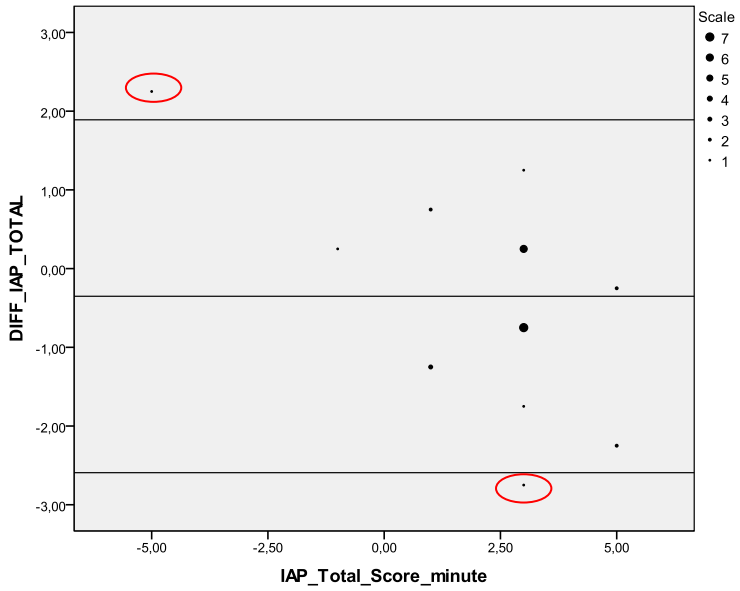


Figure 17 Bland and Altmanon IAP_total scores

The Bland & Altman plots on the four IAP profiles (Tonal/melodic, Rhythmic ground, Volume, and Phrasing) reveal almost the same picture as in Figure 17. In all four profiles, there was one difference outside limits (or 96% within limits). The distribution of difference in raters' scorings generally looks equal, even though there are one or two outliers in each of the IAP profiles.

A visual inspection of Q-Q plots of differences in the IAP scorings indicated a normal distribution. A Pearson correlation analysis was performed which indicated significant ($r(25)=.528$ to $.926$, $p<.004$) correlation on total scores and all subscales. Since the Pearson is not a robust measure of rater correlation, Cohen's Kappa was calculated on the raters' ratings.

4.5.2.2 Cohen's Kappa (weighted) on IPA_Aut profiles and scores

Cohen's Kappa was used to calculate how well the two raters agreed on the three IAP_Aut profile scoring (see Section 3.7.5.2). But before the data were subjected to this analysis, the data were "cleaned". The "cleaning" was performed in order to remove incidents of missing data (incidents where there were no scorings from both raters) since this would distort the results (e.g. in five cases Rater I had rated the last 4-5 seconds whereas Rater II had not rated the ending of the improvisation). The interpretation of agreement in the Kappa coefficients is: agreement is slight (K=0–0.2), fair (K=0.21–0.40), moderate (K=0.41–0.60), substantial (K=0.61–0.80), and almost perfect (K=0.81–1).

To get an overview of the raters' agreements and disagreements on the four profiles; Volume, Tonal/melodic, Rhythmic ground, and Phrasing, their ratings are presented in an error matrix (Table 53). Rater I's scorings are presented in the columns and Rater II's scorings are in the rows. The scores detailed in the diagonal direction from top left corner to bottom right (uncoloured Table cells) are the scorings where the raters have agreed. The rest is where they have

disagreed. E.g. Rater I (the columns) have seven 'follower' scorings with which Rater II (the rows) in two incidents agrees, and in two incidents has rated the participant as being 'dependent' and three incidents as being 'partner'. The darkness of cell colour indicates the size of the disagreement. There was only one scoring where the raters totally disagreed – where Rater I scored the participant as being dependent in the music and Rater II scored the participant as being resisting. Otherwise, the ratings were distributed close to the agreement diagonal.

Table 53 Error matrix on raters on IAP_Aut_Volume

		Rater I					R2 totals
		Dependent	Follower	Partner	Leader	Resister	
Rater II	Dependent	0	2	8	0	0	10 (2.2%)
	Follower	0	2	5	1	0	8 (1.8%)
	Partner	0	3	249	42	0	294 (65.2%)
	Leader	0	0	51	64	7	122 (27.1%)
	Resister	1	0	3	6	7	17 (3.8%)
	R1 totals	1 (0.2%)	7 (1.6%)	316 (70.1%)	113 (25.1%)	14 (3.1%)	451

A Cohen's weighted Kappa calculation on the raters' agreement on the IAP Autonomy Volume profile was K_w=.475, which indicates a moderate level of agreement between the raters.

The two raters' agreements and disagreements on IAP_Aut_ rhythmic ground scorings are presented in the error matrix in Table 54. Rater I's scorings are presented in the colored columns and Rater II's scorings are in the rows. The scores detailed in the diagonal direction from top left corner to bottom right (uncoloured table cells) are the scorings where the raters have agreed. The rest is where they have disagreed – e.g. Rater I (the columns) has 24 'follower' scorings for which Rater II (the rows) in four incidents has rated the participant as being 'dependent'; in nine incidents they agree on 'follower'; and eleven incidents Rater II has rated the participant as being 'partner'. There is only one scoring where the raters totally disagree – where Rater I scores the participant as 'dependent' and Rater II scores as 'resister'. Generally the ratings are distributed around the agreement diagonal.

Table 54 Error matrix on raters on IAP_Aut_Rythmic ground

		Rater I					R2 totals
		Dependent	Follower	Partner	Leader	Resister	
Rater II	Dependent	**2**	4	0	0	0	6 (1.4%)
	Follower	0	**9**	9	1	1	20 (4.5%)
	Partner	0	11	**206**	30	0	247 (56.1%)
	Leader	0	0	51	**82**	10	143 (32.5%)
	Resister	1	0	3	8	**12**	24 (5.5%)

	R1 totals	3 (0.7%)	24 (5.5%)	269(61.1%)	121 (27.5%)	23 (5.2%)	440

A Cohen's weighted Kappa calculation on the rater agreement on the IAP_Autonomy rhythmic ground profile gives K_w =.621, which indicates a substantial level of agreement between the raters.

The two raters' agreements and disagreements on IAP_Aut_Tonal/melodic scorings are presented in the error matrix in Table 55. Rater I's scorings are listed in the coloured columns and Rater II's scorings, in the rows. The scores detailed in the diagonal direction from top left corner to bottom right (uncoloured table cells) are the scorings where the raters have agreed. The remaining cells are where they have disagreed – e.g. Rater I (the columns) has five 'follower' scorings with which Rater II (the rows) in no incidents has agreed but has, in three incidents, rated the participant as being 'partner' and two times as being 'leader'. Incidences fitting the category 'dependent' were not observed by any of the raters. Rater II rated the participants more as 'leaders' in tonal and melodic than Rater I did (59.8% vs. 45.7%).

Table 55 Error matrix on raters on IAP_Aut_Tonal and melodic

		Rater I					R2 totals
		Dependent	Follower	Partner	Leader	Resister	
Rater II	Dependent	0	0	0	0	0	0 (0%)
	Follower	0	0	0	0	0	0 (0%)
	Partner	0	3	41	22	0	66 (32.2%)
	Leader	0	2	44	62	11	119 (59.8%)
	Resister	0	0	4	7	3	14 (7.0%)
	R1 totals	0 (0%)	5 (2.5%)	89(44.7%)	91 (45.7%)	14(7.0%)	199

A Cohen's weighted Kappa calculation on the raters' agreement on the IAP_Autonomy tonal and melodic profile yields a K_w =.357, indicating a fair level of agreement between the raters.

The two raters' agreements and disagreements on IAP_Aut_phrasing scorings are presented in the error matrix in Table 56. As previously in Table 55, Rater I's scorings are presented in the coloured columns and Rater II's scorings in the colored rows. The scores detailed in the diagonal direction from top left corner to bottom right (uncoloured table cells) are the scorings where the raters have agreed. The rest is where they have disagreed – e.g. Rater I (the columns) has five 'dependent' scorings with which Rater II (the rows) in two incidents agrees, and in two incidents has rated 'follower', and in one incident rated the participant as 'resister'. Rater II rated the participants' more as 'leaders' in phrasing than Rater I did (48.1% vs. 38.1%).

Table 56 Error matrix on raters on IAP_Aut_Phrasing

Rater II		Rater I					R2 totals
		Dependent	Follower	Partner	Leader	Resister	
	Dependent	2	6	0	0	0	8 (1.8%)
	Follower	2	9	6	1	0	18 (4.0%)
	Partner	0	11	132	27	1	171 (37.9%)
	Leader	0	2	71	127	17	217 (48.1%)
	Resister	1	1	4	17	14	37 (8.2%)
	R1 totals	5 (1.1%)	29 (6.4%)	213 (47.2%)	172 (38.1%)	32 (7.1%)	451

A Cohen's weighted Kappa calculation on the raters' agreement on the IAP_Autonomy phrasing profile yields a K_w =.603, indicating a substantial level of agreement between the raters.

The results in this section suggest that the raters agreed more in rating the participants' autonomy in regards to Rhythmic ground (K_w=.621) and Phrasing (K_w=.603) than on Volume (K_w=.475) and Tonal/melodic ground (K_w=.357). In addition, the results support the hypothesis of Cohen's Kappa on raters' agreement on the IAP more than fair (k>.21).

4.6 Factor analysis of the ICCS_SR

Research question 2 a-i addresses the construct validity of the ICCS_SR (Does the ICCS staff/relative version reveal a "real world" construct?). A factor analysis was performed in order to discover patterns in the relationships among the ICCS_SR questionnaire items, and whether the items could be explained largely or entirely in terms of a smaller number of variables called factors. The ICCS questionnaires already have "factors" in terms of subscales. Beside revealing if the ICCS_SR is a "real world" construct, another goal of this factor analysis was to compare the ten subscales constructed by Rubin and Martin (1994) with the extracted factors from the ICCS_SR. Due to the small number of cases (i.e. collected questionnaires) in the other ICCSs, only the ICCS_SR has been subjected to a factor analysis.

4.6.1 Factor calculations on ICCS_SR

Field (2005) recommends a sample size of over 300 cases when undertaking a factor analysis. Therefore, ICCS_SR data from all time points and all participants were pooled in the factor analysis; a total of 169 completed ICCS_SR questionnaires (cases) and a case to item ratio of 169:30 or 5.6:1. These figures indicate that this factor analysis in the middle third of the current practice in factor analysis (Costello & Osborne, 2005) (see Section 3.8.6.1 for details on rationales and the methods/terms used).

If the data are normally distributed, the 'maximum likelihood' approach should be applied. However, if the data have a significantly skewed distribution, the researcher should choose the 'principal axis factor' (Costello & Osborne, 2005). The Shapiro-Wilk test of normality indicates that all items in the ICCS_SR data

are significantly normally distributed (p<.000) . The 'maximum likelihood' was therefore chosen for this factor analysis.

SPSS generates three outputs (the R-matrix, Kaiser-Meyer-Olkin measure, and the Bartlett's test of sphericity measure) that are used in deciding whether a factor analysis is appropriate to run. The R-matrix generates a Pearson correlation coefficient and a significance score for the 30 questionnaire items. If any variables (items) have a majority of correlation significance greater than 0.05 and correlation coefficients greater than 0.9, the problem of singularity (the item not being well-defined) occurs and the variables (items) underpinning the problem need to be further examined or eliminated (Field, 2005). Since the ICCSs have 30 items, the "majority" is defined as more than 15 incidents of correlations with a significance greater than .05. In the ICCS_SR dataset, item 5 has 17 incidents of significance >.05, item 9 has 21 incidents, item 19 has 16 incidents, item 23 has 22 incidents, and item 30 has 19 incidents of correlation significance above .05. Since this analysis was performed post hoc it was not possible to edit the questions. None of the ICCS_SR items have a correlation coefficient greater than 0.9. The determinant for the ICCS_SR data set is 5.25 E-006 (0.00000525) which is smaller than the necessary value of 0.00001 (Field, 2005). Therefore, multicollinearity (where variables/items are highly correlated) might be problematic for these data because they were collected for only 18 participants – although they were evaluated at different time points by 38 staff and five relatives.

The second SPSS outcome used in deciding whether the factor analysis is appropriate to run is the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy. The KMO gives a score between 1 and 0. A score close to 1 indicates that patterns of correlation are fairly compact, whereas a score near 0 indicates diffusion in the pattern of correlation (Field, 2005). Consequently, a factor analysis is likely to be unsuitable (Field, 2005). In this dataset (ICCS_SR) the KMO value is .767, indicating a "good" correlation, and that a factor analysis can be applied.

Bartlett's test of sphericity tests the null hypothesis that the correlation from the R-matrix is an identity matrix. An identity matrix is a square matrix in which all the main diagonal elements are ones and all the remaining elements are zeros (Field, 2005). If the R-matrix were an identity matrix, all item correlations would be zero. For the factor analysis to have any meaning, there has to be some relationship between the items. In this dataset, the Bartlett's test is highly significant (p<0.001), indicating that the R-matrix is not an identity matrix (Field, 2005) and suggesting that it is appropriate to perform a factor analysis.

After establishing that the dataset is suitable for a factor analysis, the first step in extracting factors is determining the "eigen values" associated with each linear component (eigen vector) in the R-matrix (Field, 2005). The "eigen value"

associated with each item is not represented here since it does not give information needed for the later interpretation. The number of factors to extract can either be determined by the Kaiser's criterion or the 'scree test'. A calculation established that the average communality in the ICCS_SR dataset is .523. Since the average communality is less than 0.7 and there are 30 items, the appropriate way to establish the number of factors to extract is the scree test. Visual inspection of the scree plot (Figure 18) indicates that the curve flattens out at factor seven, which, according to the scree test, means that the appropriate number of factors to extract is six.

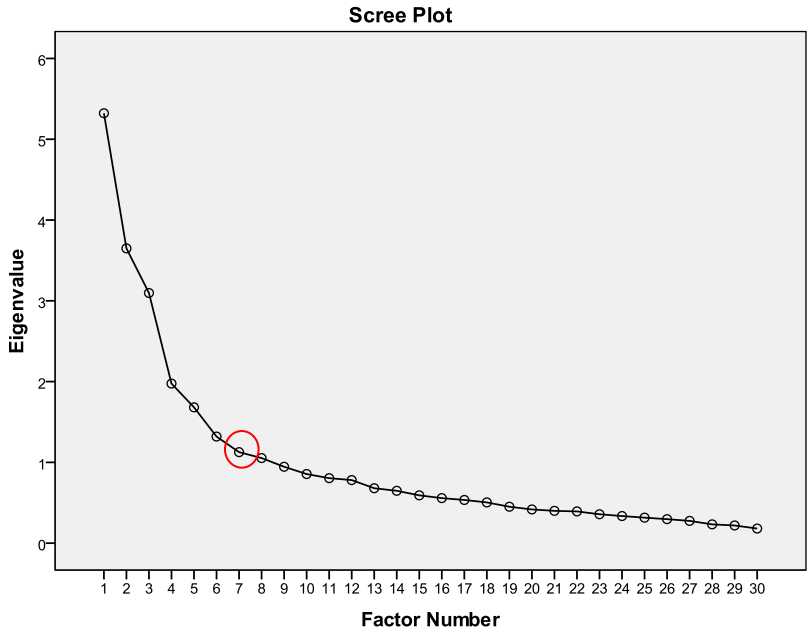


Figure 18 Scree Plot of ICCS_SR items

Besides deciding on amount of factors, one has to decide on the method of rotation. In the ICCS_SR there is an overlap between the item definitions and therefore the factors. Because the items are related, the oblique method has been applied.

4.6.2 Results of factor analysis of ICCS_SR

The factor analysis provides two matrixes to interpret; the 'pattern matrix' (Table 57), which details the factors (categories of items) and the individual items loadings on it (how well the item correlate with factor), and the 'factor correlation matrix' (Table 58) which details the correlation between the six factors. The next step in this factor analysis was to look at which questions load onto the same factor in order to identify common themes.

When interpreting the pattern matrix (Table 57), the questions that load highly on factor one (item 3,19,22,24,25,26,27) relate to expressing emotions, supportiveness and conveying immediacy. Therefore I have labeled factor one "Emotional immediacy". The five questions that load highly on factor two (item

10,11,12,13,28) all relate to aspects of assertiveness; therefore factor two might be labeled "Assertiveness". The questions that load highly on factor three (Item 14, 16, 18, 20, 21, 28, 29, 30) have to do with environmental control, verbal expressiveness and flexibility; therefore factor three might be labeled "Verbal and environmental control". The questions that load highly on factor four (Item 1, 7, 8, 9, 13) are about social relaxedness, revealing oneself, and about choosing conversation topics; therefore, factor four might be labeled "Social relaxation, management and openness". The questions that load highly on factor five (Item 4, 5, 6, 18, 22, 23) are about empathy, supportiveness, and understanding messages between the lines. Therefore, factor five might be labeled "empathic understanding and supportiveness". Finally, the questions that load heavily on factor six (Item 1, 3, 14, 15) are about self-disclosure and being responsive to the thoughts and ideas of others (altercentrism). Therefore, factor six might be labeled "altercentrism and self disclosure". The factor analysis of the ICCS_SR data reveals that the 30 items can be grouped in six meaningful subscales:

1. Emotional immediacy – alpha .76
2. Assertiveness – alpha .39
3. Verbal and environmental control – alpha .76
4. Social relaxation, management and openness – alpha .65
5. Empathic understanding and supportiveness – alpha .64
6. Altercentrism and self disclosure – alpha .53

The factor analysis of 169 completed ICCS_SR questionnaires resulted in six logical subgroups of items. Rubin and Martin's (1994) original ICCS scale had ten subscales/factors with three items in each. Since my analysis only extracted six factors, there are more items in each of the factors. In Table 57 Rubin and Martin's (1994) subscale groupings and the ICCS_SR items are presented in the left hand column with the six extracted factors in the right hand columns. The items' loadings on the respective factors are presented in the right hand columns. The factor extraction confirms the hypothesis of the ICCS_SR items grouping into logical sub-groups.

Table 57 Factors extracted from the ICCS_SR items (Pattern Matrix)

	Factor					
	1	2	3	4	5	6
1 DIS - How often does # show friends who ¤ really is?				-.402		.533
2 DIS - How often does # experience being understood?			-.437	-.284		
3 DIS - How often does # reveal to others how ¤ feels?	.303	.261				.553
4 EMP - How often is # able to take the stance of others?					.820	
5 EMP - How often does # have difficulty understanding others feelings?(R)					-.524	
6 EMP - How often does # understand how you feel?	.285				.517	
7 SOC - How often is it comfortable for #, to be together with others?				-.402		
8 SOC - How often does # seem relaxed in small groups?				-.641		

9 SOC - How often does # feel insecure when amongst strangers?(R)				.773		
10 ASS - When someone has wronged #, how often would ¤ confront the person?		.639		-.254		
11 ASS - How often does # have difficulty standing up for own rights?((R)		-.470	.269			
12 ASS - How often does # stand up for own rights?		.863				
13 ALT - How often are conversations about #'s topics? (R)		.343		.399		.263
14 ALT - How often does # let others know that ¤ understand what they say?			-.354			.357
15 ALT - How often does # mind wander during conversations						.393
16 INT - How often is shift of topic in #'s conversations without problems?			-.551			
17 INT - How often is # involved in negotiating conversational topics?	.246					
18 INT - How often does # comprehend both what is said and what is not said?			-.406		.416	
19 EXP - How often is it apparent if # is happy or sad?	.300					.298
20 EXP - How often is finding the right words hard for #?(R)			.809			
21 EXP - How often do you experience # being good at expressing him/herself verbally?			-.747			
22 SUP - How often does # respond supportive – not evaluative?	.374				.573	
23 SUP - How often does # make an effort to be equal with others?					.316	
24 SUP - How often would you describe # as a warm and loving person?	.510				.259	
25 IMM - How often do you experience that # cares about you	.777					
26 IMM - How often does # try to look into your eyes when you talk?	.498					
27 IMM - How often does # tell other that ¤ feel close to them?	.746					
28 ENV - How often do you experience that # communicate what ¤ wants?		.373	-.333			
29 ENV - How often can # persuade other to his/her perspective?		.282	-.420			
30 ENV - How often does # have difficulties convincing others to do what # wants? (R)			.368			

In Table 58 we can see the Pearson correlations values between the six factors extracted using maximum likelihood extraction method, Oblimin rotation with Kaiser normalization, on the ICCS_SR dataset. Table 58 show that the Pearsons' r values are generally low ($r < \pm.227$) which indicates that the six extracted factors are well defined.

Table 58 Factor correlation matrix on ICCS_SR (Pearson's r)

Factor	1	2	3	4	5	6
1. Emotional immediacy		.145	-.217	-.190	.166	.227
2. Assertiveness	.145		-.219	.070	-.141	.213
3. Verbal and environmental control	-.217	-.219		.068	-.197	.104
4. Social relaxation, management and openness	.190	.070	.068		-.159	.018
5. Empathic understanding and supportiveness	.166	-.141	-.197	-.159		.051
6. Altercentrism and self disclosure	.227	.213	.104	.018	.051	

4.7 Reliability analysis of the ICCS questionnaires

Research question 2a,b,c addresses the reliability of the newly constructed ICCS questionnaires. Therefore, a reliability analysis was performed using Cronbach's Alpha to examine if the ICCS scale consistently reflects the construct it is measuring. The Cronbach's Alpha value is a widely accepted measure for construct reliability in questionnaires (Field, 2005). In this study, the ICCSs (SR, Par, MT, MTP, Rater) have been subjected to a Cronbach Alpha analysis in order to assess internal validity of the measures. In the original ICCS by Rubin and Martin (1994) the Cronbach's Alpha was .86. (see Section 3.7.7 for details on Cronbach Alpha). The next section presents the results of the Cronbach alpha calculation on the ICCS_SR.

4.7.1 Cronbach alpha on ICCS_SR

Data from 169 completed ICCS_SR questionnaires were used in the Cronbach alpha calculation to reveal flaws in the construct of the ICCS_SR. The overall Cronbach alpha on the ICCS_SR questionnaire was α=.774. This value indicates an "acceptable" consistency on the overall ICCS_SR scale. It is therefore possible to confirm the hypothesis of the Cronbach alpha value of internal consistency on the ICCS_SR items being interrelated and interchangeable (α =.70 - .90).

Table 59 reports on the individual ICCS_SR items' Pearson's "r" correlation with the overall score. By examining the values in the "Corrected Item-Total Correlation" column, eleven questions (5,9,11,12,13,15,19,20,23,29,30) correlate with the overall score with a Pearson's "r" value of below .3 (a limit defined by Field (2005) as indicative of problematic items). Six of these items (5,9,11,13,20, and 30) all have reversed questions which could pose a problem for the respondents. Another issue that may have caused the low correlation is revealed in the inter-item correlation. This means that if a person scores highly on one item (e.g. assertiveness), the opposing items (e.g. altercentrism) are negatively correlated. These issues here will be discussed in more detail in Chapter 5.

The values in column three in Table 59 indicate what would happen to the overall Cronbach alpha if the item were deleted. If the four items (5,13,15,23), that, if they were deleted would increase the Cronbach's alpha, were deleted from the ICCS_MusRat, the overall Cronbach alpha would increase from .774 to .821.

Table 59 Cronbach alpha's on ICCS_SR items

	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
1 DIS - How often does # show friends who ¤ really is?	.384	.763
2 DIS - How often does # experience being understood?	.495	.760
3 DIS - How often does # reveal to others how ¤ feels?	.407	.761
4 EMP - How often is # able to take the stance of others?	.326	.765
5 EMP - How often does # have troubles understanding others feelings?(Reversed)	**.090**	**.778**
6 EMP - How often does # understand how you feel?	.557	**.**755
7 SOC - How often is it comfortable for #, to be together with others?	.430	.762
8 SOC - How often does # seem relaxed in small groups?	.365	.763
9 SOC - How often does # feel insecure when in groups of strangers?(Reversed)	**.156**	.774
10 ASS - When someone has wronged #, how often would ¤ confront the person?	.313	.767
11 ASS - How often does # have trouble standing up for own rights?(Reversed)	**.296**	.767
12 ASS - How often does # stand up for own rights?	**.169**	.773
13 ALT - How often are conversations about #'s topics? (Reversed)	**-.267**	**.794**
14 ALT - How often does # let others know that ¤ understand what they say?	.466	.759
15 ALT - How often does # mind seem to wander during conversations	**-.146**	**.791**
16 INT - How often is a shift of topic in #'s conversations occurring without problems?	.325	.765
17 INT - How often is # involved in negotiating talk topics?	.325	.765
18 INT - How often does # perceive both what is said and what is not said?	.328	.765
19 EXP - How often do you notice if # is happy or sad?	**.247**	.769
20 EXP - How often is finding the right words hard for #?(Reversed)	**.223**	.771
21 EXP - How often do you experience # being good verbally?	.504	.756
22 SUP - How often does # respond kindheartedly (supportive) – not evaluative?	.522	.756
23 SUP - How often does # make an effort to be equal with others?	**.055**	**.779**
24 SUP - How often would you describe # as warm and loving person?	.416	.762
25 IMM - How often do you experience that # cares about you	.386	.763
26 IMM - How often does # try to look into your eyes when you talk?	.406	.762
27 IMM - How often does # tell other that he feel close to them?	.336	.765
28 ENV - How often do you experience that # communicates what ¤ wants?	.350	.765
29 ENV - How often can # persuade other to his/her position?	**.241**	.769
30 ENV - How often does # have problems convincing others to do what # wants? (R)	**.132**	.774

Since the ICCS_SR subscales results are reported in Section 4.2.2, their Cronbach alphas need to be presented here as well. Since the subscales only have three items, they are very sensitive to how the questions are perceived by the informants. The Cronbach alpha values of the subscales are presented in Table 60. Four scales (empathy, social relaxation, assertiveness, and immediacy) have a "questionable" alpha between .7 and .6 (.662 to .680). One subscale (Self disclosure) have a "poor" alpha (α=.562). Four subscales (Interaction management, expressiveness, supportiveness, and environmental control) have an "unacceptable" low alpha below .5 (.303 to .478). The subscale altercentrism has a problem with the item coding – if question 15 is reversed (How often does # mind seem to wander during conversations?) The Altercentrism scale will get a Cronbach alpha of .230, which is still unacceptable, but the model assumptions are not violated.

Table 60 Cronbach alpha Statistics ICCS_SR subscales

ICCS Sub-scale	Cronbach's Alpha	N of Items	ICCS_SR Scale reliability	Alphas on ICCS Rubin and Martin, (1994)
Self Disclosure	.562	3	Poor	.63
Empathy	.662	3	Questionable	.49
Social relaxation	.664	3	Questionable	.63
Assertiveness	.680	3	Questionable	.72
Altercentrism	-.726	3	The value is negative due to a negative average covariance among items. This violates reliability model assumptions.	.49
Interaction management	.346	3	Unacceptable	.41
Expressiveness	.430	3	Unacceptable	.46
Supportiveness	.478	3	Unacceptable	.43
Immediacy	.671	3	Questionable	.45
Environmental control	.303	3	Unacceptable	.60

4.7.2 Cronbach alpha on ICCS_Par

Data from 51 completed ICCS_Par questionnaires were used in the Cronbach alpha calculation to reveal flaws in the construct of the ICCS_Par. The overall Cronbach alpha on the ICCS_Par questionnaire is α=.675. This value indicates a "questionable" consistency on the overall scale. It is therefore not possible to confirm the hypothesis of the Cronbach alpha value of internal consistency on the ICCS_Par items being interrelated and interchangeable (α =.70 - .90).

The "Corrected Item-Total Correlation." column in Table 61 displays the individual items' Pearson's "r" correlation with the overall score. There seems to be a internal consistency problem with most items – except items 1,6,7,14,17,21,25,28, which all correlate with the overall score with an "r" value

above .3 (A limit defined by Field (2005) to help indicate problematic items). This means that these items have to be revised.

The values in column three in Table 61 indicate what would happen to the overall Cronbach alpha if the item were deleted. If the four items (11,13,15,16), that, if they were deleted would increase the Cronbach's alpha, were removed from the ICCS_Par, the overall Cronbach alpha would increase from .675 to α=.747

Table 61 Cronbach alpha's on ICCS_Par items

	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
1 DIS - How often do you show friends who you really is?	.449	.646
2 DIS - How often do you feel that you are understood by others?	**.199**	.668
3 DIS - How often do you reveal to others how you feel?	**.236**	.665
4 EMP - How often are you able to put yourself in others' shoes?	**.210**	.667
5 EMP - How often do you have difficulties understanding others feelings? (R)	**.160**	.672
6 EMP - How often do others feel that you understand them?	.321	.659
7 SOC - How often is it comfortable for you, to be together with others?	.403	.660
8 SOC - How often do you feel relaxed in small groups?	**.297**	.660
9 SOC - How often do you feel insecure when you are amongst strangers? (R)	**.246**	.664
10 ASS - When someone has wronged you, how often would you confront the person?	**.226**	.666
11 ASS - How often do you have difficulty standing up for your rights? (R)	**-.036**	**.689**
12 ASS - How often do you stand up for your rights?	**.166**	.671
13 ALT - How often are conversations about your own topics? (R)	**-.227**	**.702**
14 ALT - How often do you let others know that you understand what they are saying?	.439	.654
15 ALT - How often does your mind wander during conversations?	**-.176**	**.704**
16 INT - How often is a shift of topic in your conversations occurring without problems?	**.035**	**.681**
17 INT - In conversations, , how often do you take charge by negotiating conversational topics?	.375	.655
18 INT - How often would you estimate that you comprehend both what is said and what is not said in conversations with friends?	**.207**	.668
19 EXP - How often do your friends notice if you are happy or sad?	**.298**	.660
20 EXP - How often is it hard for you to find the right words to express yourself? (R)	**.167**	.671
21 EXP - How often do you experience being good at expressing you self verbally?	.333	.659
22 SUP - How often is your communication supportive – not evaluative?	**.178**	.670
23 SUP - How often do you make an effort to be equal with others? ?	.416	.648
24 SUP - How often would others describe you as warm and loving?	**.292**	.663
25 IMM - How often do your friends feel that you care about them?	.373	.657
26 IMM - How often do you try to look others in their eyes when you talk to them?	**.089**	.675

27 IMM - How often do you tell others that you feel close to them?	**.243**	.665
28 ENV - How often do you feel that you accomplish what you want to in your conversations?	.371	.657
29 ENV - How often can you persuade others to share your perspective?	**.162**	.672
30 ENV - How often do you have difficulties convincing others to do what you want them to do? (R)	**.245**	.664

4.7.3 Cronbach alpha on ICCS_MT

Data from 28 completed ICCS_MT questionnaires were used in the Cronbach alpha calculation to reveal flaws in the construct of the ICCS_MT. The overall Cronbach alpha on the ICCS_MT questionnaire is α=.890. The value indicates a "good" consistency on the overall scale. It is therefore possible to confirm the hypothesis of the Cronbach alpha value of internal consistency on the ICCS_MT items being interrelated and interchangeable (α =.70 - .90).

The "Corrected Item-Total Correlation." column in Table 62 displays the individual items' Pearson's "r" correlation with the overall score. Six questions (10,11,13,18,22,25) correlate with the overall score with a Pearson's "r" value below .3 (A limit defined by Field (2005) to help indicate problematic items). This means that these items have to be revised.

The values in column three in Table 62 indicate what would happen to the overall Cronbach alpha if the item were deleted. If the six items (10,11,13,18,22,25) that, if they were deleted, would increase the Cronbach's alpha, were removed from the ICCS_MT, the overall Cronbach alpha would increase from .890 to .921.

Table 62 Cronbach alpha's on ICCS_MT items

	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
1 DIS - Did the participant's music express who he/she really is?	.405	.888
2 DIS - Did you 'understand' the participant's music?	.606	.884
3 DIS - Did the participant reveal emotions in the music?	.732	.880
4 EMP - Did the participant understand the emotion the therapist played?	.490	.886
5 EMP - Did the participant have troubles understanding the feelings the therapist played?(R)	.351	.889
6 EMP - Did the participant make an effort to be compassionate in the music?	.534	.885
7 SOC - Did the participant seem comfortable playing music together with you?	.685	.883
8 SOC - Did the participant seem relaxed when you played music together?	.600	.884
9 SOC - Did the participant seem insecure playing music with a unfamiliar person? (R)	.559	.884
10 ASS - Did the participant react musically on things that seemed to annoy in the music?	-.008	.896

11 ASS - Did the participant have trouble being independent in the music?(R)	.163	.894
12 ASS - Did participants create own musical space?	.607	.883
13 ALT - Did the participant play more than listen?(R)	-.289	.902
14 ALT - Did you and the participant's music complement each other?	.574	.885
15 ALT - Did you experience the participant being present when you played?	.337	.889
16 INT - Was the participant's music flexible and varied?	.718	.882
17 INT - Did the participant both give space and take charge in the music?	.451	.887
18 INT - Did you notice something that were not expressed in the music?	-.303	.898
19 EXP - Was it in the participant's music noticeable how he/she feels?	.644	.882
20 EXP - Was it difficult for the participant to musically communicate and express how he/she feels?(R)	.676	.882
21 EXP - Did you experience the participant as being good at musical expression?	.654	.882
22 SUP - Did the participant support the musical ideas of the therapist?	.161	.892
23 SUP - Did you and the participant maintain an equal relationship?	.541	.885
24 SUP - Did you sense compassion and warmth in the participants music?	.612	.883
25 IMM - Did you feel the participants care?	.126	.894
26 IMM - Did the participant adapt his/her music to music of the therapist?	.373	.888
27 IMM - Did you experience closeness from the participant	.522	.886
28 ENV - Did the participant express what he wanted in the music?	.664	.882
29 ENV - Did the participant influence the therapist to follow musical ideas?	.443	.887
30 ENV - Did the participant have problems drawing the therapist into own musical space?(Rev)	.581	.885

4.7.4 Cronbach alpha on ICCS_MTP

Data from 28 completed ICCS_MTP questionnaires were used in the Cronbach alpha calculation to reveal flaws in the construct of the ICCS_MTP. The overall Cronbach alpha on the ICCS_MTP questionnaire is α=.933. The value indicates an "excellent" internal consistency on the overall scale. It is therefore possible to confirm the hypothesis of the Cronbach alpha value of internal consistency on the ICCS_MTP items being interrelated and interchangeable (α =.70 - .90).

In Table 63, the "Corrected Item-Total Correlation." column displays the individual items' Pearson's "r" correlation with the overall score. Five questions (8,9,11,13,18) all correlate with the overall score with a Pearson's "r" value below .3 (A limit defined by Field (2005) to help indicate problematic items). This means that these items have to be revised for future use.

The values in column three in Table 63 indicate what would happen to the overall Cronbach alpha if the item were deleted. If the five items (8,9,11,13,18) that, if they were deleted would increase the Cronbach's alpha, were removed

from the ICCS_MTP, the overall Cronbach alpha would increase from .933 to .957.

Table 63 Cronbach alpha's on ICCS_MTP items

	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
1 DIS - Did your music express how you felt? ?	.630	.930
2 DIS - Did you experience, that your music was understood?	.815	.928
3 DIS - Did you reveal your emotions in your music?	.731	.929
4 EMP - Did you understand the conditions the therapist expressed in music (follow exercise)? ?	.587	.930
5 EMP - Did you have difficulties understanding the feelings that the therapist played? (Rev)	.667	.929
6 EMP - Did you make an effort to be compassionate in the music?	.764	.928
7 SOC - Were you comfortable playing music with the therapist? ?	.456	.931
8 SOC - Did you feel relaxed playing music?	**.260**	**.934**
9 SOC - Do you feel insecure when you play music with people you don't know? (Rev)	**-.023**	**.936**
10 ASS - Did you react musically to things that annoyed you in the music?	.611	.930
11 ASS - Did you have difficulty in achieving independence in the music? (Rev)	**.135**	**.938**
12 ASS - Were you able to establish your own musical space?	.383	.932
13 ALT - Did you play more than listen? (Rev)	**-.080**	**.938**
14 ALT - Did yours and the therapists music complement each other?	.821	.927
15 ALT - Did you have a sense of being present while playing?	.746	.928
16 INT - Was your music flexible and varied?	.810	.927
17 INT - Did you both give space and take charge, playing music?	.835	.927
18 INT - Did you notice something that was not expressed in the music?	**-.456**	**.941**
19 EXP - Was it noticeable in your music how you feel?	.831	.928
20 EXP -Was it difficult to communicate and express what you feel in the music? (Rev	.844	.927
21 EXP - Did you experience being good at expressing yourself through music?	.754	.928
22 SUP - Did you follow the musical ideas of the therapist?	.633	.929
23 SUP - Did you and the therapist maintain an equal relationship?	.582	.930
24 SUP - Do you think that the therapist sensed compassion and warmth in your music?	.791	.927
25 IMM - Do you think the therapist felt your care?	.730	.928
26 IMM - Did you adapt your music to the music of the therapist?	.476	.931
27 IMM - Did you experience closeness towards the therapist?	.703	.928
28 ENV - Did you express what you wanted in the music?	.554	.931
29 ENV - Were you able to draw the therapist into your musical ideas?	.506	.931
30 ENV - Was it difficult to draw the therapist into your musical space?(Rev)	.636	.930

4.7.5 Cronbach alpha on ICCS_MusRat

Data from 28 completed ICCS_MusRat questionnaires were used in the Cronbach alpha calculation to reveal flaws in the construction of the ICCS_MusRat. The overall Cronbach Alpha on the ICCS_MusRat questionnaire is α=.902. This value indicates an "excellent" consistency on the overall scale. It is therefore possible to confirm the hypothesis of the Cronbach alpha value of internal consistency on the ICCS_MusRat items being interrelated and interchangeable (α =.70 - .90).

In Table 64, the "Corrected Item-Total Correlation." column displays the individual items' Pearson's "r" correlation with the overall score. Six items (1,8,10,11,12,15) correlate with the overall score with a Pearson's "r" value below .3 (A limit defined by Field (2005) to help indicate problematic items). This means that these six items need further revising.

The values in column three in Table 64 indicate what would happen to the overall Cronbach alpha if the item were deleted. If the four items (8,10,11,12) that, if they were deleted would increase the Cronbach's alpha, were removed from the ICCS_MusRat, the overall Cronbach alpha would increase from .902 to .922.

Table **64 Cronbach alpha's on ICCS_MusRat items**

	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
1. Dis - Was the participant's music congruent with body language? (free)	**.250**	.902
2. Dis - Did you experience clarity/focus in the participants' music? (dialog)	.672	.896
3. Dis - Did the participant seem to reveal emotions in the music? (free)	.420	.900
4. Emp - Did the participant match the rhythm of the therapist? (follow)	.527	.898
5. Emp - Did the participant have difficulty matching the musical style of the therapist? (follow) (Rev)	.700	.894
6. Emp - Did the participant give musical signals of understanding (copy, mirror, develop)? (dialog)	.692	.894
7. Soc -Did the participant seem comfortable?(free)	.461	.900
8. Soc - Did the participant seem relaxed in the shared music making? (hold on)	**-.074**	**.907**
9. Soc - Did the participant seem insecure playing music with the therapist?(dialog) (Rev)	.308	.901
10. Ass - When the therapist was challenging in the shared music, did the participant maintain playing phrase? (hold on)	**.110**	**.905**
11. Ass - Did the participant get affected musically by challenging playing of the therapist?(hold on) (Rev)	**.036**	**.908**

12. Ass - Did the participant establish musical independence? (hold on)	**.157**	**.904**
13. Alt - Was the participant primarily into own music?(dialog) (Rev)	.429	.900
14 Alt - Did the participant's music accompaniment/ relate to the therapist's?(dialog)	.654	.896
15. Alt - Did the participant seem concentrated and focused? (hold on)	**.276**	.902
16. Int - Did the participant play in a flexible and varied way?(dialog)	.743	.893
17. Int - Did the participant develop ideas in the music?(dialog)	.443	.900
18. Int -Did the participant respond to changes in the music?(free)	.591	.897
19. Exp - Did the participant's musical expression seem clear?(free)	.470	.899
20. Exp - Did the participant seem "stiff" in matching the therapist's music?(follow) (Rev)	.636	.896
21. Exp - Did the participant seem to be good at expressing him/her self musically?(follow)	.554	.897
22. Sup - Did the participant's music relate to the musical output of therapist?(free)	.478	.899
23. Sup - Did the participant intend to keep an equal supporting relationship in their music making?(free)	.665	.895
24. Sup - Did you experience a feeling of interpersonal warmth coming from the participant?(free)	.697	.895
25. Imm - Did the participant seem willing to participate in the improvisation?(follow)	.456	.899
26. Imm - Did the participant look at the therapist? (follow)	.324	.902
27. Imm - Did the participant seem attentive to the music of the therapist?(free)	.517	.898
28. Env - Did the participant seem satisfied with own musical output?(Dialog)	.560	.898
29. Env - Did the therapist pick up and use the participant's musical ideas?(dialog)	.343	.901
30. Env - Did the participant have difficulties signaling his/hers intentions? (dialog) (Rev)	.640	.896

Next chapter is a discussion of the results presented in this chapter.

Chapter 5 – Discussion

The main purpose of this study has been to examine whether 20 music therapy sessions in neurological rehabilitation have an effect on interpersonal communication competencies (ICC) in everyday life and in musical interactions, as compared to standard rehabilitation alone. In addition, the purpose has been to reveal correlation in interpersonal communication competencies in music and daily life. A secondary purpose of the study has been to develop a research protocol that, in a consistent and reliable way, assesses ICC in music and everyday life. A third purpose has been to develop an Improvisation Assessment Profile Protocol that reveals information about the participant's communicative musicality.

This chapter starts with a summary of the main findings followed by a section where the results are related to the previous research and literature referred to in Chapters 1 and 2. The last sections are a discussion of study limitations, choice of intervention, research design, methods, and analysis. The clinical applicability of the individual parts of the research protocol are discussed, as well as recommendations for future research.

5.1 Summary of findings

Before the first intervention, the two randomized groups only differed statistically in the variance of physical and psychological needs. Otherwise, the two groups were comparable on all measures.

A repeated measures ANOVA with Greenhouse-Geisser correction determined that the mean of ICC in everyday life, as measured by staff and relatives, did not differ statistically significantly between treatments (music therapy + standard rehabilitation and standard rehabilitation alone). Results from the participants' own evaluation of ICC in everyday life show the same result. The effect-size value on the overall ICCS_SR scale indicated a "medium" effect of music therapy on everyday ICC. The effect-size value on the ICCS_SR subscale 'Self-disclosure' indicated that music therapy had a very large (positive) effect on everyday self-disclosure competencies. The effect-size values on the ICCS_SR subscales "Social relaxation" and "Environmental control" indicated a medium (positive) effect of music therapy on those everyday competencies. The effect size calculation on the ICCS_SR subscale "Altercentrism" also revealed an (unexpected) positive effect of standard rehabilitation on this competence.

There was a significant positive development in the assessing music therapists' evaluation of participants' ICC in music, pre/post the 20 music therapy sessions. The results suggest that the participants' ICC in music increased significantly from pre to post music therapy on the total score and on the subscales: Self-disclosure in music; Social relaxation in music; Assertiveness in music; and Expressiveness in music. Generally, the effect sizes on the music

therapist evaluation of ICC in music were high. The results indicated that the music therapist performing the assessments experienced that the music therapy participants became more relaxed in the musical exercise and, in addition, increased self-disclosure, assertiveness, and expressiveness in the musical improvisations.

Results from the blinded raters' evaluations of the participants' performance in the four assessment exercises pre/post music therapy, showed no significant difference on the total ICCS_MusRat scale. The results suggest that the participants' ICC in music did not change significantly from pre to post music therapy. The effect size value on the raters' evaluation of the subscale "Immediacy in music" reached a medium level. The effect size values on the two subscales "Social relaxation in music" and "Interaction management in music" almost reached medium level.

Results on the participants' evaluation of own ICC in music right after the four assessment exercises showed no significant difference on any scale pre/post music therapy. The results suggest that the participants did not experience that their ICC in music developed between pre music therapy and post music therapy.

Results on the effect of 20 music therapy sessions on communicative musicality (as measured with the IAP) showed no significant development. The development in the median of the four IAP scores (Volume, Rhythmic ground, Tonal/melodic, and Phrasing), pre/post music therapy, suggested that the participants, post MT, had become more of a partner in establishing volume, tonal and melodic stance, and in defining phrases. The results also suggested (though the effect was not significant) that the participants generally had become more of a leader in establishing rhythmic ground.

A correlation analysis of ICC in music and ICC in daily life revealed that, on the total score and five subscales (Empathy, Assertiveness, Altercentrism, Expressiveness, and Supportiveness), the staff/relative evaluation of ICC in daily life correlated significantly with the music therapist's evaluation of the participants' ICC in music. This result indicates a relationship between some aspects of musical and everyday life communication competencies. In addition, the blinded raters evaluation of ICC in music correlated with the staff/relative evaluation of ICC in everyday life, on the subscale 'Expressiveness'. This result indicates a modest relationship between the ICC of musical and everyday life. The two tools measuring ICC in music had a high level of correlation. The blinded musical rater evaluation of the participants' ICC in music correlated significantly with the music therapist evaluation of the participants' ICC in music on the total score and on seven subscales (Self-disclosure, Social relaxation, Assertiveness, Altercentrism, Expressiveness, Immediacy, and

Environmental control). This result indicated that the tools were measuring the same construct, which increases the validity of them both.

The Bland and Altman plot on the two rater's ICCS_MusRat_total scores showed that differences in ratings were within limits. The weighted Cohen's kappa analysis of the ICCS_MusRat showed that the raters were in "moderate" agreement on the total scores.

The Bland and Altman plot on the IAP scorings showed that differences in ratings were almost within limits. A Cohen's weighted Kappa calculation on the raters' agreement on the four IAP Autonomy profiles, showed that the raters agreed more when rating the participants' autonomy in Rhythmic ground and Phrasing than when rating Volume and Tonal/melodic autonomy.

A factor analysis of the ICCS_SR data revealed that the 30 questionnaire items could be grouped into six meaningful subscales: 1) Emotional immediacy; 2) Assertiveness; 3) Verbal and environmental control; 4) Social relaxation, management, and openness; 5) Empathic understanding and supportiveness; 6) Altercentrism and self-disclosure.

All the new ICCS scales developed for the study were tested for internal consistency using Cronbach's Alpha calculation. The overall Cronbach's alpha on the:

- ICCS_SR questionnaire indicated a "good" internal consistency.
- ICCS_Par questionnaire indicated a "questionable" internal consistency.
- ICCS_MT questionnaire indicated a "good" internal consistency.
- ICCS_MTP questionnaire indicated an "excellent" internal consistency.
- ICCS_MusRat tool indicated an "excellent" internal consistency.

On all scales, there were items that did not correlate with the overall score and items that, if they were deleted, would increase the overall Cronbach alpha.

5.2 Discussion of findings

This section is a discussion of the findings in Chapter 4. It will relate the findings of the present study to the definitions presented in Chapter 1 as well as to the research literature and research questions presented in Chapter 2.

5.2.1 Independent variables

Before interventions commenced, there were statistical differences in the variance of physical and psychological rehabilitation needs in the two intervention groups. The differences in variance of physical needs had the consequence that the physical music therapy exercises were not exactly the same in both groups. In addition, the design and development of the physical exercise was adjusted to match the capability of the group members. The

differences in variance in psychological needs did not have any consequence for how the group activities were performed, but they did affect the communication style of the music therapist. Group members with greater psychological needs were in some degree "protected" and not confronted as directly as the more psychologically stable group members were.

Participant G's additional brain injury is a confounding variable that may have affected the results of the study. Interestingly, Participant G's ICC in everyday life remained steady as his rehabilitation needs increased at time-point three (after additional injury). At time-point forur (post std.rehab.) his ICCS_SR score was 21.5 points lower than in the previous measurement. This development could indicate two things: Either Participant G's ICC in everyday life had decreased dramatically during standard rehabilitation, or staff/relatives needed some time to adjust their experience of Participant G's ICC, post his additional injury. Since Participant G's additional injury appeared during the wash-out period, it did not influence the effects of treatments, and his data was therefore included. On the other hand, Participant G's additional brain injury is a confounding variable that has possibly affected the ICCS_SR results in relation to the effect of standard rehabilitation.

Another event that may have influenced the study was caused by the administration at Høskoven. Half way through Group II's music therapy course (session 10) Høskoven administration made a financial decision to terminate the music therapy department. There was therefore, no daily music therapist left at the institution. Even though the clinical music therapist intended to keep sessions as usual, the participants frequently brought up the subject of the dismissals during the last sessions.

5.2.2 Effect of music therapy

This study has aimed to measure the effect of 20 music therapy sessions on ICC in music and everyday life. Only the ICC evaluations from the music therapist performing the assessments indicated a statistically significant effect of music therapy on ICC in music. The lack of significant results can have several explanations. Firstly, the sample size is low, which means that the effect of music therapy had to be large and general in order for it to reach a statistically significant level. However, even if the results had been significant, it would still have been problematic to generalize findings to the ABI population using such a small sample size. Secondly, seven of the eight participants who completed the study had all previously received music therapy. These seven participants may already have benefitted from music therapy and even reached their optimal level of ICC as a result of music therapy. Thirdly, all participants received a standard rehabilitation offer that includes both physical training and creative activities, which could have diluted the effect of music therapy. Finally, the participants had all suffered from ABI, which inevitably affects the person's ability to develop skills and competencies. Consequently, 20 music therapy

sessions may have been too few in order to significantly change ICC in this study's participants.

In this section, the effect of music therapy is discussed in relation to the different measures used to investigate the effect. First the assessing music therapist, then the blinded raters, followed by staff/relatives, and finally the participants. The results are viewed in relation to previous research and findings.

5.2.2.1 Assessing music therapists' evaluation of the effect of music therapy
The assessing music therapists' evaluation of the participants' ICC in music was the only measure which indicated a significant effect of music therapy. Since the music therapist performing the assessments was not blinded to treatment, it is difficult to evaluate whether the positive development in the participants musical ICC is due to music therapy or reflects the assessing music therapists' preconceptions. In the literature review, several studies on the interpersonal interaction of people with ABI in music therapy have depended upon the music therapists' evaluation of the interaction (Barker & Brunk, 1991; S. Gilbertson & Aldridge, 2008; Nayak, et al., 2000). The music therapists' perspective is interesting since it is a first-hand report on the actual interaction, but the measure also implies serious reliability problems. Therefore, it is problematic to let the therapist measurement stand alone as the only outcome measure.

Another noteworthy issue is that the two intervention groups show differences in development of ICC in music. The first MT group's mean (Group I) increases by approximately five points whereas Group II's mean increases by approximately fifteen points (see page 173). The two groups had similar pre MT mean scores on ICC in music, but Group II's scores increased three times as much as those of Group I. One explanation offered is Participant J (12)'s large change in scores at the post music therapy assessment. Another explanation for the remarkable improvement in Group II could be that that the last assessment was performed after the music therapist had been dismissed from Høskoven.

Nevertheless, the assessing music therapists' evaluation of ICC in music resulted in a significant change pre/post 20 music therapy sessions on the ICCS_MT total score and the subscales: Self disclosure in music; Social relaxation in music; Assertiveness in music; and Expressiveness in music. The development in ICC in music can also be explained within the theoretical framework, i.e. that musical interaction affects ICC in music such as assertiveness and self-disclosure. The finding is in conjunction with the findings of Gilbertson (2006), who also focused on interaction in music and found that the participants changed from showing isolated and idiosyncratic behavior towards conventional and intergraded behavior in the musical improvisations.

5.2.2.2 Blinded raters evaluation of the effect of music therapy

The blinded rater tools (ICCS_MusRat and IAP) were included as a way of "objectively" assessing ICC in music. The blinded raters' scores support the music therapists' evaluation of the participants' ICC in music shown by the correlation of the two tools. However, the development in the blinded raters' evaluations was not as "positive" as the music therapists'. That the raters' results did not reach statistical significance, is probably due to the small sample size. The effect size values on the raters' scoring indicated a "small" effect of music therapy. The effect size on the "Immediacy in music" subscale reached a "medium" level. Immediacy in music has to do with being approachable and available for musical interaction in "free improvisation" and "follow-the-therapist improvisation". In addition, the effect sizes on the subscales "Social relaxation in music" and "Interaction management" in music almost reached medium level. The "Social relaxation in music" subscale has to do with the degree of anxiety and the feeling of comfort while playing in the "free improvisation" and the "dialogue improvisation". The "Interaction management in music" subscale has to do with ritualistic procedures like taking turns, phrasing, starting and ending, playing flexibly and varied, and coming up with ideas in the "dialogue improvisation" and the "free improvisation". Based on the effect sizes it seems reasonable to state that the blinded raters experience an increase in the participants' ICC in musical improvisation. The result of the video analysis is in conjunction with that of Purdie et al. (1997) who found small but non-significant improvements in musical behavior after 12 music therapy sessions.

The blinded raters also performed an IAP autonomy analysis to establish whether the music therapy had an effect on the communicative musicality elements: pulse, quality, and phrasing (Rhythmic ground, Volume, Tonal/melodic ground, and phrasing) – see Section 2.7.2. There were no significant developments on the IAP autonomy scores from pre to post music therapy. There were some interesting tendencies, however. The decrease in autonomy on the volume, phrasing and tonal/melodic ground scores indicated that the participants had become better at "partnering" with the music therapists in those scales, whereas the tendency towards increased autonomy in rhythmic ground indicated that the participants had improved their autonomy in leading/defining the rhythmic ground.

This result of moving towards a leadership role is in agreement with Barker and Bunk (1991) who found that patients moved from a passive role in the group to one of helpful leadership.

From a communicative musicality perspective, the tendency of movement towards a more partnering role in phrasing, volume, and tonal/melodic ground can be interpreted as an increase in communicative musicality competencies.

The rhythmic ground score development indicates an increase in leadership competencies in communicative musicality.

5.2.2.3 Staff and relatives' evaluation of the effect of music therapy
The effect size values and the descriptive statistics indicated an effect of music therapy that did not become evident in the ANOVA and pairwise comparison on the ICCS_SR data. The absence of a significant effect of music therapy treatment could either be due to the Hawthorn effect or the low sample size.

Staff and relatives' evaluation of ICC in everyday life at time-point one and time-point two indicated that both standard rehabilitation and music therapy had a positive effect on ICC. The positive effect of both conditions can be explained with the Hawthorne effect, namely the circumstance where participants improve the behavior that is being experimentally measured simply in response to the fact that they know they are being studied – and not as a response to the experimental treatment (McCarney, et al., 2007). The Hawthorne effect and placebo effect are almost the same, but can be discriminated by the fact that a placebo involves a change in treatment. In this study, the standard rehabilitation meant that nothing was changed except that the participants' ICC in daily life was measured, which advocates the Hawthorne effect. In addition, the participants and staff/relatives were not blinded to the purpose of the study. At time-point three (after the wash-out period), participants in Group I continued to increase their everyday ICC as measured by staff/relatives, whereas Group II's everyday ICC dropped to the baseline level. This development can be interpreted as Group I continuing to improve in ICC after music therapy, while the Hawthorn effect in Group II is declining. At time-point four, Group II (post-MT) showed an increase in ICC again.

The effect size values on the "Self-disclosure" subscale indicated that music therapy had a very large (positive) effect on everyday self-disclosure competencies. The clinical music therapy involved playing and singing both as accompaniment and as a soloist. Participants were encouraged to reveal intra-psychic material both in narratives and musically. When engaging in solo playing, the instruction was that, in order to make the music significant to the listener, it had to be significant for the performer – meaning that the participants were encouraged and instructed to be present, to live and feel the music they were making. The results suggest that the verbal and musical openness in the music therapy setting may have transferred to everyday settings (cf. theoretical framework) and affected the participants' ability to self-disclose. This finding is in line with Barker and Bunk (1991) who found that the participants improved at expressing personal matters after two years of music therapy.

The effect-size values on the ICCS_SR subscales "Social relaxation" and "Environmental control" indicated a medium (positive) effect of music therapy and an unexpected large effect size of standard rehabilitation on the subscale "Altercentrism". The music therapy groups worked together towards the performance – a goal of which all group members were aware, and all members had a common interest in producing the best possible result. Therefore, most conflicts were solved in a cooperative way where everybody expressed their needs (e.g. conflicts could be about the drums being too loud, or who was to play the keyboard, kaozilator, or sing backup etc.). The positive development in the "Environmental control in everyday life" could be explained by looking at the competencies rehearsed in those situations. Being exposed to, and coping with, the other group members may have rehearsed "Social relaxation" competencies. The effect size results on standard rehabilitation having an effect on Altercentrism could be due to carryover from music therapy, since Group I's mean scores kept increasing on that scale at all time points. Group II's Altercentrism mean scores finished at the same level as they started - but with an increase after standard rehabilitation and a decrease after music therapy.

5.2.2.4 Participants' evaluation of the effect of music therapy

The participants have self-rated their ICC in everyday life and musical improvisation. The only significant result is that the participants rated empathy in music equally, pre and post music therapy. On the everyday-life ICCS scores, there were no predictable developments in the participants' own evaluation of ICC. The non-systematic differences in time-point one (pre-treatment) scores make it difficult to assume that any development in the scores is due to treatments and not to other factors (such as differences in cognitive skills, self-regard, self-awareness, self-honesty, etc.). The differences in participants' self-evaluation could also be due to participants' "tiredness" or "awareness" on the day of questionnaire collection. In Group I, there is a very small negative effect of music therapy that could be due to the music therapy treatment making the participants more aware of their own ICC – resulting in a more realistic evaluation. I believe that the inconsistency in scores is primarily due to cognitive impairments in the participants. However, cognitive impairments were not a problem in the study by Dahlberg et al (2007) where participants' self-evaluation on the Social Communication Skills Questionnaire-Adapted revealed an effect of the social skill training (the intervention). Therefore, the ICCS_Par and ICCS_MTP might have been too complex for the people with cognitive impairments.

5.2.2.5 Summary of the discussion of the effect of music therapy

When accumulating the effect size values from staff/relative and music therapist scores on the "Self-disclosure" subscale it seems reasonable to suggest that the music therapy as performed at Høskoven had an effect on self-disclosure competencies in both music and everyday life. It has already been suggested that the sharing of personal materials in the groups affected self-

disclosure competencies such as being open and revealing personal material to others.

An explanation to why it is primarily self-disclosure competencies that are affected by music therapy could be that self-disclosure competencies do not depend on cognitive or physical skills. Self-disclosure competencies depend more on psychological competencies such as trust and self-worth and the willingness for risk taking and vulnerability (Rubin & Martin, 1994). Most of the other ICC competencies, as defined by Rubin and Martin (1994), depend highly on cognitive skills such as verbal and nonverbal encoding (Expressiveness), attentiveness when following the ritualistic form in communication (interaction management), attentiveness and flexibility towards others (altercentrism), and the ability to have meta-perspective in solving interpersonal problems in a cooperative manner (environmental control).

When comparing the effect size values on ICC in music from the blinded raters' and the music therapists' evaluations, the results indicate that music therapy had an effect on immediacy competencies in music. This result indicates that the participants improved in nonverbal musical behaviors such as: facing the other; direct eye contact; open stance; pleasant facial expression; and conveying a feeling of interpersonal warmth in the music. The music therapy group format and activities involved support such an effect.

Both the music therapist and blinded rater effect size values on "Social relaxation in music" and the staff/relative effect size on "Social relaxation in everyday life" subscales indicate a medium to large effect of music therapy. Social relaxation has to with feeling comfortable and having a low level of apprehension in the interaction. The intensive group process of preparing for a concert could reasonably have increased the participants' ability to handle other group members' negative reactions or criticism, without stress. Therefore, it seems reasonable that the group music therapy had an effect on social relaxation.

Both the music therapist performing the assessments and the blinded rater effect size values on "Interaction management in music" indicated a small to medium effect of music therapy. Interaction management in music has to do with the ability to take turns, and to start and end the improvisation. In addition, the participant's ability to play flexibly and varied, to come up with ideas in the musical dialogue, and the ability to perceive changes in the music, were rated. In all sessions there were parts where the participants took turns to be the caller in a call-response exercise on different instruments. This could reasonably have increased the participants' ability to take turns, play more flexibly and varied, perceive changes and come up with new ideas. In addition, the repeated rehearsal of songs where the participants took turns improvising could also have affected their interaction management competencies in music.

Some aspects of the theoretical framework of ICC transcending from musical to everyday interaction as presented in Section 1.7 have been confirmed. However, further studies with a larger sample size are required in order to confirm the hypothesis.

5.2.3 Correlation of interpersonal communication competencies in music and everyday life

The five ICCS measurements were constructed to enable a comparison of musical and everyday communicative competencies. An important assumption in this discussion is that the 15 analyzed participants are representative for the ABI clientele with medium to severe ABI. The correlation analysis reveals that there were similarities in how the music therapist experienced the participants' ICC in the music therapy setting and how staff and relatives experienced the participants ICC in everyday interactions. The assessing music therapist and staff/relative ICCS scores correlated significantly on the total score and on the empathy, assertiveness, altercentrism, expressiveness, and supportiveness subscales. That the participants are perceived alike in both everyday life and music therapy on the five subscales, can have three explanations:

- The five subscales represent the most general constructs of ICC that transcend across types of interactions (hypothesis confirmed).
- The five subscales correlate because the questionnaire is constructed in order to reveal a correlation (Type II error)
- The music therapist performing the assessments had knowledge of the participants from outside the therapy room. Ratings of ICC in music by the music therapist could therefore have been influenced by that knowledge which would increase the correlation (Type II error).

There are five ICC subscales for which the staff/relatives and music therapists' scores do not correlate (Self-disclosure, Social relaxation, Interaction management, Immediacy, and Environmental control). One explanation could be that the music therapy setting enabled the participant to perform better on these ICC subscales (the participants' ICC in music scores are generally higher on these subscales), which would eliminate correlation with ICC in daily life. The reason why the participants communicate better in music than in daily life could be that the five ICCS subscales in daily life depend highly on verbal encoding and decoding abilities; abilities that are often affected by ABI.

The blinded rater evaluation of ICC in music is the only "true" measure of the participants' musical interaction, as compared to the music therapist, whose ICC ratings were possibly influenced by their interaction with the participants between the improvisation exercises. Therefore, the raters' evaluations are a more genuine measure of the participants' ICC in music. The only significant correlation detected between the ratings of ICC in music, and staff/relative evaluations of ICC in everyday life, is on the expressiveness scale. This finding

is in agreement with Burgoon and Bacue (2003), who found that the ability of nonverbal expressivity is relatively stable across situations (Section 1.3).

5.2.4 Interrater reliability on the ICCS_MusRat and IAP

The raters used two tools to evaluate the participants' ICC in music (ICCS_MusRat and IAP_autonomy). In total, 28 assessment sessions (dialogue, follow, hold on, and free improvisations) were rated. In the ICCS_MusRat, the raters assessed how much the interactional features showed in the whole music clip (a lot, some, not at all etc.). Whereas in the IAP, the raters assessed what role the participants had in the music clip, every ten seconds. In the ICCS, the rater had to consider the whole improvisation, whereas in the IAP, they only had to concentrate on ten seconds. The IAP is therefore more detailed than the ICCS_MusRat. Both Bland and Altman plots and Cohen's Kappa were produced to evaluate the raters' agreement on the ICCS_MusRat and IAP. In this discussion, the focus will be on Cohen's Kappa.

5.2.4.1 Interrater reliability on ICCS_MusRat

The weighted kappa coefficient on the overall ICCS_MusRat score indicated a moderate agreement between the raters. In 22 of the ICCS_MusRat items, the raters agreed moderately or better. The discussion here will focus on the eight items about which the raters only had slight or fair agreement, according to the achieved Kappa coefficient. Four items had slight agreement:

- q 8. Did the participant seem relaxed in the shared music making? (hold on)
- q 15. Did the participant seem concentrated and focused? (hold on)
- q 28. Did the participant seem satisfied with his own musical output? (dialog)
- q 29. Did the therapist pick up and use the participant's musical ideas? (dialog)

and four items had fair agreement:

- q1. Was the participant's music congruent with body language? (free)
- q2. Did you experience clarity/focus in the participants' music? (dialog)
- q7. Did the participant seem comfortable? (free)
- q25. Did the participant seem willing to participate in the improvisation? (follow)

The low kappa coefficient indicates that the raters comprehended the rated qualities (relaxation, concentration, satisfaction with own output, musical mirroring, body language, clarity, comfort, and participation) in music differently. Too little training in using the ICCS_Mus_Rat could be the cause of this disagreement. When comparing items that have a low kappa with the high-kappa score items, there do not seem to be any characteristics that can explain the kappa difference. No matter what the explanation might be, it is now established that the raters only agree slightly or fairly on the eight items and the items therefore need further attention before any additional use of the

ICCS_MusRat. Solutions could include further training of the raters or a reformulation of the items.

5.2.4.2 Interrater reliability on IAP

The weighted kappa coefficient on the two raters' IAP scores suggest that the raters agreed substantially in rating the participants' autonomy in regards to Rhythmic ground and Phrasing. On the Volume profile, the raters' agreement was moderate and on the Tonal/melodic ground profile it was fair. The Improvisation Assessment Profile has so far primarily been used in the microanalysis of improvised music (Wosch & Wigram, 2007) and it has not been possible to locate any Cronbach alpha results on IAP profiles in the literature. Jacobsen (2012) constructed another way of calculating Autonomy Scores, "[…] as an expression of how well the child and parent follow each other, and controls for the case in which the parent leads much more than he or she follows"(Jacobsen, 2012, p136). Jacobsen reports Pearson's r on two raters' IAP scores ($r=.855$, $p < .001$, 2-tailed). The results in Jacobsen (2012) and this study indicate that it is possible to make reliable IAP assessments of free improvisations.

5.2.5 Internal consistency in the newly develop ICCSs

The five ICCS tools developed for this study all had a relatively high overall Cronbach Alpha, which is comparable with the Cronbach alpha Rubin and Martin (1994) found on the original ICCS (.86).

Items affecting the internal consistency have been identified and a further revision of some of the items is required. E.g., item 11 (about having problems in being independent) affected the internal consistency across all five questionnaires. The internal consistency problem could be due to the fact that independence is difficult to assess and rate. Alternatively, the reversed coding (where focus is on the problem and not on the competence) of the item could be the origin of the internal consistency problem. Also, item 13 (about taking too much space, as opposed to altercentrism) accounted for internal consistency problems in all scales but the ICCS_MusRat. Again, the item is reverse coded, which could be the origin of the problem. Another explanation could be that it is not obvious that the question seeks to reveal "self-centeredness", and the respondents are unsure whether they are rating a positive or negative feature. On the two musical ICCS questionnaires filled in right after the musical assessment, item 18 ("Did you notice something that was not expressed in the music?") is also affecting the internal consistency in both questionnaires. Perhaps the wording of this item is not specific enough. It could be replaced with a question focusing on whether the participant primarily perceived details or the overall musical picture. Item 18's wording could then be: "Were you absorbed by details in the music?". The question would then review the participants' ability to perceive the complete musical picture. In the participant version of the ICCS, there were internal consistency problems in 22 of the items.

This high number of items with internal consistency problems indicates that the population has difficulties understanding the items. This fact could lead to reformulation of the questions in order to increase understandability for the ABI population. I would, however, prefer to test the tool on other populations before it is revised.

5.2.6 New subscale construct based on factor analysis

A factor analysis revealed that the 30 ICCS_SR items could be ordered into six meaningful subscales:

1. Emotional immediacy
2. Assertiveness
3. Verbal expressiveness and environmental control
4. Social relaxation, management, and openness
5. Empathic understanding and supportiveness
6. Altercentrism and self disclosure

The six factors give titles to a "real world" construct of ICC based on how staff and relatives experienced the participants. There was some overlap between the constructs/factors (c.f. 4.6.2). Nevertheless, the factors are statistically well defined. The original ten Rubin and Martin (1994) subscales are distributed in a meaningful way within these six "real world" subscales. The analysis does not reveal whether the six "real world" subscales in the ICCS_SR correlate with the remaining four ICCS questionnaires. Because of the low number of collected questionnaires, a factor analysis has not been performed on them. The expectation is that there would be some overlap in how the items distribute into factors for the remaining four ICCS – an issue for future research.

Another interesting result from the factor analysis is that some ICCS_SR factors correlate negatively with each other. E.g. if the participant scores are high on the "empathic understanding and supportiveness" factor, the tendency is that the scores on the "assertiveness", "verbal expressiveness and environmental control", "social relaxation, management and supportiveness" factors go down. In addition, the "verbal expressiveness and environmental control" factor correlates negatively with the "assertiveness" and "emotional immediacy" factors. These findings indicate that some ICC work in opposite directions. Since the six extracted factors are in agreement with the original ten subscales, a correlation matrix on the original ten subscales would give a more detailed picture of opposing ICC. The correlation matrix in Appendix 26 indicates that Environmental control opposes Altercentrism with statistical significance.

5.3 Discussion of research design, methods, and analysis

The applied research design was a randomized AB-BA cross-over design with paired allocation. Data collection methods were:

- Questionnaires on ICC in music and everyday life
- Questionnaires informing on rehabilitation needs
- Improvised musical exercises
- Blinded rating of the music

The clinical method was specifically tailored to address the participants' rehabilitation needs and the goal of performing a concert. Statistical analyses included:

- Repeated measures ANOVA
- Paired t-test
- Pearson's correlation analysis
- Factor analysis
- Cohen's weighted Kappa
- Weighted Chronbach alpha
- Bland and Altman plots

5.3.1 Evaluation of Research design

The crossover design was chosen to counteract the low number of possible participants by enabling a within-participant analysis. If more participants had been accessible, the parallel group design would have been preferred. In the literature review, it is established that a fixed design is most common in research design in functional music therapy. In recent years, cognitive and psychological issues have also been researched using fixed designs. Case studies as well as fixed and flexible research designs have all been applied in music therapy studies on interpersonal interaction in people with ABI.

The crossover design implies that data is being collected over a long period (in this study, a year) making the study prone to participants leaving the study. Two participants did leave the study due to severe illness. In addition, one participant acquired an additional brain injury during the wash-out period.

As mentioned in Section 3.1, the crossover design can cause the problem of carry-over effect. Group I's continuous increase in ICC in daily life post the 'wash out period' indicates such a carry-over effect. A way to work around the carry-over effect problem would be to analyze the data from the first three measurement points as if it was a RCT parallel paired group design with a 3-month follow up.

Even though it is too late now, the Hawthorn-effect issue could have been controlled by collecting ICCS_SR and ICCS_Par questionnaires for both groups, three months prior to first intervention.

Another design feature that would have added valuable information is a follow-up measurement. It would have revealed whether the effects of music therapy were lasting or maybe increasing over time (such as Group I's time-point three data suggests). Initially the plan was to perform a follow-up measurement, but the administration at Høskoven was not interested in contributing further to the study, after the dismissal of the two music therapists.

The initial pairing before randomization was based on descriptive statistics of cognitive and social rehabilitation needs. A more mathematical pairing such as factor analysis would have increased the validity of the pairing.

There are several results that can only be explained by guesswork – such as the Hawthorne effect and the decrease in Group I's own evaluation of ICC in daily life, post music therapy. To answer those questions the research design could have benefited from flexible elements such as staff and participant interviews – thus making it a mixed method design.

5.3.2 Evaluation of data collection methods

The applied data collection methods were inspired by the knowledge gained in the literature review (Section 2.7). The data collection methods were:

- Video recording of four musical exercises (dialogue, follow, hold on, free)
- Blinded rating of musical exercises (questionnaire and IAP)
- Self-administered questionnaire to the music therapist
- Self-administered questionnaires to staff and relatives
- Interview style questionnaire to participants on ICC in everyday life and music

5.3.2.1 Video recording of musical exercise

The same music therapist conducted the four musical exercises in all 28 assessments. The music therapist performing the assessments had practiced the exercise with the researcher (as a participant) and a range of trial assessments with ABI people prior to the commencement of the study. In any interaction, the interactional partner plays an immense role. In this study, it was believed that, by having the same music therapist performing the assessments, the input from the interactional partner would be consistent. However, when looking at the recorded exercise it seems that the music therapist performing the assessments became more comfortable in the musical interaction. When the participants acted unexpectedly, the music therapist's musical reactions became more confident. It is my experience that the music therapist performing the assessments was more confident performing Group II's assessments than she was in performing Group I assessments. The music therapists' musical output is an independent variable that has not been controlled for in this study. This could have been assessed by letting the blinded raters evaluate the music therapist's music and interactional style etc. – a recommendation for future

research. This reflection makes it evident that the change in the participants' ICC in music could be due to changes in either the participant or the music therapist – or both. This discussion reveals a fundamental problem in researching interaction (musical or everyday), namely the problem of duplicating interaction. The first interaction will inevitably affect the following interactions. Both interactional partners will inevitably remember the first and in some way change their interactions accordingly.

Other professional fields of research have initiated structured interactions in order to evaluate interactional competencies of people with ABI (Helffenstein & Wechsler, 1982). The idea of performing four predefined musical improvisation exercises to assess ICC in persons with ABI is a new feature in music therapy research.

The correlation analysis revealed that the music therapist performing the assessments agreed with blinded raters on their rating of the participants' ICC in music, despite very differently formulated items. The finding advocates that the musical exercises reveal "something" that can be measured and that that "something" is likely to be Interpersonal Communication Competencies in Music.

5.3.2.2 Blinded rater questionnaire rating (ICCS_MusRat)

The idea of letting blinded raters evaluate output or interaction is a feature that has previously been implemented in ABI music therapy research (Cohen, 1992; Jungblut, 2005; Peretz, et al., 2006; Purdie, et al., 1997; Sarkamo, et al., 2008; Staum, 1983; Tamplin, 2008; A. H. Thaut, et al., 2007). Purdie et al.'s (1997) study was the only study with blinded rating focusing on interpersonal interaction in people with ABI. In this study, the ICCS_MusRat items were constructed based on an adaptation of the original ICCS Rubin and Martin (1994) items – an approach identical to Prudie et al. (1997) whose initial model was the Behavior Rating Scale. The raters had ten hours of training in using the ICCS_MusRat, which probably reduced the level of discrepancy in their ratings. The raters agree more than moderately on the majority of the items. However, the inter-rater agreement analysis revealed eight ICCS_MusRat items with low agreement.

The feedback from the raters on item 17 ("Did the participant develop ideas in the music?" (dialog)) was problematic, since participants may well have taken initiative without developing anything new (e.g. taking the initiative to go back to something known). We agreed that the item was to be interpreted in relation to stagnation and rigid playing. (E.g. if someone returns to something known a couple of times, they may well be developing ideas).

The feedback from the raters on item 30 ("Did the participant have difficulties signaling his/her intentions?") was that the word "intentions" was problematic.

E.g. if a person intended to imitate, then one could say that his intention was to repeat the therapist. The participant will, in such a situation, repeat the therapist's intentions. We agreed that the item concerned the ability or inability to signal turn-taking/giving, problems defining pauses, playing flutteringly, sporadically, etc. If the participant intended to imitate, and had no problems with it, the rating should be "almost none of the time".

There was feedback from the raters on other items as well, but the above examples give an idea of the thoroughness with which the raters approached the work. If the ICCS_MusRat is to be used by other researchers or music therapists, thorough training and clarification will also have to be done.

5.3.2.3 The IAP (blinded rating and calculating scores)
The idea of letting blinded raters perform IAP ratings has, to my knowledge, only been applied in a newly defended PhD study on parenting competencies by Stine Lindahl Jacobsen (2012). Our methods differ though: Jacobsen (2012) has kept the event-counting procedure, whereas the approach applied in this study is that of time intervals, as inspired by Thomas Wosch (2007).

The calculation of the IAP autonomy per minute score needs some further discussion. The scores applied to the five IAP autonomy roles follow a logical continuum (dependent=-2, follower=-1, partner=0, leader=1, resister=2). Consequently, the results of the IAP autonomy score per minute will lie between -12 and +12 (six dependent (-2x6) vs. six resister ratings (2x6)). None of the participants in this study were rated as the extreme roles that consistently, however. For a participant to have a "normal" level of autonomy in music per minute, the score should lie somewhere around zero. Having looked at the improvisations and the related IAP scores, I would suggest a definition of normal autonomy per minute in music that lies between 1 and 4. It is my experience that participants who score outside this range have issues of autonomy. The participants who performed outside this range are either controlling/resisting/rigid or anonymous/dependent/inactive. Future research where the IAP rating protocol is applied to a normal population will hopefully determine a more valid "normal range" of autonomy per minute in free improvisation.

5.3.2.4 Music therapist questionnaire (ICCS_MT)
As discussed in Section 5.2.2.1, the music therapists' evaluation of the participants' ICC in music gives a firsthand report on the actual interaction, yet the measure implies serious validity problems. In addition, the music therapist questionnaire scores correlated well with the blinded raters' evaluation of ICC in music.

From a clinical perspective, the ICCS_MT could be very useful providing a structured method of collecting the music therapist's experience of the participants ICC. In addition, the high correlation with the blinded raters'

evaluation of ICC gives the tool validity. Since the incorporation of blinded raters are unlikely in everyday practice, the tool could be implemented as a means of collecting participants ICC. Moreover, the feedback from the music therapist performing the assessments was that the ICCS_MT tool was easy to complete.

5.3.2.5 Staff and relatives questionnaire (ICCS_SR)

The method of letting different professional disciplines rate the participants' ICC and rehabilitation needs have been applied previous ABI studies (Braunling-McMorrow, et al., 1986; Dahlberg, et al., 2007; Finset, et al., 1995; Helffenstein & Wechsler, 1982; Johnson & Newton, 1987; Oddy & Humphrey, 1980; Uomoto & Brockway, 1992). However, the staff's professional disciplines may have affected how the staff scored the participants' ICC. For example, a nurse might score differently to a psychologist, since they perceive the participant with a different focus and in different contexts. The rationale behind having several staff members rating was to control for the diversity in the professional focus of the staff. At the same time, some participants' close staff were pedagogues while others' were nurses or psychomotor pedagogues. A statistical analysis of the ICCS_SR data would reveal whether there were professional tendencies regarding the rating of ICC in people with ABI.

5.3.2.6 Participant and music therapy participant questionnaire (ICCS_MTP /ICCS_Par)

The ICCS_MTP was collected right after the assessment sessions. The method enabled the participant to recall the musical performance. The participants also rated their own ICC in everyday life using the ICCS_Par. Both questionnaires were administered as a structured interview. Cognitive deficits in the participants may have affected the reliability of the two questionnaires.

5.3.2.7 Rehabilitation Needs questionnaire (RNQ)

The clinical intervention was guided by the participants' individual rehabilitation needs, informed through the Rehabilitation Needs Questionnaire (RNQ).

The RNQ was constructed to clarify rehabilitation needs that can be addressed within music therapy. In addition, it was to be easily administered, have a set protocol for applicability across all ranges of ABI severity, correspond with researched practices and methods of music therapy in neurological rehabilitation, and generate data that can be analyzed quantitatively.
These construction goals were met and fulfilled. However, since the music therapy practice at Høskoven informed the RNQ item generation, it could be criticized for not corresponding with all methods of music therapy in neurological rehabilitation. I have therefore constructed an RNQ based on the methods described in Baker and Tamplin (2006)'s book "Music therapy methods in neurorehabilitation" (see Appendix 27). The advantage of the

"Baker & Tamplin RNQ" is that it has page references to clinical methods, meaning that it can be used directly as a clinical tool informing which methods to apply.

Rehabilitation services in Denmark are working on implementing WHO's "International Classification of Functioning and Health" (ICF) (Jensen & Møller, 2004). Therefore, the RNQ items have been coordinated with the ICF codes (Appendix 28). In this way, the RNQ could possibly be used as an ICF documentation tool.

5.3.3 Evaluation of the clinical method

The clinical approach involved addressing rehabilitation needs and preparing for a concert performance. In relation to music therapy theory, the focus on rehabilitation needs points at functional music therapy (F. Baker & Tamplin, 2006; Michael H. Thaut, 2005), whereas the goal of working towards a public concert performance points in the direction of Community Music Therapy (Stige, et al., 2010). However, since the community was not involved in the music production, the method cannot be defined as community music therapy. The communication and energy in the music therapy groups revolved around both addressing rehabilitation needs and preparing the concert. The preparation for the concert meant repetitive practice and rehearsals, which in return also had a positive impact on the functional goals.

A feature that may have affected the result of the study is that the sessions were not conducted at the same time of day. Group I's sessions were held in the afternoon whereas Group II's sessions were held in the morning. Consequently, fatigue, arousal levels, etc. could be issues affecting the effect of music therapy.

All sessions lasted approximately two and a half hours, which for some people with ABI, feels like a long time doing the same thing, due to concentration problems or fatigue. Consequently, the activities in the sessions were changed at approximately 15-minute intervals, except when rehearsing songs (though we did change rehearsal song when the energy dipped).

In relation to the participants' individual goal of reducing rehabilitation needs as rated by staff and relatives, the group's mean dropped from pre to post music therapy on the social needs scale, but remained steady on the physical, psychological, and cognitive needs scales. This result indicates that the clinical method only had an effect on staff/relatives experience of the participants' social needs. However, the rehabilitation needs questionnaire results rely on a subjective evaluation by staff and relatives and it is therefore unknown whether tests of physical, cognitive, psychological capabilities would have revealed a physical, cognitive, and psychological effect of music therapy.

Feedback from the participants was very positive. All participants verbally expressed satisfaction with the process and concert. In addition, all expressed a wish for the music therapy to continue.

5.3.4 Evaluation of analysis

All statistical analysis of the effect of music therapy is problematic due to the very low sample size. The crossover design also meant data had to be aggregated based on intervention, in order to perform an ANOVA analysis. Data were pooled by treatment condition. The analysis of the individual groups revealed great variation in the effect of both music therapy and standard rehabilitation at the different time points, which was inconsistent with the hypothesis that music therapy has a greater effect on ICC than does standard rehabilitation (explained by the Hawthorn effect). This inconsistency with the hypothesis made the restructuring of data into ANOVA factors problematic.

The collected video data and the performed IAP analysis could have resulted in a more thorough microanalysis, inspired by Wosch (2007). Such an analysis would have revealed the music therapist's role in the music. The musical role of the music therapist is important since it is clear that even though it was the same music therapist performing the assessments, she did not play exactly the same pre and post music therapy. An analysis of the music therapists' music would have revealed if and how she changed musical output and response. In addition, details on the participants' music could have been analyzed in order to reveal changes in musical output and response. An example of such a microanalysis using the Celemony Melodyne Editor and IAP scores is presented in Appendix 25.

Because of the Hawthorn effect, it would have been interesting to introduce "time point" as a variable in the effect of treatment analysis. However, the small sample size would have made such an analysis pointless.

When eyeballing the data, it appears to show larger variance for higher scores. Hence, a reanalysis of the data, log-transformed, should be considered (Field, 2005).

5.3.5 Limitations of the study

The small sample size is the greatest limitation of present study. The newly developed research tools do also pose a limitation to the study since the results cannot be compared directly with other studies.

In this study 11 persons with mixed types of ABI were enrolled in the randomized part of the study, which is much lower than the sample sizes in other fixed music therapy studies on interpersonal communication (M=37.8) (see Section 2.6.2 for details). In fixed studies on ICC from other clinical fields

than MT, the mean sample size is 18.4 (Std.div=24), which emphasizes this study's small sample size.

Another limitation of the study is that data from the new ICCS questionnaires are not compared with data from other (standardized) questionnaires such as th Neuro Behavioral Rating scale. Such a comparison would have increased the validity of the new ICCS.

5.3.6 Recommendations for future research

Future research should try to accommodate the problems described in the previous sections. Obviously, similar future research should enroll a larger number of participants, based on a power calculation of this study. This study's protocol, in terms of population (>5 years post ABI), design and interventions could be repeated in an Activity Center other than Høskoven. However, it is important the facility has not previously offered music therapy and that standard rehabilitation does not include musical activities. In addition, the facility should be able to provide at least 14 participants (based on power calculations of this study). Another possibility is to repeat this study's ICCS protocol on acute patients in a ward where there is currently no music therapy. Either the parallel group design or the crossover design with randomization of standard rehabilitation/music therapy could be performed in such an acute ABI ward. The music therapy session in an acute ward should be more frequent and of shorter duration due to fatigue issues in the participants.

Since the music therapy literature indicates that music therapy has an effect on ICC in other populations (Stige, et al., 2010), such evidence could be generated if the same study design was performed on a group of non-brain injured people (adolescents, adults, psychiatric patients, etc.) who are expected to have normal cognitive functioning.

Another interesting study for the future is to apply the five ICCS measures on a normal population, in order to reveal whether the correlation of ICC in music and daily life, as revealed in this study, can be generalized to a non-injured population. Such a study would also reveal whether the lack of correlation in ICC in musical and everyday communication on some of the ICCS subscales was due to the participants' ABI.

Yet another possible study for the future is to apply the IAP rating protocol developed for this study on a non-injured population. Such a study would determine a normal range of autonomy per minute in free improvisation. The study should have participants with both musical and non-musical backgrounds. In addition, if a microanalysis was conducted on data from such a study (as in Appendix 25), a "normal" development of "roles" in free improvisation could be generated.

5.4 Clinical applicability

Several researchers argue that interpersonal communication problems following an ABI might be the major challenge in the rehabilitation of people with ABI (Sections 1.2 and 1.4). The review of music therapy ABI research in Section 2.4 revealed that music therapy is a relevant intervention when the goal is an increase in interpersonal communication competencies. The intervention in this study focused on rehabilitation needs and a concert performance. In addition, the intervention involved physical movement and verbal interaction. The effect size results from the study indicated that group music therapy as performed at Høskoven affected the participants' interpersonal communication competencies.

This study describes a new method of assessing general interpersonal communication competencies using musical exercise, blinded ratings, and questionnaires. The result of the clinical intervention revealed that group music therapy in post-acute neurological rehabilitation could have an effect on self-disclosure competencies in everyday life. These finding should be taken into consideration by both clinicians in different disciplines, as well as teachers/educators working with this population.

Often the goal in ABI music therapy is to affect physical, cognitive, and psychological needs. However, this study documents that the major benefit of music therapy may be an increase in interpersonal communication competencies. In music therapy practice with populations other than people with ABI, the goal of therapy is often an increase in communication competencies. The new ICCSs supply a method of measuring ICC across settings (daily life and music) that can easily be applied other populations.

Specifically, the music therapy intervention in this study addressed rehabilitation needs and, in addition, worked towards a public concert performance. The combination of rehabilitation needs and public concert increased the participants' interaction and motivation. In addition, the results suggest that the participants had an increase of social relaxation in both music and everyday life.

It is my experience in conducting this study that the assessment protocol (the four musical exercises, blinded rating, and the ICCS questionnaires – see Section 3.4) can easily – in parts or as a whole – be applied in everyday clinical work. Data from the ICCSs can be used as both documentation and clinical assistance. In this way, the ICCSs could be a new music therapy reference system.

5.5 Conclusion

The present study aimed at answering a range of research questions. Even though seven out of eight of the participants had previously participated in music therapy, both effect-size values and t-tests showed a positive effect of music therapy. Both music therapist performing the assessments, and the blinded raters, experienced an increase in the participants' interpersonal communication competencies in musical improvisations, post 20 music therapy sessions. The effect-size values from staff/relative evaluation of interpersonal communication competencies in daily life revealed that self-disclosure competencies in daily life were positively affected by 20 music therapy sessions.

The assessing music therapist and staff/relative scores on interpersonal communication competencies in music and daily life correlated significantly on the total score and on the Empathy, Assertiveness, Altercentrism, Expressiveness, and Supportiveness subscales. The blinded raters' scores on interpersonal communication competencies in music did not support the results.

The improvisation assessment profile ratings of the participants' free improvisations, pre/post music therapy, revealed a tendency of the participant to move towards a more partnering role on the profiles: phrasing, volume, and tonal/melodic. This result can be interpreted as an increase in partnership competencies in communicative musicality. The rhythmic ground score development indicated an increase in leadership competencies when engaging in communicative musicality.

The secondary research questions addressed the research tools and procedures developed for the study.

The new Interpersonal Communication Competence Scale Staff/Relatives (ICCS_SR) questionnaire revealed a good overall internal consistency (Cronbach's alpha). A factor analysis of the questionnaire revealed six factors that give titles to "real world" constructs of interpersonal communication competencies based on how staff/relatives experienced the participants.

On the new Interpersonal Communication Competence Scale (in music) Music Therapist (ICCS_MT) questionnaire, the Cronbach's alpha value indicated a good internal consistency and, on the music therapy participant (ICCS_MTP) questionnaire, the Cronbach alpha value indicated an excellent internal consistency. These high Cronbach alphas point out that it has been possible to construct a reliable self-rating and a reliable therapist version of interpersonal communication competence in music questionnaires, based on the ICCS by Rubin and Martin (1994).

On the Interpersonal Communication Competence Scale (in music) blinded rater (ICCS_MusRat) questionnaire, the Cronbach alpha indicated an "excellent" consistency. The Cohen's kappa coefficient on the overall ICCS_MusRat score indicated a moderate agreement between the raters. Therefore, it can be concluded that is possible to make a reliable interpersonal communication competence in music rater tool.

The substantial, moderate, and fair Cronbach alphas on the raters' Improvisation Assessment Profile (IAP) ratings indicate that it is possible to make reliable IAP assessments of free improvisations.

The results suggest that music therapy (20 sessions) can have an effect on self-disclosure competencies in people with acquired brain injury even after more than five years of rehabilitation. A new reliable research tool on interpersonal communication competence in music and everyday life, based on the ICCS by Rubin and Martin (1994), has been constructed. The study reveals a new way of calculating an IAP per minute score that assesses communicative musicality and gives a quantitative (Likert-scale type) score on autonomy in musical improvisations.

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Appendices

Appendix 1 Literature search

The strategy of the literature review has been to get an overview over the different themes of the project. I started the search by writing 5 questions which lead me to a set of search word combinations. The search was aimed at the whole text except where it is mentioned:

1. Which experiences have so fare been made in using ICF in neurological rehabilitation?
    a. "ICF + "music therapy"
    b. "ICF + music"
    c. "ICF + "neurological rehabilitation"
    d. "ICF + brain damage"
    e. "ICF + stroke"
    f. "ICF + Traumatic brain injury"

2. What has been written about acquired brain damage, interpersonal skills and quality of life?
    a. "Interpersonal competence + neurology" (also Google Scholar)
    b. "Interpersonal competence + brain" (also Google Scholar)
    c. "Interpersonal skill + neurology"
    d. "Interpersonal skill + brain"
    e. "Interpersonal skill + quality of life + neurology"
    f. "interpersonal skill" (only searched in abstract)
    g. "interpersonal competence"(only searched in abstract)

3. Which research tools can be used in investigating interpersonal skills and quality of life in this population?
    a. "Interpersonal + scale" (- psykNet (653 hits))
    b. "Interpersonal + skill + questionnaire"
    c. "interpersonal + competence+ questionnaire"
    d. "quality of life + questionnaire + stroke"
    e. "questionnaire"+"interpersonal"+"brain damage"(also Google scholar)

4. What does the literature say about music therapy and this population?
    a. "Music therapy" + "neurology "
    b. "Music therapy + brain damage" (also Google Scholar)
    c. "Music therapy + stroke"
    d. "Music therapy + Traumatic brain injury"
    e. "Music + neurology "
    f. "Music + brain damage"
    g. "Music + stroke"
    h. "Music + Traumatic brain injury"

5. From a more philosophical approach I wanted to investigate the human need of being in relation and its influence on quality of life.
    a. "interpersonal + quality of life" (only searched abstract)
    b. "interpersonal Relation + existence" (only searched abstract)

The search was conducted from the 8th of September 2008 to the 3th of October 2008. I searched in ArticelFirst, The Cochrane Library, Medline(PubMed), Proquest, bibliotek.dk, PsykInfo, Web of Science, and Aboline. If the title was anywhere near the subject, I would read the abstract. Through reading the abstract I decide if the literature was relevant. Articles, books and thesis have all been included. I must take in to account that I have been skimming many thousands of titles and abstracts and therefore unwillingly have overseen literature. Only English and Nordic language articles have been enrolled. When searching the Danish bases I used both the English and Danish version of the search word combinations.

I searched the following journals:

1) Brain Injury (Official research journal of the International Brain Injury Association)
    a) "Music"
    b) "interpersonal"

2) Brain – a journal of Neurology
    a) "music therapy"

3) Journal of Neurology
    a) "music therapy"

4) NeuroRehabilitation (IOS press)
    a) "music therapy"

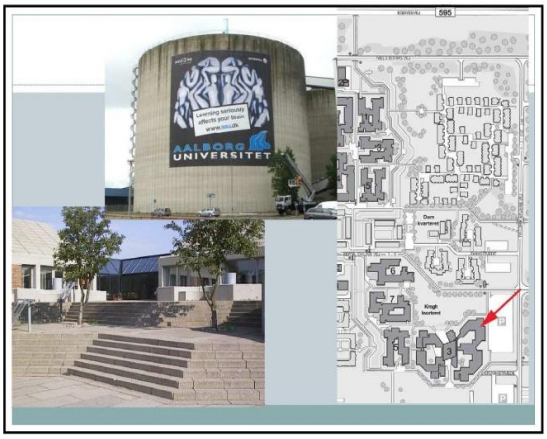
5) Music Therapy Perspectives (2004-2008)
    a) "Brain"
    b) "interpersonal"
    c) "Stroke"
    d) "Neurology"

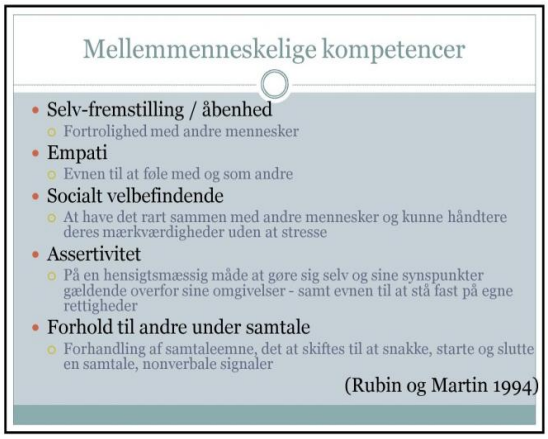
6) Music Therapy Research Quantitative and Qualitative Foundations CD-ROM, Second Edition 1964-2003. (Journal of Music Therapy (1964-2003), Music Therapy (1981-1996), Music Therapy perspectives (1982-1984, 1986-2003)

a) "Brain damage" (65 document hits. Most of the hits were about MT and mentally retarded children, autistic and psychiatric diagnosed clients. And references')
b) "neurology"(87 document hits, mostly references)
c) "Stroke patients" (21 document hits)
d) "Traumatic brain injury"(25 document hits)

7) Review of references in:
   a) Margaret Sturchens (2005) Social communication interventions (article in), Rehabilitation for Traumatic Brain injury, Oxford University press, USA
   b) Simon Gilbertsons (2005), Music Therapy in Neurorehabilitation after traumatic brain injury: a literature review, (article in) Music therapy and neurological rehabilitation, 2005, Jessica Kingsley Publishers, London and Philadelphia
8) Google Scholar on the writers:
   a) "Wendy Magee"
   b) "Felicity Baker"
   c) "Simon Gilbertson"
   d) "Nicki Cohen"
   e) "Margaret Struchen"

Appendix 2 Power points from participant information session at Høskoven





Mellemmenneskelige kompetencer, fortsat

- Interaktionskontrol
  - Interaktionsinvolvering, -fleksibilitet og -opmærksomhed, forholde sig til andres tanker og nonverbale signaler
- Udtryksevne
  - Verbale (det at finde de rigtige ord til at udtrykke sig med)
  - Musikativ (ansigtsudtryk, stemmemelodi, gestik osv.)
- Støtte til andre
  - Ikkedømmende, åben, spontan og problemløsende
- Nærvær
  - Musikative signaler som: Søge øjenkontakt, åbent kropssprog, udstråle imødekommenhed, osv.
- Kontrol over omgivelser
  - At kunne samarbejde om at løse problemer - at kunne få andre med på éns ideer

Det nonverbale – 60 % af kommunikationen

- Nonverbal kommunikation har at gøre med:
  - stemmeføring, gestik, ansigtsudtryk, kropsholdning, mv.
- Der er sammenhæng mellem evnen til at opfange og udtrykke sig nonverbalt
- Evnen er multimodal.
  - Folk med ekspressiv stemme har som oftest også et ekspressivt ansigt og kropssprog
- Der er sammenhæng mellem nonverbal udtryksevne og personlighedstræk
  - Ekstroverte, kommunikative, høj selvtillid, ikke dogmatiske, fysisk attraktive personer er bedre til at udtrykke sig nonverbalt.
- Evnen til afkodningen af nonverbale kan øges via:
  - Modning, træning og øvelse
- Evnen til afkode nonverbale signaler har at gøre med intelligens og mentale evne

Undersøgelser viser om kvinders nonverbale kommunikation i forhold til mænd at:

- Kvinder smiler over dobbelt så meget som mænd
- De søger oftere øjenkontakt
- De har et tydeligere stemme- og ansigtsudtryk
- De giver og modtager flere berøringer
- De har en mere flydende tale end mænd
- De taler også mindre og lytter mere
- De afbryder mindre og er mindre dominerende
- De er bedre til at tilpasse sig samtalepartnerens stil
- De giver flere lytte signaler
- De viser færre rastløse signaler (Burgoon and Bacue, 2003, p184)

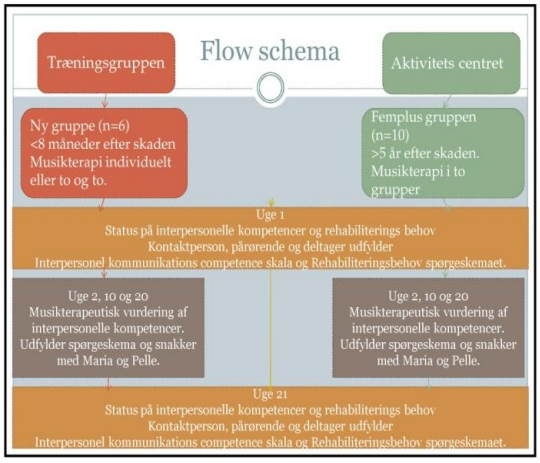
Forsknings spørgsmål

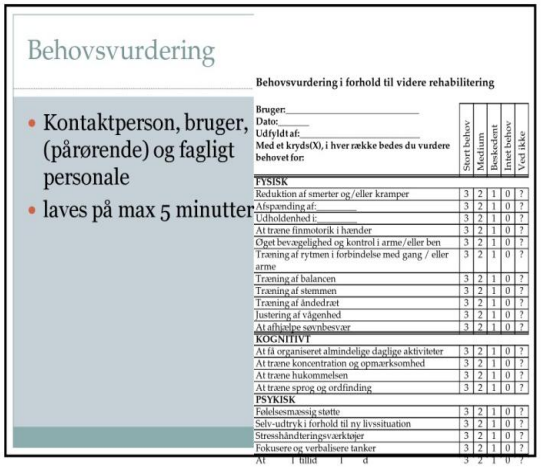
- På hvilken måde er der korrelationen mellem interpersonelle kompetencer i og udenfor musik, hos mennesker med erhvervet hjerneskade ?
  - Hvad er effekten af 20 musikterapi sessioner på interpersonelle kompetencer i musik?
  - Hvad er effekten af 20 musikterapi sessioner på interpersonelle kompetencer i daglig livet?
- Hvordan kan WHO's International Classification of Functioning, Disability and Health (ICF) blive implementeret i forbindelse med dokumentationen af musikterapi?

Nanna med den røde mund – Kim Larsen

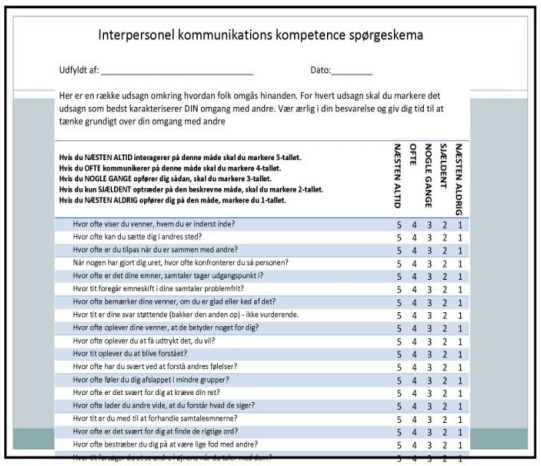
1. Nanna med den røde mund og lange sorte negle,
   hun drikker og hun er lidt dum, så hun er glad.
   Det' så trist, det' så trist, siger de.
2. Nanna med den røde mund og lange sorte negle,
   hun har 2 mænd og 8 børn, så hun er glad.
   Det' så trist, det' så trist, siger de.
3. Nanna med den røde mund og lange sorte negle,
   hun griner og får dem til at le - ja, sig mig, hvad er der egentlig galt?
   Det' så trist, det' så trist, siger de.
4. Naaaaaa nanana nana..... + (2. vers)

Betegnelse	Påvirkning af interaktionen
Opmærksomhed/koncentration	
Forringet koncentration	Problemer med at fastholde et samtaleemne. Svært ved at holde styr på en samtale hvis noget forstyrrer.
Svært ved at skifte fokus	Svært ved at skifte imellem taler og lytter rollen. Svært ved at skifte samtaleemne.
Nedsat tanke hastighed	Lange pauser i samtaler, nedsat samtale hastighed, svært ved at forstå andre når de taler i normalt tempo
Indlæring og hukommelse	
Nedsat korttidshukommelse	Gentager sig selv og mister tråden i samtaler
Nedsat modtagelighed	Sammenblander instruktioner og beskeder
Nedsat organisering af indlært	Uorganiseret / usammenhængende tale
Udførsel	
Problemer med integration	Svært ved at sammenholde verbale og nonverbale signaler
Nedsat initiativ	Indleder ikke samtaler - virker uinteresseret i andre
Nedsat selv-opmærksomhed	Gensvar bliver usammenhængende og fejl opdages ikke
Nedsat evne til planlægning	Det kan være svært at planlægge og udføre ting
Selvoptagethed	Afbryder andre, vedholdende tale, svært ved at tage andres perspektiv
Rigiditet	Svært ved at skifte samtaleemne, stereotype svar og reaktioner
Regulering af følelser og adfærd	Uforudsigelig social adfærd, upassende grin, overdreven vrede.
Nedsat selv-indsigt	Har urealistiske mål eller forståelse af livssituation. Knap så troværdig. Benytter sig ikke af kompenserende trategier. (Struchen, 2005, p.90)

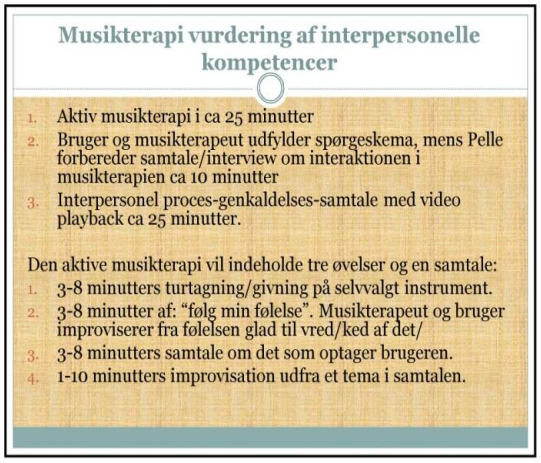

Flow schema
Træningsgruppen
Aktivitets centret
Ny gruppe (n=6)
<8 måneder efter skaden
Musikterapi individuelt
eller to og to.
Femplus gruppen
(n=10)
>5 år efter skaden.
Musikterapi i to
grupper
Uge 1
Status på interpersonelle kompetencer og rehabiliterings behov
Kontaktperson, pårørende og deltager udfylder
Interpersonel kommunikations competence skala og Rehabiliteringsbehov spørgeskemaet.
Uge 2, 10 og 20
Musikterapeutisk vurdering af
interpersonelle kompetencer.
Udfylder spørgeskema og snakker
med Maria og Pelle.
Uge 2, 10 og 20
Musikterapeutisk vurdering af
interpersonelle kompetencer.
Udfylder spørgeskema og snakker
med Maria og Pelle.
Uge 21
Status på interpersonelle kompetencer og rehabiliterings behov
Kontaktperson, pårørende og deltager udfylder
Interpersonel kommunikations competence skala og Rehabiliteringsbehov spørgeskemaet.


Behovsvurdering
• Kontaktperson, bruger, (pårørende) og fagligt personale
• laves på max 5 minutter
Behovsvurdering i forhold til videre rehabilitering
Bruger:
Dato:
Udfyldt af:
Med et kryds(X), i hver række bedes du vurdere behovet for:
Stort behov
Middelstort
Beskedent
Intet behov
Ved ikke
FYSISK
Reduktion af smerter og/eller kramper 3 2 1 0 ?
Afspænding af: 3 2 1 0 ?
Udholdenhed i: 3 2 1 0 ?
At træne finmotorik i hænder 3 2 1 0 ?
Øget bevægelighed og kontrol i arme/eller ben 3 2 1 0 ?
Træning af rytmen i forbindelse med gang / eller arme 3 2 1 0 ?
Træning af balancen 3 2 1 0 ?
Træning af stemmen 3 2 1 0 ?
Træning af åndedræt 3 2 1 0 ?
Justering af vågenhed 3 2 1 0 ?
At afhjælpe søvnbesvær 3 2 1 0 ?
KOGNITIVT
At få organiseret almindelige daglige aktiviteter 3 2 1 0 ?
At træne koncentration og opmærksomhed 3 2 1 0 ?
At træne hukommelsen 3 2 1 0 ?
At træne sprog og ordfinding 3 2 1 0 ?
PSYKISK
Følelsesmæssig støtte 3 2 1 0 ?
Selv-udtryk i forhold til ny livssituation 3 2 1 0 ?
Stresshåndteringsværktøjer 3 2 1 0 ?
Fokusere og verbalisere tanker 3 2 1 0 ?
At i fælled i d 3 2 1 0 ?


Samlet vurdering af behov / henvisning til musikterapi
Bruger:
Dato:
Vurderet rehabiliteringsbehov
0 =intet, 1= mindre, 2=middel, 3= stort
ICF kode
FYSISK
Kognitivt
PSYKISK
SOCIALT


Interpersonel kommunikations kompetence spørgeskema
Udfyldt af:
Dato:
Her er en række udsagn omkring hvordan folk omgås hinanden. For hvert udsagn skal du markere det udsagn som bedst karakteriserer DIN omgang med andre. Vær ærlig i din besvarelse og giv dig tid til at tænke grundigt over din omgang med andre
Hvis du NÆSTEN ALTID interagerer på denne måde skal du markere 5-tallet.
Hvis du OFTE kommunikerer på denne måde skal du markere 4-tallet.
Hvis du NOGLE GANGE opfører dig sådan, skal du markere 3-tallet.
Hvis du kun SJÆLDENT optrøder på den beskrevne måde, skal du markere 2-tallet.
Hvis du NÆSTEN ALDRIG opfører dig på den måde, markere du 1-tallet.
NÆSTEN ALTID
OFTE
NOGLE GANGE
SJÆLDENT
NÆSTEN ALDRIG
Hvor ofte viser du venner, hvem du er inderst inde?
Hvor ofte kan du sætte dig i andres sted?
Hvor ofte er du tilpas når du er sammen med andre?
Når nogen har gjort dig uret, hvor ofte konfronterer du så personen?
Hvor ofte er det dine emner, samtaler tager udgangspunkt i?
Hvor tit foregår emneskift i dine samtaler problemfrit?
Hvor ofte bemærker dine venner, om du er glad eller ked af det?
Hvor tit er dine svar støttende (bakker den anden op) - ikke vurderende.
Hvor ofte oplever dine venner, at de betyder noget for dig?
Hvor ofte oplever du at få udtrykt det, du vil?
Hvor tit oplever du at blive forstået?
Hvor ofte har du svært ved at forstå andres følelser?
Hvor ofte føler du dig afslappet i mindre grupper?
Hvor ofte er det svært for dig at kræve din ret?
Hvor ofte lader du andre vide, at du forstår hvad de siger?
Hvor tit er du med til at forhandle samtaleemnerne?
Hvor ofte er det svært for dig at finde de rigtige ord?
Hvor ofte bestræber du dig på at være lige fod med andre?

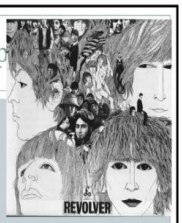

Screen shot fra video optageren


Musikterapi vurdering af interpersonelle kompetencer
1. Aktiv musikterapi i ca 25 minutter
2. Bruger og musikterapeut udfylder spørgeskema, mens Pelle forbereder samtale/interview om interaktionen i musikterapien ca 10 minutter
3. Interpersonel proces-genkaldelses-samtale med video playback ca 25 minutter.
Den aktive musikterapi vil indeholde tre øvelser og en samtale:
1. 3-8 minutters turtagning/givning på selvvalgt instrument.
2. 3-8 minutter af: "følg min følelse". Musikterapeut og bruger improviserer fra følelsen glad til vred/ked af det/
3. 3-8 minutters samtale om det som optager brugeren.
4. 1-10 minutters improvisation udfra et tema i samtalen.

INTERPERSONEL KOMMUNIKATIONSKOMPETENCE SKALA – MUSIK VERSION

Her er 30 spørgsmål om hvordan du oplever dig selv i den musik du lige har lavet. Du skal på skalen "i høj grad – slet ikke" sætte et kryds det sted som passer bedst på din oplevelse. Vær ærlig i din besvarelse. Giv dig tid til at tænke grundigt over DIN oplevelse af at lave musik.	I høj grad		Slet ikke
Musikalsk selv fremstilling			
1. Oplevede du, at din musik var et udtryk for den du virkelige er?	IHG		SI
2. Oplevede du, at din musik blev forstået?	IHG		SI
3. Lagde du følelser i din musik?	IHG		SI
Musikalsk empati			
4. Forstod du de følelser musikterapeuten spillede?	IHG		SI
5. Havde du svært ved at forstå hvad musikterapeuten følte i musikken? (R)	IHG		SI
6. Bestræbte du dig på at være medfølende i musikken?	IHG		SI
Musikalsk velbefindende			
7. Var du veltilpas, da du spiller musik sammen med musikterapeuten?	IHG		SI
8. Følte du dig afslappet da du spillede?	IHG		SI
9. Føler du dig usikker, når du spiller musik med personer du dårligt kender? (R)	IHG		SI
Musikalsk selvhævdelse			
10. Gjorde du noget ved de ting som irriterede dig i musikken?	IHG		SI
11. Havde du problemer med at være selvstændig i musikken? (R)	IHG		SI
12. Følte du, at du kunne skabe dit eget musikalske univers?	IHG		SI
Forhold til andre under musik			
13. Spillede du mere end du lyttede? (R)	IHG		SI
14. Supplerede din og musikterapeutens musik hinanden?	IHG		SI
15. Stak dine tanker af da du spillede?	IHG		SI

With a little help



What would you THINK if I sang out of tune,
Would you stand up and walk out on me.
Lend me your ears and I'll sing you a song,
And I'll try not to sing out of key.
Oh I get by with a little help from my friends,
I get high with a little help from my friends,
Oh I'm gonna try with a little help from my friends.

What do I do when my love is away.
(Does it worry you to be alone)
How do I feel by the end of the day
(Are you sad because you're on your own)
No, I get by with a little help from my friends,
Mmm I get high with a little help from my friends,
Mmm I'm gonna to try with a little help from my friends
a little help from my friends

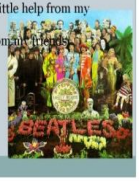
Do you need anybody?
I need somebody to love.
Could it be anybody?
I want somebody to love.

Would you believe in a love at first sight?
Yes I'm certain that it happens all the time.
What do you see when you turn out the light?
I can't tell you, but I know it's mine.

Oh I get by with a little help from my friends,
Mmm I get high with a little help from my friends,
Oh I'm gonna try with a little help from my friends

Do you need anybody?
I just need someone to love.
Could it be anybody?
I want somebody to love

Oh...
I get by with a little help from my friends,
I'm gonna try with a little help from my friends
I get high with a little help from my friends
Yes I get by with a little help from my friends,
with a little help from my friends



Appendix 3 Information letter to participants and relatives (translated)

Participant Information

Participants at Høskoven has over the last 5 years, as part of their rehabilitation, been offered music therapy. Music therapy is offered based on a assessment of needs and participant motivation. In Denmark there have until now been few studies documenting the effects of music therapy in the neurological rehabilitation. Therefore, I allow myself to ask you if you and your family will participate in a music therapy research project in collaboration with Høskoven and Aalborg University. Focus of research is interaction between people, both in music and everyday life.

The music therapy is based on your needs. It is this project's hypothesis that in parallel with retraining language, concentration, relaxation, emotions, motor skills, rhythm and voice, etc. we simultaneous entrain interactional skills. Competencies that have to do with; listening, giving and taking, show openness, feel empathy, and be present, and so on. Music therapy be based on your rehabilitation needs and activites pland together with your music therapist. It is not a prerequisite that you can sing and play to benefit from music therapy.

The typical work in music therapy can be divided into three categories.

1) Physiological
    a) Voice and speech
    b) Training of paralysis, etc. on instruments
    c) Rhythm / pace (walking and arms, etc.)
    d) Motor Control
    e) Endurance
2) Cognitive
    a) Language
    b) Memory
    c) Arousal
    d) Awareness
3) Psychological
    a) Social Interaction
    b) Communication and validating feelings
    c) Experience Formation around loss and new life situations
    d) Existential themes, eg
        i) initiative and responsibility
        ii) unity and separation
        iii) to find meaning in something that seems pointless

Project participants will be divided into two groups - one intervention group receiving music therapy + standard rehabilitation and a control group receiving standard rehabilitation. Whether you come in one or another group depends on a professional assessment of whether you will benefit from music therapy offer. If you are assigned AC you will start with either music therapy or have to wait for half a year to begin.

All participants and their relatives will be required to complete two questionnaires with 25-week interval. If you are assigned AC it will be four times. One questionnaire is about your rehabilitation needs, the other is about interpersonal communication competencies. It takes approx. 15 minuts to fill them both.

Those participants who receive music therapy will also be involved in two music communication assessment sessions. I will take place in one of the first and the last session. In the sessions you will get through four musical improvisation exercises. The idea of the exercises is that we must see what you're are good ad when you interact in music. After the last exercise you will be asked to fill in a questionnaire on you musical interaction.

Your Rights

Your participation in the research project is completely voluntary, and before you may sign the consent form, you must have both written and oral information about the project.

You may at any time orally, in writing or by other clear indication withdraw your consent to return and thus withdraw from the project. Even if you withdraw your consent, this does not affect your right to present or future treatment or any other of your rights.

You are entitled to consideration before you commit to participate. Information about your health, which appears in the project are covered by professional secrecy. The same applies to other private affairs and other confidential information about you.

Keeping information about you is governed by the Act on Processing of Personal Data and Health Act.

You have the opportunity to gain access by public Law. This means that you can have access to view all documents pertaining to your participation in the project, except for the parts that contain confidential information about others.

Information

Research will result in various articles, presentations and a dissertation to be published.

The project is reported to the research ethics committee of North Jutland and data monitoring.

As a researcher and music therapist, I follow the ethical guidelines of music therapists (www.musikterapi.org). They undertake to accommodate the participants' interests ahead of other interests. If you are interested in by getting more knowledge about music therapy, please feel free to write to me.

Permission for participation in music therapy research + (copy to relatives, etc.)

With my signature I hereby certify that I have read the information letter on music therapy research project at Høskoven and that I have been informed about:

- that participation in the project is voluntary.
- that can be given information about my diagnosis and what we have worked with in music therapy, but without providing private information about me and my personality.
- Video material from the project will only be used internally. If the video footage to be shown to others should not be taken until a new clear written agreement.
- To your family and you at least twice to fill in two questionnaires.
- that it is your ambition to complete 20 music therapy sessions.
- that you can always leave the project.

Tick
I want to participate in the project □

I do not want to participate in the project: □

_____
Name (block letters)

_____
Address & Postcode

_____
Tel. & E-mail

_____
Signature

Appendix 4 Song lyrics and chords from group two's own composition

Jeg elsker sangen

Høskoven 17.12.2010 kl. 9-12

G	C	D		G
G	Em	Am7	D7	G

Jeg elsker Ulla – fordi hun er så rar

Jeg elsker Jan – han er en rigtig mand

Jeg elsker Signe – for hun er kreativ *(og gir' den gas)*

Jeg elsker Mikael – for han får ting'ne gjort

Jeg elsker Mille – fordi hun gør mig glad

Jeg elsker Søren – han er en spillemand

Jeg elsker Kurt – for han er alles ven

All names have been changed due to ethics.

Appendix 5 Original ICCS by Rubin and Martin (1994)

FIGURE 2

Interpersonal Communication Competence Scale

INSTRUCTIONS: Here are some statements about how people interact with other people. For each statement, circle the response that best reflects YOUR communication with others. Be honest in your responses and reflect on your communication behavior very carefully.

If you ALMOST ALWAYS interact in this way, circle the 5.
If you communicate this way OFTEN, circle the 4.
If you behave in this way SOMETIMES, circle the 3.
If you act this way only SELDOM, circle the 2.
If you ALMOST NEVER behave in this way, circle 1.

SELF-DISCLOSURE (alpha = .63)

* 1. I allow friends to see who I really am.
2. Other people know what I'm thinking.
3. I reveal how I feel to others.

EMPATHY (alpha = .49)

* 4. I can put myself in others' shoes.
5. I don't know exactly what others are feeling. (R)
6. Other people think that I understand them.

SOCIAL RELAXATION (alpha = .63)

* 7. I am comfortable in social situations.
8. I feel relaxed in small group gatherings.
9. I feel insecure in groups of strangers. (R)

ASSERTIVENESS (alpha = .72)

* 10. When I've been wronged, I confront the person who wronged me.
11. I have trouble standing up for myself. (R)
12. I stand up for my rights.

ALTERCENTRISM (alpha = .49)

* 13. My conversations are pretty one-sided (R)
14. I let others know that I understand what they say.
15. My mind wanders during conversations.

INTERACTION MANAGEMENT (alpha = .41)

* 16. My conversations are characterized by smooth shifts from one topic to the next.
17. I take charge of conversations I'm in by negotiating what topics we talk about.
18. In conversations with friends, I perceive not only what they say but what they don't say.

EXPRESSIVENESS (alpha = .46)

* 19. My friends can tell when I'm happy or sad.
20. It's difficult to find the right words to express myself. (R)
21. I express myself well verbally.

SUPPORTIVENESS (alpha = .43)

* 22. My communication is usually descriptive, not evaluative.
23. I communicate with others as though they're equals.
24. Others would describe me as warm.

IMMEDIACY (alpha = .45)

* 25. My friends truly believe that I care about them.
26. I try to look others in the eye when I speak with them.
27. I tell people when I feel close to them.

ENVIRONMENTAL CONTROL (alpha = .60)

* 28. I accomplish my communication goals.
29. I can persuade others to my position.
30. I have trouble convincing others to do what I want them to do. (R)

Note 1. Items with asterisks are included in the Short-Form (SF) version. All items should be arranged randomly when administered.

Appendix 6 Conjunction of Danish translation of the ICCS by Bonde, Ridder, and Hald

INTERPERSONEL KOMMUNIKATIONS KOMPETENCE SKALA

(Det bedste af LOBO, HM og SH's samlet i en)

Instruktion: Her er en række udsagn omkring hvordan folk omgåes hinanden. For hvert udsagn skal du sætte en cirkle om det udsagn som bedst karakterisere DIN omgang med andre. Vær ærlig i din besvarelse og giv dig tid til at tænke grundigt over din kommunikation med andre

Hvis du NÆSTEN ALTID interagere på denne måde skal du markere 5-tallet.
Hvis du OFTE kommunikerer på denne måde skal du markere 4-tallet.
Hvis du NOGLE GANGE opfører dig sådan, skal du markere 3-tallet.
Hvis du kun SJÆLDENT optræder på den beskrevne måde, skal du markere 2-tallet.
Hvis du NÆSTEN ALDRIG opfører dig på den måde, markere du 1-tallet.

Selv - fremstilling

1. Jeg tillader venner at se, hvem jeg virkelig er.
2. Andre mennesker ved, hvad jeg tænker.
3. Jeg viser andre, hvad jeg føler.

Empati

4. Jeg kan sætte mig selv i andres sted.
5. Jeg ved ikke præcist hvad andre føler.
6. Andre mennesker tror, at jeg forstår dem.

Social velbefindende

7. Jeg har det fint, når jeg er sammen med andre.
8. Jeg føler mig afslappet, når jeg er sammen med andre i mindre grupper.
9. Jeg føler mig usikker, når jeg er sammen med personer jeg ikke kender

Selvhævdelse

10. Når nogen har gjort mig uret, konfronterer jeg denne person.
11. Jeg har svært ved, at kræve min ret.
12. Jeg kæmper for min ret.

Forhold til andre under samtale

13. Mine samtaler er rimeligt ensidige.
14. Jeg lader andre vide, at jeg forstår hvad de siger.
15. Mine tanker "stikker af" under samtaler.

Interaktionerskontrol

16. Mine samtaler er karakteriseret ved smidige skift mellem forskellige emner.
17. Jeg tager styring i samtaler med andre ved at forhandle hvilke emner, vi skal tale om.
18. Når jeg taler med venner, lægger jeg ikke kun mærke til hvad de siger, men også hvad de ikke siger.

Udtryksevne

19. Hvis jeg er glad eller ked af det, lægger mine venner mærke til det.
20. Jeg har svært ved at finde de rigtige ord, når jeg skal udtrykke mig.
21. Jeg er god til at udtrykke mig med ord.

Støtte til andre

22. Min kommunikation er sædvanligvis beskrivende, ikke bedømmende.
23. Jeg kommunikerer med andre som om vi er jævnbyrdige.
24. Andre mennesker ville beskrive mig som en varm person.

Nærvær

25. Mine venner tror helt sikkert, at de betyder noget for mig.
26. Jeg forsøger at se andre i øjnene, når jeg taler med dem.
27. Jeg fortæller andre det, når jeg føler mig knyttet til dem.

Kontrol over omgivelserne

28. Jeg får kommunikeret det jeg har til hensigt, i forbindelse med samtaler.
29. Jeg kan overtale andre til at mene det samme som mig.
30. Jeg har svært ved at overbevise andre om at gøre det, jeg ønsker de skal gøre.

Kommentar [SH1]: Spørgsmål 1-3 var LOBO, HM og SH 100 % enige om.

Kommentar [SH2]: LOBO version

Kommentar [SH3]: Eksakt eller præcist

Kommentar [SH4]: Tænker eller tror

Kommentar [SH5]: LOBO's version idet "jeg er veltilpas i sociale situationer" lyder mærkeligt

Kommentar [SH6]: En combi af LOBO og HM/SH

Kommentar [SH7]: Fremmede kan betyde udlændinge

Kommentar [SH8]: LOBO's version lyder bedre end HM/SH's: Når nogen har forurettet mig, konfronterer jeg denne person"

Kommentar [SH9]: I tvivl - LOBO: jeg har problemer, når jeg vil gøre min ret gældende

Kommentar [SH10]: Kæmper eller står fast. Ret eller rettigheder

Kommentar [SH11]: Ret, rimeligt, temmelig

Kommentar [SH12]: "vide" er bedre end "fortæller" pga. det narrative element af at fortælle

Kommentar [SH13]: "stikker af" er bedre en "temmelig adspredt" pga. billedværdien.

Kommentar [SH14]: Lyder bedre end SH/HM's "lette skift"

Kommentar [SH15]: Charge oversættes styring og ikke ansvar.

Kommentar [SH16]: 1.LOBO's lød bedre end SH's : I samtaler med venner, opfanger jeg ikke kun hvad de siger, men også hvad de ikke siger.

Kommentar [SH17]: Omvendt ordstilling

Kommentar [SH18]: Lyder bedre end SH's "til at udtrykke mig med"

Kommentar [SH19]: Omformuleret

Kommentar [SH20]: Stadig lidt abstrakt

Kommentar [SH21]: LOBO's version

Kommentar [SH22]: SH, HM version

Kommentar [SH23]: Nøgleordet er her hensigt LOBO bruger "det jeg ønsker"

Kommentar [SH24]: LOBO's var mere præcis

Appendix 7 Back translated version of the ICCS by Jody Ghani

Interpersonal communication competence scale

Instructions: Here is a list of statements concerning how people interact with each other. For each topic, circle the statement that best characterizes the way YOU relate with others. Please be honest in your answer and give yourself time to think thoroughly about how you relate to others.

If you ALMOST ALWAYS interact in this way, you should write a number '5' down next to the statement
If you OFTEN communicate in this way, write '4'
If you SOMETIMES behave like this, write '3'
If you only OCCASIONALLY perform in the described way, write '2'
If you ALMOST NEVER behave in this way, write '1'

Myself - presentation
1. I allow friends to see who I really am.
2. Other people know what I'm thinking.
3. I show others how I feel.
Empathy
4. I can put myself in another's shoes.
5. I don't know precisely what others are feeling.
6. Other people think that I understand them.
Social comfort
7. I feel fine when I'm with other people.
8. I feel relaxed when I'm with people in small groups.
9. I feel insecure when I'm with people I don't know.
Assertiveness
10. When someone has done wrong by me, I confront that person.
11. I have difficulty standing up for myself.
12. I fight for my rights.
Relationship to others during conversation
13. My conversations are mostly one-sided.
14. I let others know that I understand what they are saying.
15. My thoughts drift off during conversation
Interaction control
16. My conversations are characterized by flexible changes in topic.
17. I take control of conversations with others by deciding what topic we should talk about.
18. When I talk with friends, I don't just notice what they say but also what they don't say.
Ability to express oneself
19. My friends notice when I'm happy or when I'm sad.
20. I have difficulty finding the right words when I have to express myself.

21. I'm good at expressing myself with words.
Support of others
22. My communication is usually descriptive, not judgemental.
23. I communicate with others as if we are equal.
24. Other people would describe me as a warm person.
Presence
25. My friends know for sure that they mean something to me.
26. I try to look other people in the eye when I'm talking with them.
27. I tell others when I feel connected to them.
Control of surroundings
28. I manage to communicate what I wish to, in connection with conversations.
29. I can convince others to think the same as me.
30. I have difficulty convincing others to do what I want them to.

Appendix 8 Mail correspondence with Rubin and Martin

24.11 2008 Søren wrote
Dear Professor Rebecca B. Rubin and Professor Matthew M. Martin

I am doing Ph.D. study on Music Therapy at Aalborg University, Denmark. My supervisors are Professor Tony Wigram and Dr. Hanne Mette Ridder, both from AAU.

My research focus is interpersonal skills of adults with mild to severe acquired brain injury. I am interested in how the interpersonal competencies show in the music therapy setting, and if there is a parallel to real life. The music therapy method used will depend on the needs of the client - e.g. motor skill training, emotional support, songwriting, memory training, voice training, gait training. My procedure will involve doing a music therapy assessment every 5th session where interpersonal skills will be evaluated - e.g.. callresponse, emotional following, leader-follower, flexibility, autonomy etc. These sessions will be videoed and analyzed.

Evaluating the client's interpersonal skills outside music therapy is much harder, and that is why I am writing to you, Dr. Rubin. I am planning on using the ICCS that you published in 1994. I am considering using it on the participants, and also to involve staff and relatives in evaluating the participants' competencies with it. Since the article is more than 14 years old I would like to know if:
1. The ICCS has been validated against other interpersonal questionnaires?
2. Has it been rewritten with the questions into the 3rd person so that staff and relatives can make an evaluation?
3. Has it been translated to other languages (Danish)?
4. Would you recommend that I use ICCS or is there a better solution?

I would be very grateful for any help you can give me.
Yours sincerely
Søren Hald

1.12.2008 Becky Rubin wrote:
Dear Søren,
I've been off in Hawaii for two weeks and couldn't reply. Hope you've heard from Matt. Attached is a chapter in a book that is coming out soon that includes this profile of the ICCS. This will be published in a book in the near future, so right now you can use the information, but you can't quote it directly due to possible copy-editing that will occur. I do not believe that it has been translated into Danish nor into a 3rd person style. You might want to try that. Brian Spitzberg developed a observer-based

instrument some years ago and you might want to contact him about it. Observers can suffer from reliability problems (unrelated to the scale) and would require training, probably. Hope you find this helpful.

Sincerely,
Rebecca Rubin

1.12.2008 Søren wrote
Dear Rebecca

Thank you for your mail. I hope you had a well spent holly day in Hawaii. I got a mail from Matt early last week - He gave me some good info as well. So I am more than happy.
I will let you know if and how I'll use the ICCS.

Sincerely
Søren

10.01.2009 Søren wrote

Dear professor Rubin and Martin

Thank you all your help so fare. I hope that you are enjoying the season. The translation process is moving on, so fare I have translated ICCS into Danish, and had a English friend translate it back to English. If you have the time, I would like to have your comments on the differences between the original and the translated. Most of the questions are very alike, but question 17 and 22 need some attention. If you have no comments I would like to hear that too.

I have attached the document "Original and translated.doc" where I would like you to write your comments.
Beside that I have attached the Danish version for your amusement.

Thank you once again

Søren Hald

20.03.2009 Rubin wrote

Dear Soren,

I've made a few suggestions (in bold inside your document). I hope this helps.
Becky Rubin

9.3. 2009,Søren wrote:

Dear professor Becky Rubin and Matt Martin
The translation process went fine - thank you with your help on that. But after trying out the ICCS questionnaire on 10 persons with acquired brain injury, I found
out that it needed to be more concrete and directed at the possible answers. So I made a ICCS-ABI version. see attachment.

Hope that I have managed to grasp the meaning of your questions. If you are to bissy, and you think there is questions that need rephrasing, I will be delighted to
hear from you.

Best regards
Søren Hald

16.03.2009 Rubin answered inside a mail from Søren
Søren:
Thank you Becky

I am grateful of your help.
I changed your suggestion so that the "we" becomes a "you". The new question 17 will be:
NEW: 17. In conversations, how often do you take charge by negotiating talk topics?

Rebecca: this is o.k.

In question 22 I think the "descriptive" is too much of an abstraction for a person with acquired brain injury. And maybe "supportive" is too… If I have to make the question more concrete, what do you think of "Kind-hearted" as an equal to supportive/descriptive?

ORIGINAL: 22 My communication is usually descriptive, not evaluative.

NEW: 22 .How often is your communication kind-hearted, not evaluative?

Rebecca: You may see this as kind-hearted, but it doesn't mean the same as "descriptive". I suppose supportive is better. Critical would mean the same as evaluative. Informative or impartial for descriptive? It's your call. Perhaps ask similar others what a better word might mean?
Becky

26.03.2009 Søren wrote

Thank you Becky

I take your comments and help as an approval of the acquired brain injury version of the ICCS.
Soon there will be a ICCS- in Music Therapy version as well. I am still working on it but have attached the first draft.

In my research I hope to find parallels between people with ABI Interpersonal skills in music therapy and Interpersonal skills in general life.

Constructing a matching questionnaires (ICCS-MT) gives me the possibility to compare interpersonal skills in the two settings. Beside the questionnaires I will conduct video analysis and interviews.

Best regards
Søren

Appendix 9 Layout of Danish ICCS_Par (items in random order)

Interpersonel kommunikations-kompetence-spørgeskema

Udfyldt af: _____ Dato:_____

Her er 30 spørgsmål om din måde at være sammen med andre på. For hvert udsagn skal du sætte et kryds ved det svar som passer bedst på DIN omgang med andre de sidste to uger. Vær ærlig i din besvarelse, og tag dig den tid det tager.

Hvis du NÆSTEN ALTID interagerer på den beskrevne måde skal du markere 5-tallet. Hvis du OFTE optræder på den beskrevne måde, skal du markere 4-tallet. Hvis du NOGLE GANGE opfører dig som beskrevet, skal du markere 3-tallet. Hvis du kun SJÆLDENT optræder på den beskrevne måde, skal du markere 2-tallet. Hvis du NÆSTEN ALDRIG interagerer som beskrevet, markere du 1-tallet.	NÆSTEN ALTID	OFTE	NOGLE GANGE	SJÆLDENT	NÆSTEN ALDRIG
1. Hvor ofte viser du venner, hvem du inderst inde er?	5	4	3	2	1
2. Hvor ofte kan du sætte dig i andres sted?	5	4	3	2	1
3. Hvor ofte er du tilpas når du er sammen med andre?	5	4	3	2	1
4. Når nogen har gjort dig uret, hvor ofte konfronterer du så personen?	5	4	3	2	1
5. Hvor ofte er det *dine* emner, samtaler tager udgangspunkt i?	5	4	3	2	1
6. Hvor tit foregår emneskift i dine samtaler problemfrit?	5	4	3	2	1
7. Hvor ofte bemærker dine venner, om du er glad eller ked af det?	5	4	3	2	1
8. Hvor tit er dine svar omsorgsfulde og støttende (bakker den anden op) - ikke vurderende?	5	4	3	2	1
9. Hvor ofte oplever dine venner, at de betyder noget for dig?	5	4	3	2	1
10. Hvor ofte oplever du at få udtrykt det, du vil?	5	4	3	2	1
11. Hvor tit oplever du at blive forstået?	5	4	3	2	1
12. Hvor ofte har du svært ved at forstå andres følelser?	5	4	3	2	1
13. Hvor ofte føler du dig afslappet i mindre grupper?	5	4	3	2	1
14. Hvor ofte er det svært for dig at kræve din ret?	5	4	3	2	1

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Hvis du NÆSTEN ALTID interagerer på den beskrevne måde skal du markere 5-tallet. Hvis du OFTE optræder på den beskrevne måde, skal du markere 4-tallet. Hvis du NOGLE GANGE opfører dig som beskrevet, skal du markere 3-tallet. Hvis du kun SJÆLDENT optræder på den beskrevne måde, skal du markere 2-tallet. Hvis du NÆSTEN ALDRIG interagerer som beskrevet, markere du 1-tallet.	NÆSTEN ALTID	OFTE	NOGLE GANGE	SJÆLDENT	NÆSTEN ALDRIG
15. Hvor ofte lader du andre vide, at du forstår hvad de siger?	5	4	3	2	1
16. Hvor tit er du med til at forhandle samtaleemnerne?	5	4	3	2	1
17. Hvor ofte er det svært for dig at finde de rigtige ord?	5	4	3	2	1
18. Hvor ofte bestræber du dig på at være på lige fod med andre?	5	4	3	2	1
19. Hvor tit forsøger du at se andre i øjnene når du taler med dem?	5	4	3	2	1
20. Hvor ofte kan du overtale andre til at mene det samme som dig?	5	4	3	2	1
21. Hvor ofte viser du andre hvad du føler?	5	4	3	2	1
22. Hvor ofte viser du andre, at du forstår hvordan de har det?	5	4	3	2	1
23. Hvor ofte føler du dig usikker, når du er sammen med personer du ikke kender?	5	4	3	2	1
24. Hvor tit holder du på din ret?	5	4	3	2	1
25. Hvor ofte "stikker dine tanker af" under samtale?	5	4	3	2	1
26. Hvor ofte opfanger du både det sagte og usagte?	5	4	3	2	1
27. Hvor ofte oplever du at være god til at udtrykke dig med ord?	5	4	3	2	1
28. Hvor ofte vil andre beskrive dig som en varm og kærlig person?	5	4	3	2	1
29. Hvor ofte fortæller du andre, at du føler dig knyttet til dem?	5	4	3	2	1
30. Hvor ofte har du svært ved at overbevise andre om at gøre det, du ønsker, de skal gøre?	5	4	3	2	1

Tak for din besvarelse – den er værdsat.

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Appendix 10 Layout of Danish ICCS_SR (items in random order)

Interpersonel kommunikations-kompetence-spørgeskema - Proxy

Udfyldt af: _____ Dato:_____

Personale☐ Ven☐ Familie☐af _____

Her er 30 spørgsmål omhandlende ¤'s måde at være sammen med andre på. For hvert udsagn skal du markere det udsagn som passer bedst på din oplevelse af ¤'s omgang med dig og andre de sidste to uger. Vær ærlig i din besvarelse og giv dig tid til at reflektere grundigt.

Hvis du oplever at ¤ **NÆSTEN ALTID** interagerer som beskrevet markeres **5.** Hvis du oplevet at ¤ **OFTE** interagerer som beskrevet markeres **4.** Hvis du oplever at ¤ **NOGLE GANGE** interagerer som beskrevet markeres **3.** Hvis du oplever at ¤ **SJÆLDENT** interagerer som beskrevet markeres **2.** Hvis du oplever at ¤ **NÆSTEN ALDRIG** interagerer som beskrevet markeres **1.**	NÆSTEN ALTID	OFTE	NOGLE GANGE	SJÆLDENT	NÆSTEN ALDRIG
1. Hvor ofte viser ¤ venner, hvem # inderst inde er?	5	4	3	2	1
2. Hvor ofte kan ¤ sætte sig i andres sted?	5	4	3	2	1
3. Hvor ofte er ¤ tilpas når # er sammen med andre?	5	4	3	2	1
4. Når nogen har gjort ¤ uret, hvor ofte konfronterer # så personen?	5	4	3	2	1
5. Hvor ofte er det ¤'s emner, samtaler tager udgangspunkt i?	5	4	3	2	1
6. Hvor tit foregår emneskift i ¤'s samtaler problemfrit?	5	4	3	2	1
7. Hvor ofte er det tydeligt om ¤ er glad eller ked af det?	5	4	3	2	1
8. Hvor tit er ¤'s svar omsorgsfulde og støttende (bakker den anden op) - ikke vurderende.	5	4	3	2	1
9. Hvor ofte oplever du, at du betyder noget for ¤?	5	4	3	2	1
10. Hvor ofte oplever du at ¤ får udtrykt det, # vil?	5	4	3	2	1
11. Hvor tit tror du at ¤ oplever at blive forstået?	5	4	3	2	1
12. Hvor ofte har ¤ svært ved at forstå andres følelser?	5	4	3	2	1
13. Hvor ofte tror du ¤ føler sig afslappet i mindre grupper?	5	4	3	2	1
14. Hvor ofte er det svært for ¤ at kræve sin ret?	5	4	3	2	1

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Hvis du oplever at ¤ **NÆSTEN ALTID** interagerer som beskrevet markeres **5**. Hvis du oplevet at ¤ **OFTE** interagerer som beskrevet markeres **4.** Hvis du oplever at ¤ **NOGLE GANGE** interagerer som beskrevet markeres **3**. Hvis du oplever at ¤ **SJÆLDENT** interagerer som beskrevet markeres **2**. Hvis du oplever at ¤ **NÆSTEN ALDRIG** interagerer som beskrevet markeres **1.**	NÆSTEN ALTID	OFTE	NOGLE GANGE	SJÆLDENT	NÆSTEN ALDRIG
15. Hvor ofte lader ¤ andre vide, at # forstår hvad de siger?	5	4	3	2	1
16. Hvor tit er ¤ med til at forhandle samtaleemnerne?	5	4	3	2	1
17. Hvor ofte er det svært for ¤ at finde de rigtige ord?	5	4	3	2	1
18. Hvor ofte bestræber ¤ sig på, at være på lige fod med andre?	5	4	3	2	1
19. Hvor tit forsøger ¤ at se dig i øjnene når I taler sammen?	5	4	3	2	1
20. Hvor tit kan ¤ overtale andre til at mene det samme som #?	5	4	3	2	1
21. Hvor ofte viser ¤ andre hvad # føler?	5	4	3	2	1
22. Hvor ofte oplever du, at ¤ forstår hvordan du har det?	5	4	3	2	1
23. Hvor ofte føler ¤ sig usikker, når # er sammen med personer # ikke kender?	5	4	3	2	1
24. Hvor tit holder ¤ på sin ret?	5	4	3	2	1
25. Hvor ofte "stikker ¤'s tanker af" under samtale?	5	4	3	2	1
26. Hvor ofte opfanger ¤ både det sagte og usagte?	5	4	3	2	1
27. Hvor ofte oplever du at ¤ er god til at udtrykke sig med ord?	5	4	3	2	1
28. Hvor ofte vil du beskrive ¤ som en varm og kærlig person?	5	4	3	2	1
29. Hvor ofte fortæller ¤ andre, at # føler sig knyttet til dem?	5	4	3	2	1
30. Hvor ofte har ¤ svært ved at overbevise andre om at gøre det, # ønsker, de skal gøre?	5	4	3	2	1

Tak for din besvarelse – den er værdsat.

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Appendix 11 Layout of Danish ICCS_MTP

Interpersonel kommunikationskompetence skala – Musik version

Udfyldt af: _____Dato:_____

Her er 30 spørgsmål om hvordan du oplevede dig selv i den musik du lige har lavet. Du skal på skalaen 1 til 5 graduere udsagnet i forhold til din oplevelse. Det er DIN oplevelse af at lave musik som er interessant, så vær ærlig i din besvarelse og giv dig tid til at tænke dig om. Du skal med et kryds (X) markere det tal som passer bedst.

Hvis du i Højeste grad oplevede samspillet som beskrevet skal du markere 5. Hvis du i Større grad oplevede samspillet som beskrevet, skal du markere 4. Hvis du Nogen grad oplevede samspillet som beskrevet, skal du markere 3. Hvis du kun Mindre grad oplevede samspillet som beskrevet, skal du markere 2. Hvis du Mindste grad oplevede samspillet som beskrevet, markere du 1.	I HØJESTE GRAD	I STØRRE GRAD	I NOGEN GRAD	I MINDRE GRAD	I MINDSTE GRAD
1. Oplevede du, at din musik var et udtryk for hvordan du havde det?	5	4	3	2	1
2. Forstod du de følelser musikterapeuten spillede?	5	4	3	2	1
3. Var du veltilpas, da du spillede musik sammen med musikterapeuten?	5	4	3	2	1
4. Reagerede du musikalsk på ting som irriterede dig i musikken?	5	4	3	2	1
5. Spillede du mere end du lyttede?	5	4	3	2	1
6. Var din musik fleksibel og afvekslende?	5	4	3	2	1
7. Var det i din musik tydeligt hvordan du føler?	5	4	3	2	1
8. Gik du med på musikterapeutens musikalske ideer?	5	4	3	2	1
9. Tror du musikterapeuten mærkede din omsorg?	5	4	3	2	1
10. Fik du udtrykt det du ville i musikken?	5	4	3	2	1
11. Oplevede du, at din musik blev forstået?	5	4	3	2	1
12. Havde du svært ved at forstå de følelser musikterapeuten spillede?	5	4	3	2	1
13. Følte du dig afslappet da du spillede?	5	4	3	2	1

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Hvis du i Højeste grad oplevede samspillet som beskrevet skal du markere 5. Hvis du i Større grad oplevede samspillet som beskrevet, skal du markere 4. Hvis du Nogen grad oplevede samspillet som beskrevet, skal du markere 3. Hvis du kun Mindre grad oplevede samspillet som beskrevet, skal du markere 2. Hvis du Mindste grad oplevede samspillet som beskrevet, markere du 1.	I HØJESTE GRAD	I STØRRE GRAD	I NOGEN GRAD	I MINDRE GRAD	I MINDSTE GRAD
14. Havde du problemer med at være selvstændig i musikken?	5	4	3	2	1
15. Supplerede din og musikterapeutens musik hinanden?	5	4	3	2	1
16. Tog du både ansvar og gav plads i musikken?	5	4	3	2	1
17. Var det svært at kommunikere og udtrykke det du føler i musik?	5	4	3	2	1
18. Bevarede du og musikterapeuten et jævnbyrdigt forhold?	5	4	3	2	1
19. Tilpassede du din musik efter musikterapeuten?	5	4	3	2	1
20. Fik du musikterapeuten med på dine musikalske ideer?	5	4	3	2	1
21. Lagde du følelser i din musik?	5	4	3	2	1
22. Bestræbte du dig på at være medfølende i musikken?	5	4	3	2	1
23. Føler du dig usikker, når du spiller musik med personer du dårligt kender?	5	4	3	2	1
24. Følte du, at du kunne skabe dit eget musikalske rum?	5	4	3	2	1
25. Havde du følelsen af at være til stede da du spillede?	5	4	3	2	1
26. Lagde du mærke til noget som *ikke* blev udtrykt i musikken?	5	4	3	2	1
27. Oplevede du at være god til at udtrykke dig i musik?	5	4	3	2	1
28. Tror du musikterapeuten oplevede omsorg og varme i din musik?	5	4	3	2	1
29. Oplevede du nærvær i forhold til musikterapeuten?	5	4	3	2	1
30. Havde du svært ved at få musikterapeuten med ind i dit musikalske rum?	5	4	3	2	1

Tak for din besvarelse – den er værdsat.

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Appendix 12 Layout of Danish version of the ICCS_MT

Interpersonel kommunikationskompetence skala – Musikterapeut version

Bruger: _____Dato:_____

Her er 30 spørgsmål om hvordan du oplevede brugeren i den musik I lige har lavet. Du skal på skalaen 1 til 5 graduere udsagnet i forhold til din oplevelse af brugeren. Du skal med et kryds (X) markere det tal som passer bedst.

Hvis du i Højeste grad oplevede samspillet som beskrevet skal du markere 5. Hvis du i Større grad oplevede samspillet som beskrevet, skal du markere 4. Hvis du Nogen grad oplevede samspillet som beskrevet, skal du markere 3. Hvis du kun Mindre grad oplevede samspillet som beskrevet, skal du markere 2. Hvis du Mindste grad oplevede samspillet som beskrevet, markere du 1.	I HØJESTE GRAD	I STØRRE GRAD	I NOGEN GRAD	I MINDRE GRAD	I MINDSTE GRAD
1. Oplevede du, at brugerens musik var et udtryk for den han/hun virkelig er?	5	4	3	2	1
2. Forstod brugeren de følelser musikterapeuten spillede?	5	4	3	2	1
3. Virkede brugeren veltilpas, da I spiller musik sammen?	5	4	3	2	1
4. Reagerede brugeren musikalsk på ting som syntes at irriterede ham/hende i musikken?	5	4	3	2	1
5. Spillede brugeren mere end han/hun lyttede?	5	4	3	2	1
6. Var brugerens musik fleksibel og afvekslende?	5	4	3	2	1
7. Var det i brugerens musik tydeligt hvordan han/hun føler?	5	4	3	2	1
8. Støttede brugeren op om musikterapeutens musikalske ideer?	5	4	3	2	1
9. Mærkede du brugerens omsorg?	5	4	3	2	1
10. Fik brugeren udtrykt det han/hun ville i musikken?	5	4	3	2	1
11. Forstod du brugerens musik?	5	4	3	2	1
12. Havde brugeren svært ved at forstå de følelser musikterapeuten spillede?	5	4	3	2	1

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13. Følte brugeren sig afslappet da I spillede?	5	4	3	2	1
14. Havde brugeren problemer med at være selvstændig i musikken?	5	4	3	2	1
15. Supplerede din og brugerens musik hinanden?	5	4	3	2	1
16. Tog brugeren både ansvar og gav plads i musikken?	5	4	3	2	1
17. Var det svært for brugeren, at kommunikere og udtrykke det han/hun føler i musik?	5	4	3	2	1
18. Bevarede du og brugeren et jævnbyrdigt forhold?	5	4	3	2	1
19. Tilpassede brugeren sin musik efter musikterapeutens?	5	4	3	2	1
20. Fik brugeren musikterapeuten med på sine musikalske ideer?	5	4	3	2	1
21. Lagde brugeren følelser i sin musik?	5	4	3	2	1
22. Bestræbte brugeren sig på at være medfølende i musikken?	5	4	3	2	1
23. Føler brugeren sig usikker, når han/hun spiller musik med personer brugeren dårligt kender?	5	4	3	2	1
24. Følte du, at brugeren kunne skabe sit eget musikalske univers?	5	4	3	2	1
25. Havde du følelsen af at brugeren var "til stede" da I spillede?	5	4	3	2	1
26. Lagde du mærke til noget som *ikke* blev udtrykt i musikken?	5	4	3	2	1
27. Oplevede du at brugeren var god til at udtrykke sig med musik?	5	4	3	2	1
28. Oplevede du kærlighed og varme i brugerens musik?	5	4	3	2	1
29. Oplevede du nærvær fra brugeren?	5	4	3	2	1
30. Havde brugeren svært ved at få musikterapeuten med ind i sit musikalske rum?	5	4	3	2	1

Tak for din besvarelse – den er værdsat.

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Appendix 13 IAP rating schema

Time	0.10	0.20	0.30	0.40	0.50	1.00	1.10	1.20	1.30	1.40	1.50
Volume											
Rhythmic ground											
Tonal and melodic											
Phrasing											

Appendix 14 ICCS_MusRat (video rater tool)

Dialoguing Improvisation (ex 1)

Clip:_____ Rater_____ Date_____ **Here is a list of questions concerning the video-clip you just watched. If your experience of the participant – therapist relationship as described, ring one number in the right columns to score each question:** • **Almost all of the time (90+ %) circle 5** • **Lot of the time (60-90%) circle 4** • **Some of the time (40-60%) circle 3** • **Little of the time(10-40 %) circle 2** • **Almost none of the time (0-10%) circle 1**	**Almost all the time**	**A lot of the time**	**Some of the time**	**Little of the time**	**Almost none of the time**
2. Did you experience clarity/focus in the participant's music?	5	4	3	2	1
6. Did the participant give musical signals of understanding? (copy, mirror, develop)	5	4	3	2	1
9. Did the participant seem insecure playing music with the therapist?	5	4	3	2	1
13. Was the participant primarily into own music?	5	4	3	2	1
14. Did the participant's music accompaniment/relate to the therapist's?	5	4	3	2	1
16. Did the participant play in a flexible and varied way?	5	4	3	2	1
17. Did the participant develop ideas in the music?	5	4	3	2	1
28. Did the participant seem satisfied with own musical output?	5	4	3	2	1
29. Did the therapist pick up and use the participant's musical ideas?	5	4	3	2	1
30. Did the participant have difficulty signaling his/her intentions ?	5	4	3	2	1

Following the music therapist's improvisation (ex 2)

Clip:_____ Rater_____ Date_____ **Here is a list of questions concerning the video-clip you just watched. If your experience of the participant following the therapist as described, ring one number in the right columns to score each question:** • **Almost all of the time (90+ %) circle 5** • **Lot of the time (60-90%) circle 4** • **Some of the time (40-60%) circle 3** • **Little of the time(10-40 %) circle 2** • **Almost none of the time (0-10%) circle 1**	**Almost all the time**	**A lot of the time**	**Some of the time**	**Little of the time**	**Almost none of the time**
4. Did the participant match the rhythm of the therapist?	5	4	3	2	1
5. Did the participant have difficulty matching the musical style of the therapist?	5	4	3	2	1
20. Did the participant seem "stiff" in matching the therapist's music?	5	4	3	2	1
21. Did the participant seem to be good at expressing him/her self musically?	5	4	3	2	1
25 Did the participant seem willing to participate in the improvisation?	5	4	3	2	1
26. Did the participant look at the therapist?	5	4	3	2	1

Hold on Improvisation (ex 3)

Clip:_____ Rater_____ Date_____ **Here is a list of questions concerning the video-clip you just watched. If your experience of the participant – therapist relationship as described, ring one number in the right columns to score each question:** **•Almost all of the time (90+ %) circle 5** **•Lot of the time (60-90%) circle 4** **•Some of the time (40-60%) circle 3** **•Little of the time(10-40 %) circle 2** **•Almost none of the time (0-10%) circle 1**	**Almost all the time**	**A lot of the time**	**Some of the time**	**Little of the time**	**Almost none of the time**
8. Did the participant seem relaxed in the shared music making?	5	4	3	2	1

10. When the therapist was challenging in the shared music, did the participant maintain playing phrase?	5	4	3	2	1
11. Did the participant get affected musically by challenging playing of the therapist?	5	4	3	2	1
12. Did the participant establish musical independence?	5	4	3	2	1
15. Did the participant seem concentrated and focused?	5	4	3	2	1

Analyzing Free Improvisation (ex 4)

Clip:_____ Rater:_____ Date_____ Here is a list of questions concerning the video-clip you just watched. If you experienced the participants music as described, ring one number in the right columns to score each question: • **Almost all of the time (90+ %) circle 5** • **Lot of the time (60-90%) circle 4** • **Some of the time (40-60%) circle 3** • **Little of the time(10-40 %) circle 2** • **Almost none of the time (0-10%) circle 1**	**Almost all the time**	**A lot of the time**	**Some of the time**	**Little of the time**	**Almost none of the time**
1. Was the participant's music congruent with body language?	5	4	3	2	1
7. Did the participant seem comfortable?	5	4	3	2	1
3. Did the participant seem to reveal emotions in the music?	5	4	3	2	1
19. Did the participant's musical expression seem clear?	5	4	3	2	1
22. Did the participant's music relate to the musical output of therapist?	5	4	3	2	1
24. Did you experience a feeling of interpersonal warmth coming from the participant?	5	4	3	2	1
18. Did the participant respond to changes in the music?	5	4	3	2	1
23. Did the participant intend to keep an equal supporting relationship in their music making?	5	4	3	2	1
27. Did the participant seem attentive to the music of the therapist?	5	4	3	2	1

Appendix 15 All English versions of the ICCS

	ICCS_Par (adapted from Rubin and Martin (1994))	ICCS_SR (¤=he/she, #=participant name)	ICCS - MT therapist (after assessment)	ICCS - MTP participant (after assessment)	ICCS-MusRat (improvisation)
	5 ALMOST ALWAYS, 4 OFTEN, 3 SOMETIMES, 2 SELDOM, and 1 ALMOST NEVER	5 ALMOST ALWAYS, 4 OFTEN, 3 SOMETIMES, 2 SELDOM, and 1 ALMOST NEVER	5 HIGHEST, 4 GREATER, 3 MEDIUM, 2 LESS, and 1 MINIMUM degree	5 HIGHEST, 4 GREATER, 3 MEDIUM, 2 LESS, and 1 MINIMUM degree	5 ALMOST ALL, 4 A LOT, 3 SOME, 2 LITTLE, and 1 ALMOST NONE of the time.
	Self-disclosure		**Self disclosure in music**		
1	How often do you show friends who you really are?	How often does # show friends who ¤ really is?	Did the participant's music express who he/she really is?	Did your music express how you felt?	Was the participant's music congruent with body language? (free)
2	How often do you feel that you are understood by others?	How often does # experience being understood?	Did you 'understand' the participant's music?	Did you experience, that your music was understood?	Did you experience clarity/focus in the participants' music? (dialog)
3	How often do you reveal to others how you feel?	How often does # reveal to others how ¤ feels?	Did the participant reveal emotions in the music?	Did you reveal your emotions in your music?	Did the participant seem to reveal emotions in the music? (free)
	Empathy		**Empathy in music**		
4	How often are you able to put yourself in others' shoes?	How often is # able to take the stance of others?	Did the participant understand the emotion the therapist played?	Did you understand the conditions the therapist expressed in music (follow exercise)?	Did the participant match the rhythm of the therapist? (follow)
5	How often do	How often	Did the	Did you have	Did the

	ICCS_Par (adapted from Rubin and Martin (1994))	ICCS_SR (¤=he/she, #=participant name)	ICCS - MT therapist (after assessment)	ICCS - MTP participant (after assessment)	ICCS-MusRat (improvisation)
	you have difficulty understanding others feelings? (R)	does # have difficulty understanding others feelings?(R)	participant have difficulties understanding the feelings the therapist played?	difficulties understanding the feelings that the therapist played? (R)	participant have difficulty matching the musical style of the therapist? (follow)
6	How often do others feel that you understand them?	How often does # understand how you feel?	Did the participant make an effort to be compassionate in the music?	Did you make an effort to be compassionate in the music?	Did the participant give musical signals of understanding (copy, mirror, develop)? (dialog)
	Social relaxation		**Social relaxation in music**		
7	How often is it comfortable for you, to be together with others?	How often is it comfortable for #, to be together with others?	Did the participant seem comfortable playing music together with you?	Were you comfortable playing music with the therapist?	Did the participant seem comfortable?(free)
8	How often do you feel relaxed in small groups?	How often does # seem relaxed in small groups?	Did the participant seem relaxed when you played music together?	Did you feel relaxed playing music?	Did the participant seem relaxed in the shared music making? (hold on)
9	How often do you feel insecure when you are amongst strangers? (R)	How often does # feel insecure when in groups of strangers?(R)	Did the participant seem insecure playing music with a unfamiliar person?	Do you feel insecure when you play music with people you don't know? (R)	Did the participant seem insecure playing music with the therapist?(dialog)
	Assertiveness		**Assertiveness in music**		
10	When someone has	When someone has	Did the participant	Did you react musically to	When the therapist was

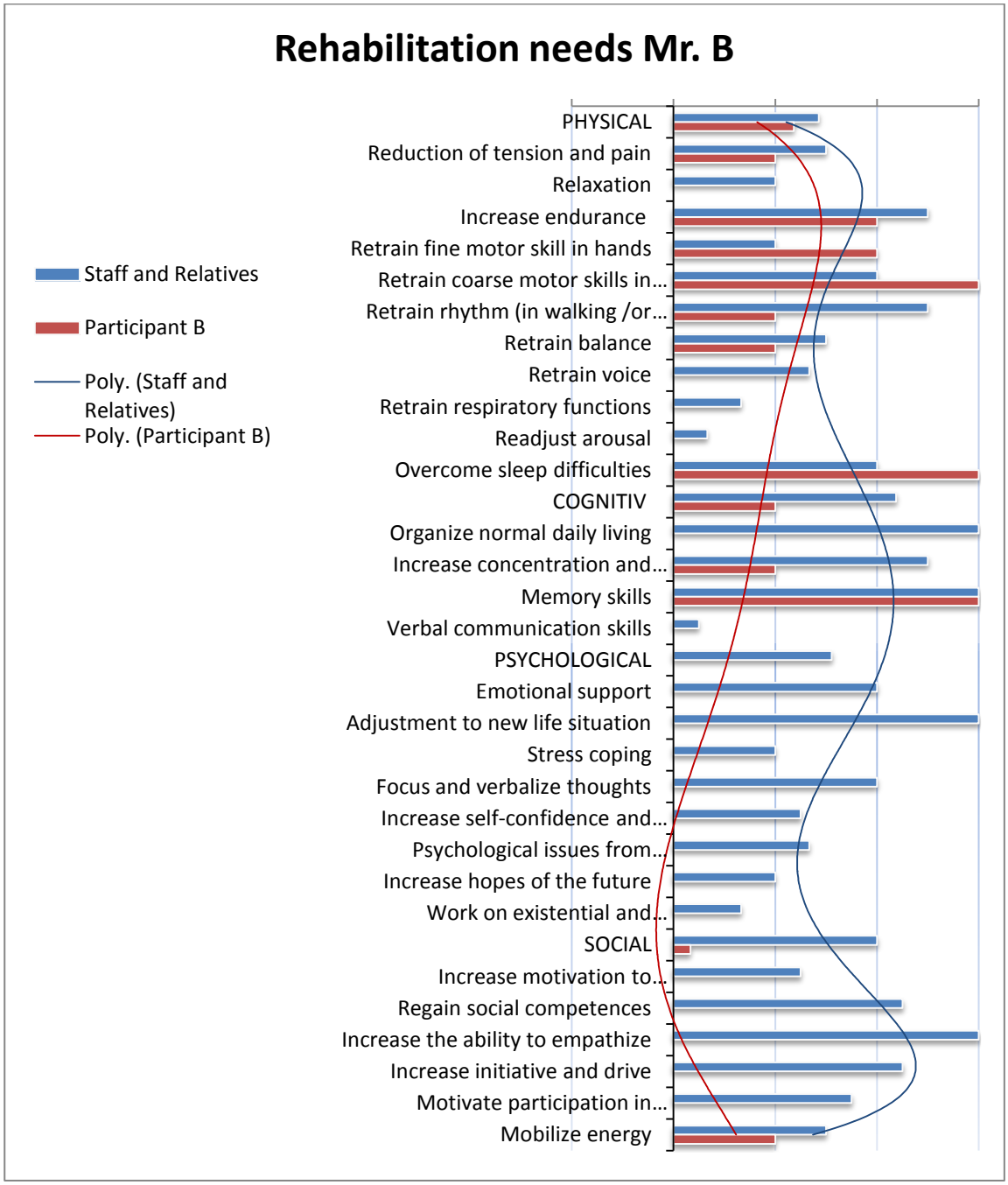
	ICCS_Par (adapted from Rubin and Martin (1994))	ICCS_SR (¤=he/she, #=participant name)	ICCS - MT therapist (after assessment)	ICCS - MTP participant (after assessment)	ICCS-MusRat (improvisation)
	wronged you, how often would you confront the person?	wronged #, how often would ¤ confront the person?	react musically on things that seemed to annoy in the music?	things that annoyed you in the music?	challenging in the shared music, did the participant maintain playing phrase? (hold on)
11	How often do you have difficulty standing up for your rights? (R)	How often does # have difficulty standing up for own rights?((R)	Did the participant have difficulty being independent in the music?	Did you have difficulty in achieving independence in the music? (R)	Did the participant get affected musically by challenging playing of the therapist?(R) (hold on)
12	How often do you stand up for your rights?	How often does # stand up for own rights?	Did participants create own musical space?	Were you able to establish your own musical space?	Did the participant establish musical independence ? (hold on)
	Altercentrism				**Altercentrism in music**
13	How often are conversations about your own topics? (R)	How often are conversations about #'s topics? (R)	Did the participant play more than listen?(R)	Did you play more than listen? (R)	Was the participant primarily into own music? (R)(dialog)
14	How often do you let others know that you understand what they are saying?	How often does # let others know that ¤ understand what they say?	Did you and the participant's music complement each other?	Did yours and the therapists music complement each other?	Did the participant's music accompaniment/ relate to the therapist's?(dialog)
15	How often does your mind wander during conversations	How often does # mind wander during conversations	Did you experience the participant being present when you	Did you have a sense of being present while playing?	Did the participant seem concentrated and focused?

	ICCS_Par (adapted from Rubin and Martin (1994))	ICCS_SR (¤=he/she, #=participant name)	ICCS - MT therapist (after assessment)	ICCS - MTP participant (after assessment)	ICCS-MusRat (improvisation)
	?	?	played?		(hold on)
	Interaction Management		**Interaction management in music**		
16	How often do you shift from one topic to the next without problems?	How often is shift of topic in #'s conversations without problems?	Was the participant's music flexible and varied?	Was your music flexible and varied?	Did the participant play in a flexible and varied way?(dialog)
17	In conversations, how often do you take charge by negotiating conversational topics?	How often is # involved in negotiating conversational topics?	Did the participant both give space and take charge in the music?	Did you both give space and take charge, playing music?	Did the participant develop ideas in the music?(dialog)
18	How often would you estimate that you comprehend both what is said and what is not said in conversations with friends?	How often does # comprehend both what is said and what is not said?	Did you notice something that were not expressed in the music?	Did you notice something that was not expressed in the music?	Did the participant respond to changes in the music?(free)
	Expressiveness		**Expressiveness in music**		
19	How often do your friends notice if you are happy or sad?	How often is it apparent if # is happy or sad?	Was it in the participant's music noticeable how he/she feels?	Was it noticeable in your music how you feel?	Did the participant's musical expression seem clear?(free)
20	How often is it hard for you to find the right words to express yourself? (R)	How often is finding the right words hard for #?(R)	Was it difficult for the participant to musically communicate and express how he/she feels?(R)	Was it difficult to communicate and express what you feel in the music? (R)	Did the participant seem "stiff" in matching the therapist's music? (R)(follow)

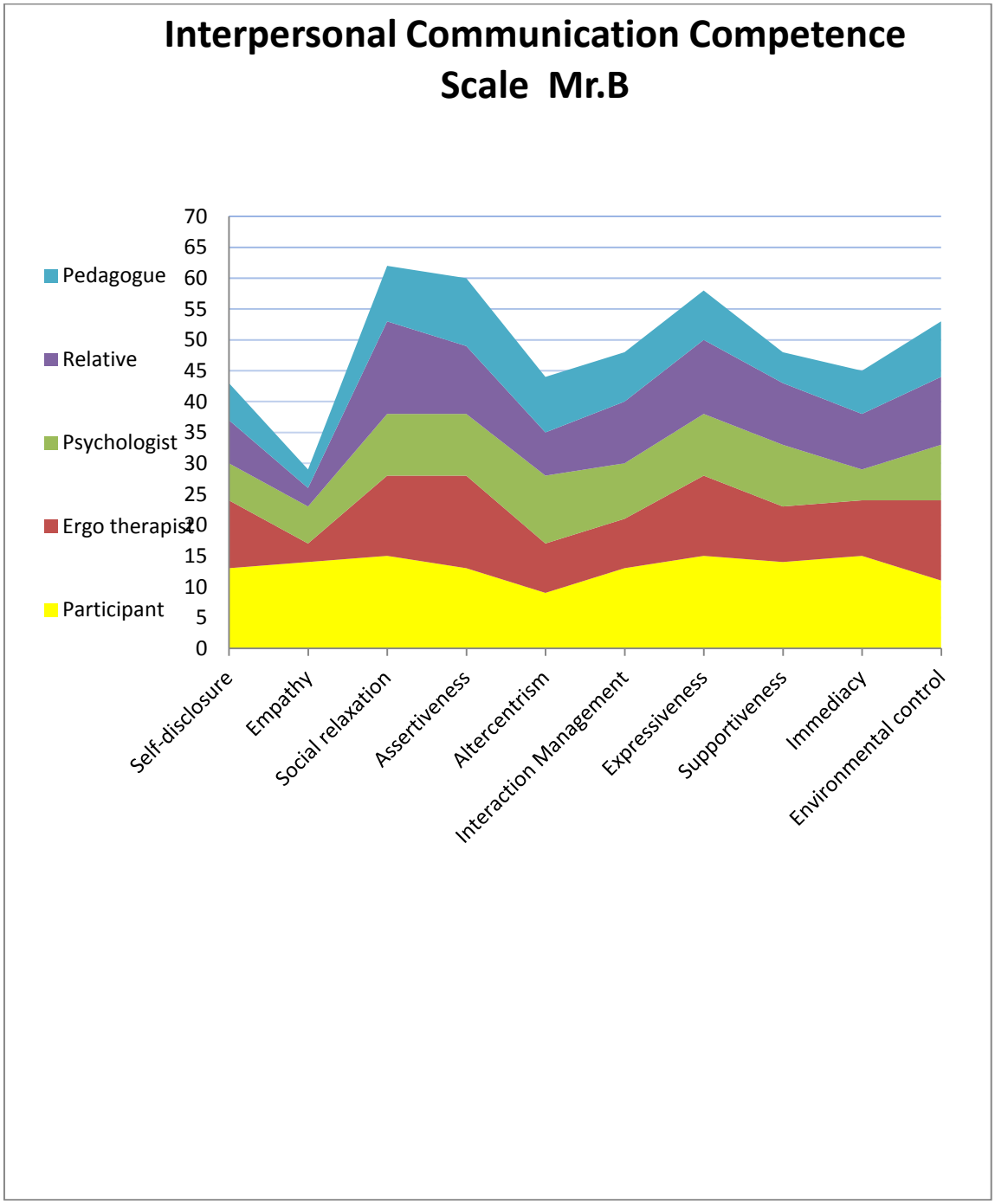
	ICCS_Par (adapted from Rubin and Martin (1994))	ICCS_SR (¤=he/she, #=participant name)	ICCS - MT therapist (after assessment)	ICCS - MTP participant (after assessment)	ICCS-MusRat (improvisation)
21	How often do you experience being good at expressing you self verbally?	How often do you experience # being good at expressing him/herself verbally?	Did you experience the participant as being good at musical expression?	Did you experience being good at expressing yourself through music?	Did the participant seem to be good at expressing him/her self musically?(follow)
	Supportiveness			**Supportiveness in music**	
22	How often is your communication supportive – not evaluative?	How often does # respond supportive – not evaluative?	Did the participant support the musical ideas of the therapist?	Did you follow the musical ideas of the therapist?	Did the participant's music relate to the musical output of therapist?(free)
23	How often do you make an effort to be equal with others?	How often does # make an effort to be equal with others?	Did you and the participant maintain an equal relationship?	Did you and the therapist maintain an equal relationship?	Did the participant intend to keep an equal supporting relationship in their music making?(free)
24	How often would others describe you as warm and loving?	How often would you describe # as a warm and loving person?	Did you sense compassion and warmth in the participant's music?	Do you think that the therapist sensed compassion and warmth in your music?	Did you experience a feeling of interpersonal warmth coming from the participant?(free)
	Immediacy			**Immediacy in music**	
25	How often do your friends feel that you care about them?	How often do you experience that # cares about you?	Did you feel the participants care?	Do you think the therapist felt your care?	Did the participant seem willing to participate in the improvisation?(follow)

	ICCS_Par (adapted from Rubin and Martin (1994))	ICCS_SR (¤=he/she, #=participant name)	ICCS - MT therapist (after assessment)	ICCS - MTP participant (after assessment)	ICCS-MusRat (improvisation)
26	How often do you try to look others in their eyes when you talk to them?	How often does # try to look into your eyes when you talk?	Did the participant adapt his/her music to music of the therapist?	Did you adapt your music to the music of the therapist?	Did the participant look at the therapist? (follow)
27	How often do you tell others that you feel close to them?	How often does # tell other that ¤ feel close to them?	Did you experience closeness from the participant?	Did you experience closeness towards the therapist?	Did the participant seem attentive to the music of the therapist?(free)
	Environmental control		**Environmental control in music**		
28	How often do you feel that you accomplish what you want to in your conversations?	How often do you experience that # communicate what ¤ wants?	Did the participant express what he wanted in the music?	Did you express what you wanted in the music?	Did the participant seem satisfied with own musical output?(Dialog)
29	How often can you persuade others to share your perspective?	How often can # persuade other to his/her perspective?	Did the participant influence the therapist to follow musical ideas?	Were you able to draw the therapist into your musical ideas?	Did the therapist pick up and use the participant's musical ideas?(dialog)
30	How often do you have difficulties convincing others to do what you want them to do? (R)	How often does # have difficulties convincing others to do what # wants? (R)	Did the participant have problems drawing the therapist into own musical space	Was it difficult to draw the therapist into your musical space?(R)	Did the participant have difficulties signaling his/hers intentions? (R)(dialog)

Appendix 16 Example of Rehabilitation Needs scoring



Appendix 17 Example of ICCS_SR and ICCS_Par scoring



Appendix 18 Approval to store data from Datatilsynet (Governmental Data control)

DATATILSYNET

Søren Hald
Kroghstræde 6, rum 8
9220 Aalborg Øst

Sendt til: hald@hum.aau.dk

15. november 2011

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Borgergade 28, 5.
1300 København K

CVR-nr. 11-88-37-29

Telefon 3319 3200
Fax 3319 3218

E-post
dt@datatilsynet.dk
www.datatilsynet.dk

J.nr. 2010-41-5487
Sagsbehandler
Anne-Marie Müller
Direkte 3319 3252

Forlængelse af tilladelse fra Datatilsynet – j.nr. 2010-41-5487

Datatilsynet har den 1. november 2011 modtaget din anmodning om forlængelse af tilladelsen til at behandle personoplysninger i det videnskabelige projekt med ovennævnte journalnummer.

Projektets titel er: " Effekten af aktiv musikterapi på interpersonelle kommunikationskompetencer hos mennesker med erhvervet hjerneskade ".

Det fremgår, at tilladelsen ønskes forlænget til 1. december 2016.

Anmodningen giver ikke Datatilsynet anledning til bemærkninger.

Datatilsynets tilladelse forlænges hermed til: **1. december 2016**.

Behandlingen af personoplysningerne kan fortsætte indtil denne dato på de af Datatilsynet tidligere fastsatte vilkår.

Ved tilladelsens udløb skal du særligt være opmærksom på følgende:

Hvis du ikke inden denne dato har fået tilladelsen forlænget, går Datatilsynet ud fra, at projektet er afsluttet, og at personoplysningerne er slettet, anonymiseret, tilintetgjort eller overført til arkiv, jf. de tidligere fastsatte vilkår om projektets afslutning. Anmeldelsen af projektet fjernes derfor fra fortegnelsen over anmeldte behandlinger på Datatilsynets hjemmeside.

Datatilsynet gør samtidig opmærksom på, at al behandling (herunder også opbevaring) af personoplysninger efter tilladelsens udløb er en overtrædelse af persondataloven, jf. § 70.

Den ændrede anmeldelse offentliggøres i Datatilsynets fortegnelse over anmeldte behandlinger på tilsynets hjemmeside.

Med venlig hilsen

Anne-Marie Müller

Appendix 19 Approval from regional ethics committee

REGION NORDJYLLAND

Phd studerende, Søren Hald
Aalborg Universitet
Institut for kommunitaktion
Kroghstræde 3
9220 Aalborg Øst

Den Videnskabsetiske Komité for Region Nordjylland

Niels Bohrs Vej 30
Postboks 8300
9220 Aalborg Øst
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Komitéen har modtaget din anmeldelse af projektet:

Effekten af musikterapi på interpersonelle kompetencer hos mennesker med erhvervet hjerneskade.

Ud fra det materiale du har fremsendt kan vi læse at det udelukkende drejer sig om interview, spørgeskemaundersøgelse, IAP- og videoanalyse. Projektet er derfor ikke anmelder pligtig.

Med venlig hilsen

Lotte Kragh

Lotte Q. Kragh
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Ref.: lqk

Journalnummer
27. oktober 2008

Appendix 20 Approval from Faculty of Humanities Research Ethics Board

AALBORG UNIVERSITY

Faculty of Humanities'
Human Research Ethics Board
Kroghstræde 3
9220 Aalborg
Denmark

Dr. Tia Hansen (chair)
Prof. Ann Bygholm
Dr. Hanne Mette Ridder
Prof. Peter Øhrstrøm

Secretary:
Lisa Bøegh Rasmussen
Email lisabr@hum.aau.dk
Phone +45 99409078 (Tia Hansen)

Søren Hald
Institut for Kommunikation
Kroghstræde 6
9220 Aalborg Ø

HREB #201104

Post hoc ethical approval

Following a request in December 2010, we have evaluated the protocol for Dr. Søren Hald's study "Active music therapy, aquired brain injury, and interpersonal communication competences" as described in the application May 5 and email June 16, 2011. We find it to be a low-risk research project with adequate ethical considerations taken into account.

Ethical approval granted:

Date: June 27, 2011 pp. HREB: Tia Hansen Signature:

The Human Research Ethics Boards (HREB) at Faculty of Humanities, Aalborg University was founded Jan 1, 2009 in response to researchers' wish for advance ethical evaluation of projects that fall below the threshold of the Regional Ethical Committee of North Jutland and thus had no means of obtaining independent ethical review and advice before. Until December 31, 2010 there was also a window of opportunity to apply post hoc for evaluation of projects launched before the existence of HREB.

Appendix 21 All scores on ICCS_MT

Par	Time	Grp	Dis	Emp	Soc	Ass	Alt	Int	Exp	Sup	Imm	Env	Total
A	Pre MT	TG	11	15	8	7	9	9	10	13	11	11	104
A	Post MT	TG	13	13	12	11	11	12	15	14	13	13	127
B	Pre MT	TG	7	7	7	9	7	5	8	7	10	8	75
B	Post MT	TG	10	7	14	12	5	6	7	7	11	7	86
C	Pre MT	1	8	7	13	9	7	8	7	10	11	10	90
C	Post MT	1	11	10	15	10	8	9	11	12	11	11	108
D	Pre MT	2	9	13	12	10	9	9	12	11	10	9	104
D	Post MT	2	11	14	13	10	8	11	14	13	12	12	118
E	Pre MT	2	8	10	9	9	8	7	11	10	9	9	90
E	Post MT	2	9	9	10	10	8	8	10	10	11	9	94
G	Pre MT	1	9	13	12	12	6	9	10	10	11	11	103
G	Post MT	1	10	13	11	12	11	10	11	11	13	11	113
H	Pre MT	2	8	6	15	6	6	6	9	6	12	6	80
I	Pre MT	1	9	13	14	12	8	8	11	10	10	9	104
I	Post MT	1	9	6	15	12	8	8	7	6	11	8	90
J	Pre MT	2	10	9	12	11	9	12	11	11	12	10	107
J	Post MT	2	13	15	13	15	11	14	15	15	14	14	139
K	Pre MT	2	10	9	15	7	9	10	10	11	12	9	102
K	Post MT	2	11	11	15	9	8	11	12	13	13	10	113
L	Pre MT	1	4	6	9	4	5	3	4	8	5	7	55
M	Pre MT	1	9	12	10	9	9	7	8	10	11	11	96
M	Post MT	1	11	13	11	13	10	11	10	11	8	10	108
O	Pre MT	TG	9	7	12	10	5	9	6	7	9	7	81
O	Post MT	TG	10	9	14	7	9	8	12	13	9	13	104
P	Test	TG	9	9	8	8	8	8	11	12	8	12	93
R	Pre MT	TG	8	9	10	10	8	6	10	10	9	9	89
R	Post MT	TG	8	10	10	12	7	8	11	10	10	7	93

Par=participant, mt=music therapy, Grp=treatment group/training group, Dis=Self-disclosure, DIS=self-disclosure, EMP=empathy, SOC=social relaxation, ASS=assertiveness, ALT= alter centrism, INT= interaction management, EXP= expressiveness, SUP=supportiveness, IMM=immediacy, ENV=environmental control

Appendix 22 All scores on ICCS_MusRat

Par	Time	Grp	Dis	Emp	Soc	Ass	Alt	Int	Exp	Sup	Imm	Env	Total
A	pre mt	TG	13	12,5	12,5	5	12	14	10,5	14	12	14,5	120
A	post mt	TG	14	14,5	14	14	12,5	15	13,5	12,5	12	15	137
B	pre mt	TG	9,5	11	12,5	15	6,5	14	11	6	8,5	11	105
B	post mt	TG	10,5	6,5	15	14,5	3	5,5	9,5	4,5	10,5	9	88,5
C	**pre mt**	**1**	**14**	**10**	**13,5**	**9**	**12,5**	**13**	**10,5**	**11,5**	**9,5**	**14**	**117,5**
C	**post mt**	**1**	**12,5**	**8**	**13,5**	**9,5**	**9**	**13**	**9,5**	**12**	**11,5**	**13**	**111,5**
D	**pre mt**	**2**	**14**	**12**	**12,5**	**11**	**8,5**	**11**	**11,5**	**8,5**	**11,5**	**12,5**	**113**
D	**post mt**	**2**	**14**	**12**	**14**	**9,5**	**10**	**9,5**	**12,5**	**10**	**11,5**	**14**	**117**
E	**pre mt**	**2**	**11,5**	**14,5**	**11,5**	**12,5**	**10**	**14**	**10,5**	**11**	**12,5**	**13**	**121**
E	**post mt**	**2**	**10**	**8,5**	**11,5**	**13**	**10,5**	**11,5**	**7,5**	**10,5**	**13**	**11,5**	**107,5**
G	**pre mt**	**1**	**9,5**	**8**	**14**	**15**	**8**	**11**	**7**	**8**	**8,5**	**12**	**101**
G	**post mt**	**1**	**11,5**	**8**	**14**	**9**	**9,5**	**13,5**	**8,5**	**6,5**	**8,5**	**14**	**103**
H	**pre mt**	**2**	**9**	**8**	**13,5**	**8**	**9**	**13**	**11**	**5,5**	**10**	**13**	**100**
I	**pre mt**	**1**	**10**	**4,5**	**15**	**10**	**7**	**9,5**	**7,5**	**5**	**10**	**11,5**	**90**
I	**post mt**	**1**	**12**	**6**	**15**	**12**	**11,5**	**13,5**	**8,5**	**11**	**9,5**	**12**	**111**
J	**pre mt**	**2**	**13**	**13,5**	**14**	**15**	**12,5**	**13,5**	**14**	**8**	**10,5**	**14,5**	**128,5**
J	**post mt**	**2**	**13,5**	**14,5**	**15**	**15**	**14,5**	**15**	**13**	**13,5**	**14,5**	**14,5**	**143**
K	**pre mt**	**2**	**14**	**9,5**	**14,5**	**8,5**	**14**	**13**	**13,5**	**11,5**	**13,5**	**14,5**	**126,5**
K	**post mt**	**2**	**13,5**	**12**	**15**	**6,5**	**14**	**12**	**13,5**	**12,5**	**14**	**14,5**	**127,5**
L	**pre mt**	**1**	**8,5**	**3**	**10,5**	**10,5**	**4**	**11**	**3**	**3**	**4**	**9**	**66,5**
M	**pre mt**	**1**	**11,5**	**10,5**	**14**	**13**	**8,5**	**12,5**	**9,5**	**12**	**11,5**	**13**	**116**
M	**post mt**	**1**	**11**	**8,5**	**13,5**	**15**	**11**	**14**	**8,5**	**8**	**11**	**13**	**113,5**
O	pre mt	TG	10,5	7	13,5	11	5,5	8	10,5	7,5	11	10,5	95
O	post mt	TG	12,5	9,5	12,5	9	13	13	8,5	12,5	11,5	13,5	115,5
P	Test	TG	11	13,5	14	8,5	8,5	14	11	8,5	11,5	13,5	114
Q	Test	TG	12	8,5	15	13	8	12,5	7	8,5	11	15	110,5
R	pre mt	TG	13,5	13	15	12	11,5	15	11,5	12,5	13	14,5	131,5
R	post mt	TG	10,5	11	14	13,5	9	15	13	7	11,5	14	118,5

Par=participant, mt=music therapy, Grp=treatment group/training group, Dis=Self-disclosure, DIS=self-disclosure, EMP=empathy, SOC=social relaxation, ASS=assertiveness, ALT= alter centrism, INT= interaction management, EXP= expressiveness, SUP=supportiveness, IMM=immediacy, ENV=environmental control

Appendix 23 All scores on ICCS_MTP

Par	Time	Grp	Dis	Emp	Soc	Ass	Alt	Int	Exp	Sup	Imm	Env	Total
A	pre mt	TG	13	15	14	12	10	14	14	12	14	11	129
A	post mt	TG	14	14	15	13	10	13	13	12	14	12	130
B	pre mt	TG	8	11	14	4	6	8	13	11	11	9	95
B	post mt	TG	13	11	15	7	11	15	13	11	15	10	121
C	**pre mt**	**1**	**14**	**13**	**14**	**9**	**9**	**6**	**7**	**14**	**10**	**10**	**106**
C	**post mt**	**1**	**13**	**12**	**9**	**6**	**7**	**13**	**11**	**12**	**11**	**13**	**107**
D	**pre mt**	**2**	**14**	**14**	**15**	**11**	**11**	**15**	**11**	**14**	**15**	**13**	**133**
D	**post mt**	**2**	**15**	**15**	**15**	**7**	**11**	**15**	**15**	**15**	**15**	**11**	**134**
E	**pre mt**	**2**	**13**	**11**	**12**	**9**	**10**	**10**	**14**	**11**	**10**	**13**	**113**
E	**post mt**	**2**	**13**	**11**	**13**	**10**	**11**	**12**	**12**	**15**	**14**	**11**	**122**
G	**pre mt**	**1**	**13**	**12**	**13**	**12**	**9**	**12**	**11**	**12**	**13**	**11**	**118**
G	**post mt**	**1**	**13**	**12**	**15**	**10**	**10**	**13**	**13**	**13**	**13**	**11**	**123**
H	**pre mt**	**2**	**11**	**9**	**10**	**8**	**9**	**11**	**10**	**11**	**8**	**12**	**99**
I	**pre mt**	**1**	**9**	**7**	**8**	**3**	**11**	**9**	**11**	**13**	**7**	**13**	**91**
I	**post mt**	**1**	**10**	**7**	**6**	**10**	**8**	**5**	**9**	**12**	**11**	**11**	**89**
J	**pre mt**	**2**	**14**	**13**	**15**	**12**	**11**	**13**	**14**	**10**	**15**	**12**	**129**
J	**post mt**	**2**	**14**	**13**	**15**	**13**	**9**	**15**	**14**	**12**	**15**	**12**	**132**
K	**pre mt**	**2**	**13**	**11**	**13**	**11**	**8**	**13**	**12**	**12**	**12**	**11**	**116**
K	**post mt**	**2**	**12**	**11**	**11**	**11**	**9**	**10**	**12**	**11**	**10**	**10**	**107**
L	**pre mt**	**1**											
M	**pre mt**	**1**	**9**	**9**	**10**	**9**	**7**	**9**	**10**	**9**	**10**	**12**	**94**
M	**post mt**	**1**	**7**	**9**	**11**	**7**	**6**	**6**	**8**	**9**	**10**	**10**	**83**
O	pre mt	TG	9	7	11	11	11	7	15	15	7	15	108
O	post mt	TG	7	15	10	9	5	9	7	7	9	9	87
P	Test	TG	7	10	7	8	8	6	9	9	10	9	83
Q	Test	TG	8	8	4	7	8	6	9	9	8	9	76
R	pre mt	TG	12	14	10	7	10	14	14	15	13	11	120
R	post mt	TG	13	7	11	9	8	10	10	11	12	7	98

Par=participant, mt=music therapy, Grp=treatment group/training group, Dis=Self-disclosure, DIS=self-disclosure, EMP=empathy, SOC=social relaxation, ASS=assertiveness, ALT= alter centrism, INT= interaction management, EXP= expressiveness, SUP=supportiveness, IMM=immediacy, ENV=environmental control

Appendix 24 All IAP Autonomy scores

Par		Volume	Rhythmic ground	Tonal/ melodic	Phrasing	**Total pr. minute**	Dependent	Follower	Partner	Leader	Resister
A	Pre MT	-0.68	-0.85	0	-0.88	**-0.8**	0	18.95%	75.49%	5.56%	0
A	Post MT	3.2	1	0	3	**2.4**	0	0	60%	40%	0
B	Pre MT	2.33	4.33	6	4	**4.17**	0	0	44.44%	41.67%	13.89%
B	Post MT	2.81	2.53	0	4.69	**3.34**	0	0	51.56%	41.15%	7.29%
C	Pre MT	2.01	2.37	3.65	3.31	**2.83**	0	0	52.76%	47.24%	0
C	Post MT	0.55	0.55	1.64	3.55	**1.57**	0	5.68%	62.5%	31.82%	0
D	Pre MT	2.25	2.63	3.75	3	**2.91**	0	0	51.56%	48.44%	0
D	Post MT	1.85	2.77	3	3.69	**2.83**	0	0	52.88%	47.12%	0
E	Pre MT	1.88	2.5	0	1.63	**2**	0	4.17%	59.72%	34.72%	1.39%
E	Post MT	1.14	1.47	0	0.34	**0.99**	0	11.6%	65.79%	17.2%	5.41%
G	Pre MT	2	0.78	0	2.67	**1.81**	0	1.23%	67.9%	30.25%	0.62%
G	Post MT	3.75	3.38	0	5.88	**4.33**	0	0.69%	49.31%	27.08%	22.92%
H	Pre MT	0.72	4.76	4.86	5.17	**3.88**	0	0.86%	43.53%	45.69%	9.91%
I	Pre MT	3.64	0	0	3.11	**3.38**	0	0	56.44%	30.87%	12.69%
I	Post MT	2.2	3.4	0	3.4	**3**	0	0	51.11%	47.78%	1.11%
J	Pre MT	0	2.18	3	3.27	**2.11**	0	0	64.77%	35.23%	0
J	Post MT	0.67	-0.25	1.19	0.94	**0.64**	0	6.89%	79.41%	9.86%	3.85%
K	Pre MT	2	2.2	2.2	3	**2.7**	0	6.11%	45.56%	45.56%	2.78%
K	Post MT	0.33	0.33	1.33	1	**0.81**	0	0	86.57%	13.43%	0
M	Pre MT	0	-0.27	3.27	6	**2.25**	0	1.14%	60.23%	38.64%	0
M	Post MT	2.11	4.44	4.78	5.67	**4.25**	0	0	37.5%	54.17%	8.33%
O	Pre MT	2	1.67	0	4	**2.56**	5.56%	0	50%	35.19%	9.26%
O	Post MT	-2.76	-4.32	0	-5.1	**-4.06**	19.09%	30.77%	48.86%	1.28%	0
P	Test	1.08	1.75	3.83	5.38	**3.01**	0	0	54.34%	41.15%	4.51%
Q	Test	1.2	1.8	2.6	3.2	**2.2**	0	0	65%	33.33%	1.67%
R	Pre MT	0.9	2.4	0	3.3	**2.2**	0	0	63.33%	36.67%	0
R	Post MT	5.79	5.28	5.79	5.07	**5.48**	0	1.29%	27.59%	49.57%	21.55%

Appendix 25 Microanalysis using IAP scores and Celemony Melodyne Editor

The job of visually presenting music therapy participants' improvised music is often a great challenge. This article presents a method of visualizing improvised music in combination with IAP autonomy ratings. The music editor software Celemony's Melodyne Editor is used to visualize the music. The software can "discriminate" instruments and indicate tones based on audio recordings. The software indicates played notes, dynamics, and timing. The program gives a method of visualizing patterns and changes in the music with exact timing. A microanalysis is performed based on Brusica's (1987) IAP autonomy profile. Two blinded raters did the IAP rating. IAP scorings every ten second and is presented in a diagram along the visualization. This method is an adaptation of Wosch's (2007) idea of presenting improvised music. Wosch (2007) illustrate how IAP scoring over time can help detect development in the improvisation (see figure). In the example (figure 1) the X-axis is a chromatic scale and the y axis is time.

The analysis reveal that the participant is playing a steady repetitive pattern (the two top notes g' and C'') and generally ignore communicative initiatives from the therapist (the subdivisions from the tenth to the thirty second). Around minute one, the therapist again initiates a loud fast call for interaction that the participant resists by continuing playing his pattern. Towards the end, the therapist chose go with the flow of the participant music. Below the musical visualization the 'ten second interval blinded IAP-autonomy rating is presented. The IAP scales phrasing, tonal and melodic, rhythmic ground, and volume is presented. The example illustrates how IAP can be used to identify where to conduct a micro analysis but also illustrate the participants reaction to communicative/interactional initiatives.

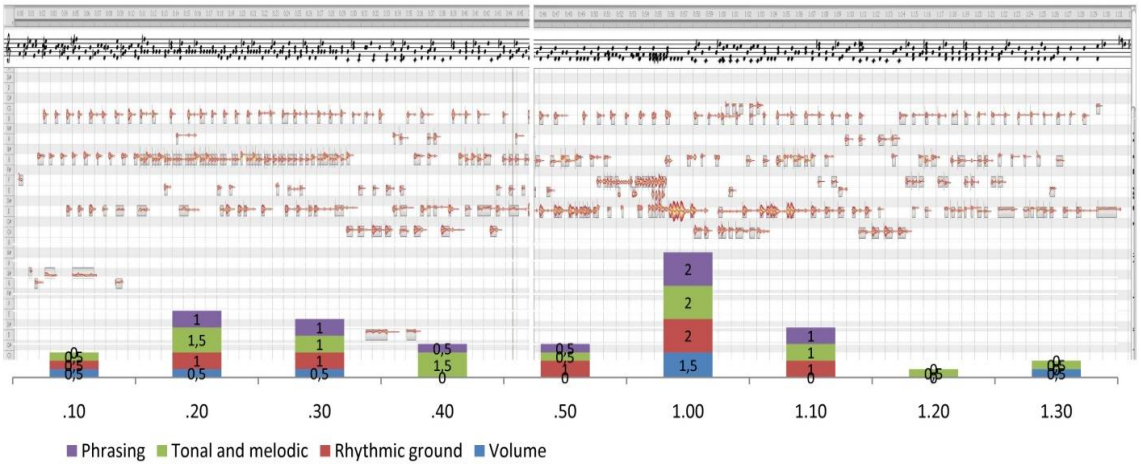


Figure 1. Ten second interval IAP scori
graphical representation of improvised

Participant's role in the music:
Resister =2, Leader =1, Partner =0, Follower =-1, Dependant =-2

Appendix 26 Correlation matrix on ICCS_SR subgroup scores

		DIS	EMP	SOC	ASS	ALT	INT	EXP	SUP	IMM	ENV	Total
DIS	Pearson Corr.		.247	.387	.277	.228	.126	.262	.377	.403	.128	.667
	Sig. (2-tailed)		.001	.000	.000	.003	.103	.001	.000	.000	.098	.000
	N		169	169	169	169	169	169	169	169	169	169
EMP	Pearson Corr.	.247		.204	-.119	-.005	.387	.082	.524	.195	.065	.502
	Sig. (2-tailed)	.001		.008	.122	.952	.000	.287	.000	.011	.404	.000
	N	169		169	169	169	169	169	169	169	169	169
SOC	Pearson Corr.	.387	.204		.119	.146	.170	.030	.238	.185	.008	.494
	Sig. (2-tailed)	.000	.008		.124	.059	.027	.694	.002	.016	.917	.000
	N	169	169		169	169	169	169	169	169	169	169
ASS	Pearson Corr.	.277	-.119	.119		.004	.151	.321	-.047	.097	.347	.457
	Sig. (2-tailed)	.000	.122	.124		.958	.050	.000	.547	.209	.000	.000
	N	169	169	169		169	169	169	169	169	169	169
ALT	Pearson Corr.	.228	-.005	.146	.004		-.019	-.069	.084	.001	-.202	.176
	Sig. (2-tailed)	.003	.952	.059	.958		.807	.372	.276	.990	.009	.022
	N	169	169	169	169		169	169	169	169	169	169
INT	Pearson Corr.	.126	.387	.170	.151	-.019		.509	.274	.188	.452	.616
	Sig. (2-tailed)	.103	.000	.027	.050	.807		.000	.000	.014	.000	.000
	N	169	169	169	169	169		169	169	169	169	169
EXP	Pearson Corr.	.262	.082	.030	.321	-.069	.509		.058	.287	.582	.596
	Sig. (2-tailed)	.001	.287	.694	.000	.372	.000		.452	.000	.000	.000
	N	169	169	169	169	169	169		169	169	169	169
SUP	Pearson Corr.	.377	.524	.238	-.047	.084	.274	.058		.402	.013	.563
	Sig. (2-tailed)	.000	.000	.002	.547	.276	.000	.452		.000	.869	.000
	N	169	169	169	169	169	169	169		169	169	169
IMM	Pearson Corr.	.403	.195	.185	.097	.001	.188	.287	.402		.133	.579
	Sig. (2-tailed)	.000	.011	.016	.209	.990	.014	.000	.000		.086	.000
	N	169	169	169	169	169	169	169	169		169	169
ENV	Pearson Corr.	.128	.065	.008	.347	-.202	.452	.582	.013	.133		.478
	Sig. (2-tailed)	.098	.404	.917	.000	.009	.000	.000	.869	.086		.000
	N	169	169	169	169	169	169	169	169	169		169
Total	Pearson Corr.	.667	.502	.494	.457	.176	.616	.596	.563	.579	.478	
	Sig. (2-tailed)	.000	.000	.000	.000	.022	.000	.000	.000	.000	.000	
	N	169	169	169	169	169	169	169	169	169	169	

Appendix 27 Rehabilitation Need Questionnaire coordinated with Baker and Tamplin (2006)

Need evaluation in regards to further rehabilitation

Client:_____

Date:_____

Evaluated by:_____

With an X please evaluate the need for:

	Large need	Medium need	Small need	No need	Don't know	Baker & Tamplin 2006 p.
PHYSICAL						
Regain gross motor movement of affected upper limb	3	2	1	0	?	65
Refine coordination of gross motor movement	3	2	1	0	?	82
Refine bilateral coordination of gross motor movements	3	2	1	0	?	83
Improve motor movement in space	3	2	1	0	?	86
Increase upper limb strength and endurance	3	2	1	0	?	91
Improve wrist deviation (eg. waving, scrubbing, colouring)	3	2	1	0	?	68
Improve wrist flexion and extension (eg. knocking)	3	2	1	0	?	70
Improve hand pronation and supination movement	3	2	1	0	?	72
Improve squeeze grip to hold and manipulate objects	3	2	1	0	?	74
Achieve and hold a hook grip	3	2	1	0	?	77
Improve five-jaw chuck grip	3	2	1	0	?	78
Achieve a disc grip	3	2	1	0	?	80
Ability to hold objects in pad-to-pad grip	3	2	1	0	?	81
Fine motor control small hand movement incl. pad-to-pad grip	3	2	1	0	?	88
Refine coordination of five fingers of affected hand or of non-dominant hand if affected hand is dominant hand (compensatory)	3	2	1	0	?	89
Improve balance and trunk control when seated	3	2	1	0	?	93
Improve standing balance and trunk control	3	2	1	0	?	94
Improve gait	3	2	1	0	?	96
Muscle relaxation and pain management	3	2	1	0	?	97
COGNITIVE						
Sustain attention sufficiently in tasks of longer duration	3	2	1	0	?	104
Focus on a task in the presence of competing stimuli	3	2	1	0	?	106
Ability to maintain attention when alternating between tasks	3	2	1	0	?	108
Ability to focus on at least two simultaneous stimuli	3	2	1	0	?	109
Understanding of acquired impairments, limitations, maintained abilities, losses, changes to premorbid situations, and future possibilities	3	2	1	0	?	111
Become aware of preservative behaviors	3	2	1	0	?	112
Complete functional activities without disruption from their own preservative tendencies	3	2	1	0	?	113
Ability to hold information in conscious awareness for brief periods and to store the information in short term memory	3	2	1	0	?	115
Ability to hold information in conscious awareness for brief periods and to store the information in short-term memory	3	2	1	0	?	118

Improve ability to recall names of people	3	2	1	0	?	122
Organizational skills	3	2	1	0	?	124
Abstract thinking	3	2	1	0	?	125
Self-monitoring	3	2	1	0	?	128
Problem-solving	3	2	1	0	?	129
Ability to follow a complex set of directions	3	2	1	0	?	126
Develop tolerance for other's ideas and contributions	3	2	1	0	?	131
Techniques and strategies for indentifying and managing frustration before it escalates to aggressive or inappropriate outbursts	3	2	1	0	?	132
PSYCHOLOGICAL						
Deal with response to traumatic event	3	2	1	0	?	194
Deal with loss of function and independence	3	2	1	0	?	194
Deal with loss of physical appearance	3	2	1	0	?	194
Deal with loss of professional status and career prospects	3	2	1	0	?	194
Deal with loss of financial control and security	3	2	1	0	?	195
Deal with loss of role within family	3	2	1	0	?	195
Deal with loss of ability to participate in recreational and social activities	3	2	1	0	?	195
Deal with loss of others associated with the incident	3	2	1	0	?	196
Deal with feelings of guilt and self-blame	3	2	1	0	?	196
Deal with feelings of blame	3	2	1	0	?	196
Deal with injury from failed suicide attempt	3	2	1	0	?	196
Adjustment to hospitalization and the therapeutic process	3	2	1	0	?	196
Non-verbal form of self-expression Release of negative emotions including frustration, agitation, anxiety, anger and gulit	3	2	1	0	?	215
To self-manage anxiety	3	2	1	0	?	216
VERBAL COMMUNICATION						
Redevelop functional verbal communication	3	2	1	0	?	149
Communicate using correctly articulated speech	3	2	1	0	?	152
Improve oral motor control and coordination						154
Achieve clearer articulation of speech	3	2	1	0	?	158
Increase rate of speech for maximum intelligibility						
Increase respiratory capacity to engage in speech of varying lengths	3	2	1	0	?	161
Respiratory control so that patient can modify vocal intensity						
Develop appropriate use of stress and rhythm in speech	3	2	1	0	?	162
To be able to speak to others with sufficient voice volume and natural sounding vocal timbre	3	2	1	0	?	170
To redevelop natural and expressive vocal inflection	3	2	1	0	?	173 174 175
To be able to be verbally understood by others and speak at a socially appropriate and engaging rate of speech	3	2	1	0	?	177
Ability to engage in appropriate and meaningful conversation with others	3	2	1	0	?	179

Appendix 28 RNQ coordinated with WHO's ICF codes

Need evaluation in regards to further rehabilitation

Client:_____

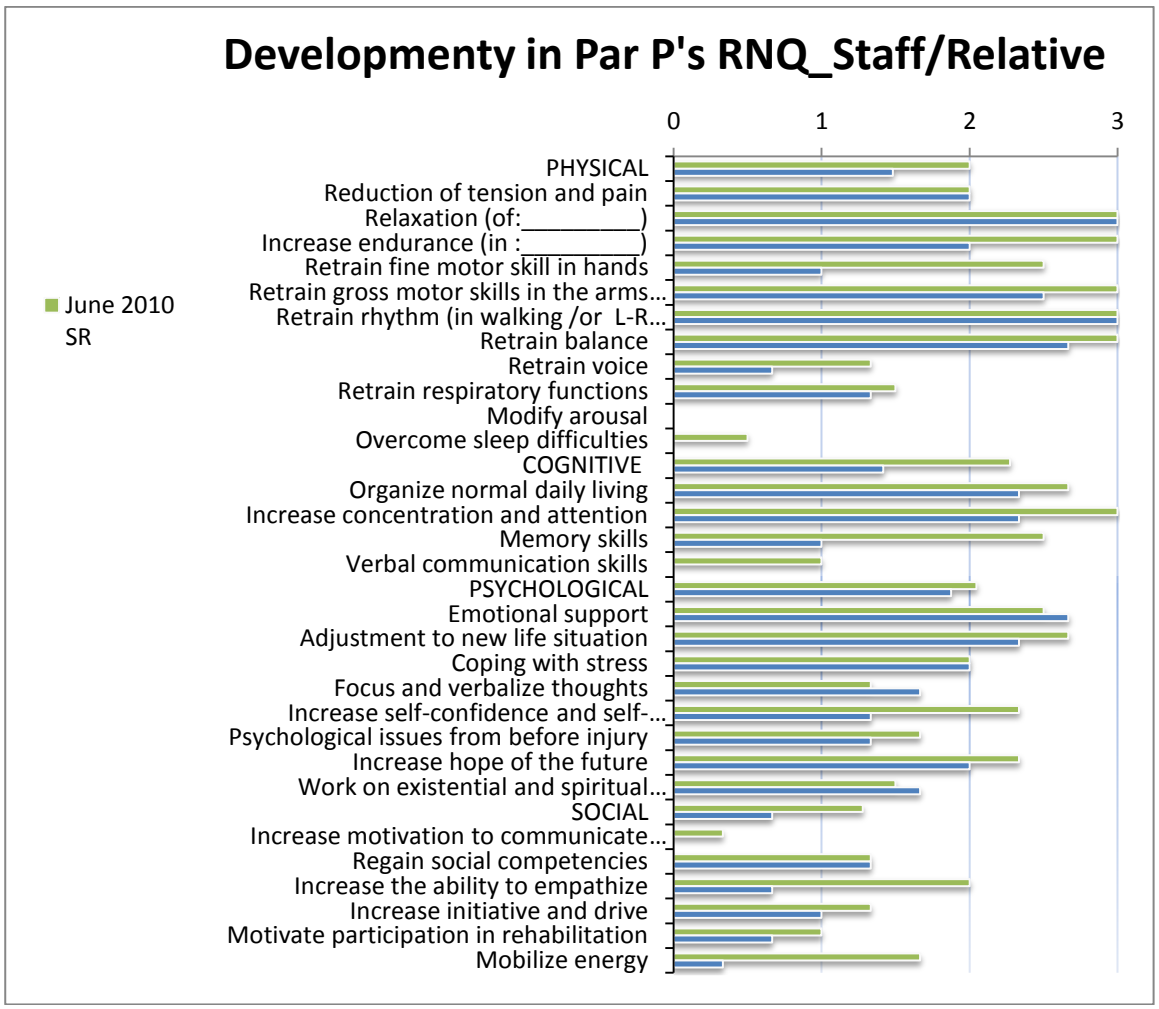
Date:_____

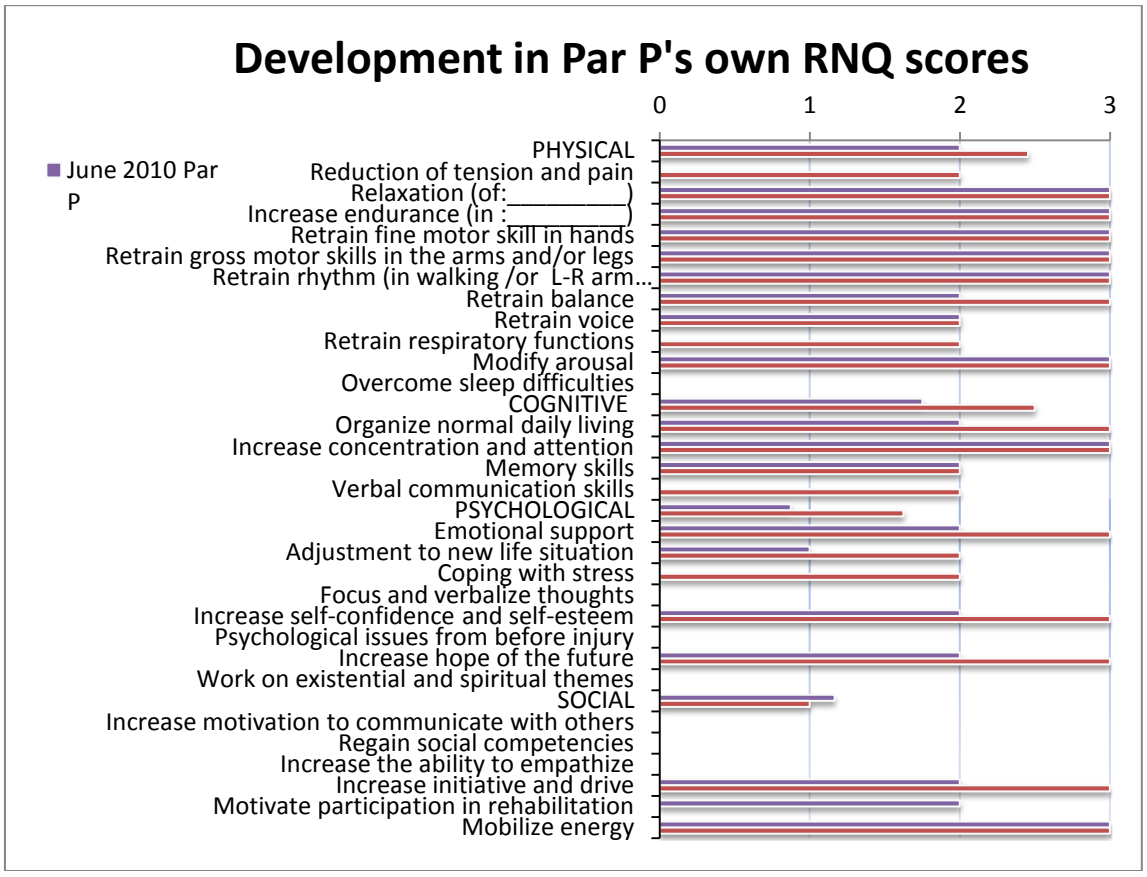
Evaluated by:_____

With an X please evaluate the need for:

	Large need	Medium need	Small need	No need	Don't know	ICF – Code
PHYSICAL						
Reduction of tension and pain	**3**	**2**	**1**	**0**	**?**	**b735/b280**
Relaxation (of:_____)	**3**	**2**	**1**	**0**	**?**	**b735x**
Increase endurance (in :_____)	**3**	**2**	**1**	**0**	**?**	**b740x**
Retrain fine motor skill in hands	**3**	**2**	**1**	**0**	**?**	**d440**
Retrain gross motor skills in the arms and/or legs	**3**	**2**	**1**	**0**	**?**	**d445**
Retrain rhythm (in walking /or L-R arm movement)	**3**	**2**	**1**	**0**	**?**	**d450**
Retrain balance	**3**	**2**	**1**	**0**	**?**	**b2351**
Retrain voice	**3**	**2**	**1**	**0**	**?**	**b310-b340**
Retrain respiratory functions	**3**	**2**	**1**	**0**	**?**	**b440**
Modify arousal	**3**	**2**	**1**	**0**	**?**	
Overcome sleep difficulties	**3**	**2**	**1**	**0**	**?**	**b134**
COGNITIVE						
Organize normal daily living	**3**	**2**	**1**	**0**	**?**	**D230**
Increase concentration and attention	**3**	**2**	**1**	**0**	**?**	**b140**
Memory skills	**3**	**2**	**1**	**0**	**?**	**b144**
Verbal communication skills	**3**	**2**	**1**	**0**	**?**	**b167 /d310/d330**
PSYCHOLOGICAL						
Emotional support	**3**	**2**	**1**	**0**	**?**	**b126 /b152**
Adjustment to new life situation	**3**	**2**	**1**	**0**	**?**	**b180**
Coping with stress	**3**	**2**	**1**	**0**	**?**	**d240**
Focus and verbalize thoughts	**3**	**2**	**1**	**0**	**?**	**B160**
Increase self-confidence and self-esteem	**3**	**2**	**1**	**0**	**?**	**b1266**
Psychological issues from before injury	**3**	**2**	**1**	**0**	**?**	**b126**
Increase hope of the future	**3**	**2**	**1**	**0**	**?**	**B1265**
Work on existential and spiritual themes	**3**	**2**	**1**	**0**	**?**	**D930**
SOCIAL						
Increase motivation to communicate with others	**3**	**2**	**1**	**0**	**?**	
Regain social competencies	**3**	**2**	**1**	**0**	**?**	**d710 – d770**
Increase the ability to empathize	**3**	**2**	**1**	**0**	**?**	**d710 - d720**
Increase initiative and drive	**3**	**2**	**1**	**0**	**?**	**b130**
Motivate participation in rehabilitation	**3**	**2**	**1**	**0**	**?**	**d740**
Mobilize energy	**3**	**2**	**1**	**0**	**?**	**b1300**

Appendix 29 Example on how the RNQ can inform on development





Summing a result of the Par P - Acute injured woman in intensive rehabilitation

Staff experience of Par p's overall rehabilitation needs are generally decreased (from mean 7.6 to 5.4). Conversely Par Ps own assessment of rehabilitation needs generally increased (from mean 5.8 to 7.5)

There are still areas of personnel Par P has large rehabilitation needs. These are; relaxation of the body, training of rhythm and balance, ADL, attention and concentration, self-expression and emotional support,

The greatest reduction in staff experience the rehabilitation needs to be seen; muscles of the hand motor skills, memory training, work with empathy and understanding, and mobilization of energy.

Par P's assessment of rehabilitation needs indicate a relative high level of insight in own needs. Par p indicate a large need in (and properly motivation for) physical training. In addition ADL, concentration and attention training as a indicated as large needs. Psychologically Par P has after std. treat a greater need for emotional support, increased self esteem and confidence, and hope for the future. Socially Par P, indicate a need for greater initiative and drive, and mobilization of energy.

Appendix 30 Danish Summary

Baggrund

Livet med en erhvervet hjerneskade indebærer ofte en ændring af fysiske, kognitive og psykologiske funktionsevner (Bateman et al., 2010). Forskning viser, at de psykosociale problemer, som ofte følger en erhvervet hjerneskade, kan være de største udfordringer i rehabiliteringsprocessen (Morton & Wehman, 1995). Af den grund er interventioner som kan imødegå psykosocial isolation af stor relevans for dette område. Forskning fra musikterapipraksis viser, at musik kan være et nyttigt redskab til at stimulere interaktion. Endvidere kan musikalsk interaktion indgås på stort set alle kognitive og fysiske niveauer og stadig være meningsfuld (Baker & Tamplin, 2006; Gilbertson, 2005, Hald, 2011). Musikterapiforskere, med speciale i erhvervet hjerneskade, har fundet, at:

- Musikterapi er et stærkt redskab til at forbedre kommunikation i grupper, generel og musikalsk adfærd (Purdie, Hamilton, & Baldwin, 1997).
- Musikterapi kan medføre øget følelsesmæssig stabilitet, tydeliggøre tanker, stimulere spontan interaktion og øge motivation og samarbejde (Nayak, Wheeler, Shiflett, og Agostinelli, 2000).
- Musikterapi kan medføre at deltagerens musik udvikler sig i retning af større integration og i højre grad følger konventionelle interaktionsmønstre (S. Gilbertson & Aldridge, 2008, s. 141).

Den teoretiske ramme for dette studie er baseret på Daniel Sterns (2000) begreb "måder-at-være-sammen-med-andre-på" samt teorier om ”kommunikativ musikalitet” (Malloch & Trevarthen, 2009), og på teorier om interpersonelle kommunikationskompetencer (Rubin & Martin, 1994). Teorierne støtter opfattelsen af, at musikalsk interaktion og improvisation kan fremme udviklingen af grundlæggende kommunikative kompetencer.

Formål

Hovedformålet med dette studie var at undersøge om 20 musikterapisessioner i neurologisk rehabilitering havde en effekt på interpersonelle kommunikationskompetencer i hverdagslivet og i musikalsk interaktion. Dette blev relateret til standard rehabilitering alene. Et sekundært mål med studiet var at udvikle en forskningsprotokol, som på en konsekvent og pålidelig måde vurderede interpersonelle kommunikationskompetencer inden for musik og hverdagslivet. Det tredje formål har været at udvikle en ”Improvisation Assessment Profile protokol”, som evt. ville kunne tilvejebringe informationer om deltagernes kommunikative musikalitet.

Forskningsspørgsmål

1) Hvilken effekt har musikterapi har på interpersonelle

kommunikationskompetencer hos mennesker med erhvervet hjerneskade?

2) Hvordan kan reviderede udgaver af Rubin og Martin's (1994) Interpersonel Communication Competence Skala (ICCS) pålideligt måle deltagernes interpersonelle kommunikationskompetencer inden for både musik og hverdagsliv?

3) Hvordan kan en "Improvisation Assessment Profile" analyse blive gennemført som et pålideligt og validt vurderingsværktøj til måling af improvisatorisk autonomi og kommunikativ musikalitet?

Metode / design
Forskningsdesignet var et" randomiseret cross-over design", der involverede 11 personer med erhvervet hjerneskade. De 11 deltagere blev fordelt tilfældigt i to interventionsgrupper ved hjælp af et matchet par design (Robson, 2011). Gruppe I (n = 6) indledte med 20 musikterapi sessioner plus standard rehabilitering. Gruppe II indledte med standard rehabilitering alene. Efter en udvaskningsperiode på 2 måneder blev interventionerne krydset over. De 11 deltagere blev rekrutteret fra Aktivitetscentret på rehabiliteringsinstitutionen Høskoven i Århus, og de havde alle levet med deres hjerneskade i mere end fem år. Desuden havde syv ud af de otte deltagere, der gennemførte studiet, tidligere deltaget i musikterapi; enten i grupper eller individuelt. Som et middel til at identificere deltagernes individuelle rehabiliteringsbehov udfyldte såvel deltager som medarbejdere og pårørende et rehabiliteringsbehovsspørgeskema. Resultaterne fra disse blev derefter brugt til at guide valget af musikterapi intervention.

Interpersonelle kommunikationskompetencer i dagligdagen blev målt ved hjælp af to spørgeskemaer. Spørgeskemaet "Interpersonal Communication Competence Scale"(ICCS) (Rubin & Martin, 1994) blev oversat til en selvrapporteringudgave, målrettet målgruppen (ICCS_PAR), og til en version designet til at indsamle oplysninger om deltagerens interpersonelle kommunikationskompetencer fra personale og pårørende (ICCS_SR).

For at kunne "måle" interpersonelle kommunikationskompetencer i musikalsk improvisation, udførte deltagerne sammen med en musikterapeut fire improvisationer før og efter de 20 musikterapisessioner. De fire øvelser havde titlerne: 1) Dialog, 2) følg udtrykket i musikken, 3) hold fast i dit udtryk og 4) fri improvisation. Deltagerne og musikterapeuten gav efterfølgende en vurdering af deres oplevelse af deltagerens interpersonelle kommunikationskompetencer i de musikalske øvelser ved hjælp af to spørgeskemaer udviklet til dette projekt. Spørgeskemaerne var baseret på Rubin og Martin's (1994) ICCS, men med adresserende musikalsk kommunikation. Der blev udviklet både en interpersonel kommunikationskompetenc-musikterapeut version (ICCS_MT) og en interpersonel kommunikationskompetence-musikterapideltager version

(ICCS_MTP). To bedømmere, som ikke kendte til deltagerne og interventioner mv., vurderede deltagernes musikalske improvisationer med en helt femte udgave af ICCS (ICCS_MusRat). De to bedømmere lavede også en "Improvisation Assessment Profile – Autonomi" (IAP_aut) (Bruscia, 1987) vurdering. IAP bedømmelser blev udført ved hjælp af fire IAP skalaer: 1) Rytmisk grund, 2) Frasering, 3) Tonal / melodisk grund og 4) Volumen. Deres bedømmelser blev omdannet til Likert-skala (numerisk) data. De fire IAP skalaer blev valgt, fordi de korresponderede med de elementer, der definerer kommunikativ musikalitet (puls, kvalitet, og frasering) (Malloch & Trevarthen, 2009).

Resultater

Forskningsspørgsmål 1

Spørgeskemadata fra personale, og pårørendes vurdering af deltagernes interpersonelle kommunikationskompetencer i hverdagslivet (ICCS_SR), blev underlagt en "repeated measurement ANOVA" analyse. Resultaterne indikerede en ikke-signifikant effekt af musikterapi på interpersonel kommunikationskompetencer i forhold til effekten af standard rehabilitering alene.

Resultaterne indikerede en signifikant ($p < .01$) korrelation mellem interpersonelle kommunikationskompetencer inden for musik, som blev vurderet af musikterapeut, og hverdagsliv som blev vurderet af personale og pårørende.

Analysen af data fra IAP analysen viste ingen signifikant forandring efter 20 musikterapi sessioner. Men resultaterne indikerede øget partnerskab i forhold til frasering, volumen og tonal / melodisk grund og øget autonomitet i forhold til oprettelse af rytmisk grund.

"Effect size"-værdierne på ICCS underskalaen "selv-åbenhed" (personale/ pårørende vurdering: $d = -1{,}447$, og musikterapeut evaluering: $d = -1{,}723$), antyder, at 20 musikterapisessioner medførte en effekt på deltagernes selv-åbenhedskompetencer, inden for både musik og i hverdagsliv. Selv-åbenhed refererer til at være åben og afsløre personligt materiale om én til andre. Det synes realistisk, at musikterapigruppeformatet, den terapeutiske stil, den improvisatoriske og strukturerede musik - kunne have haft denne positive effekt på deltagernes selv-åbenhedskompetencer. Dette resultat blev opnået på trods af, at hovedparten af deltagerne havde deltaget i musikterapi forud for denne undersøgelse. Den lille gruppe af deltager i projektet betyder, at alle resultater skal fortolkes med høj grad af forsigtighed.

Forskningsspørgsmål 2

Det originale ICCS spørgeskema af Rubin og Martin (1994) blev oversat til dansk og omformuleret til et deltager-spørgeskema egnet til mennesker med

erhvervet hjerneskade, og et personale/pårørende-spørgeskema. Cronbach Alpha værdien på deltagerens version (ICCS_Par), indikerede en "tvivlsom" intern konsistens (α = 0,675), mens Cronbach Alpha værdien på personale/pårørende-versionen (ICCS_SR) indikerede en "acceptabel" intern konsistens (α = 0,774). Disse resultater indikerer, at yderligere revision af den danske version af ICCS_Par skal gennemføres, eller at ICCS_Par spørgeskemaet var for kompliceret for mennesker med erhvervet hjerneskade at udfylde. Det har endvidere været muligt, at omformulere de oprindelige ICCS til tre musik-versioner: en version for musikterapideltagere, en version for musikterapeuten, og en version til blindede bedømmere. Cronbach Alpha værdien på musikterapeut versionen (ICCS_MT) angav en "god" intern konsistens (α = 0,890), mens Cronbach Alpha værdien på blindede bedømmer-versionen (ICCS_MusRat) og musikterapideltager-versionen (ICCS_MTP) begge indikerede en "excellent" intern konsistens (α= 0,902 og α= 0,933 respektive). Selvom resultaterne er lovende, er yderligere testning og revision af spørgeskemaer nødvendig.

Spørgsmål 3
Cohens Kappa beregninger på de blindede bedømmeres IAP analyse tyder på, at bedømmerne var mest enige når de vurderede deltagernes autonomi i forhold til Rytmisk grund (Kw = 0,621) og frasering (Kw = 0,603) i forhold til når de vurderede autonomi i Volumen (Kw =. 475) og tonal / melodisk grund (Kw = 0,357). Resultaterne indikerer, at IAP analyse kan anvendes som et gyldigt og pålideligt vurderingsværktøj til måling af improvisatorisk autonomi og kommunikativ musikalitet i fri improvisation.

Konklusion
Resultaterne tyder på, at musikterapi (20 sessioner) kan have en effekt på selv-åbenhedskompetencer hos mennesker med erhvervet hjerneskade, selv efter mere end fem års rehabilitering. Et nyt værktøj til måling af interpersonelle kommunikationskompetencer inden for musik og hverdagsliv, baseret på ICCS af Rubin & Martin (1994), er blevet konstrueret. Projektet giver endvidere en ny måde at beregne en autonomi i musik, som samtidig vurderer kommunikativ musikalitet i musikalske improvisationer.