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VITALITY FORMS NEUROTRANSMITTERS AND EMBODIED MUSIC LISTENING

A discussion of Daniel Stern's relationship with neuroscience

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1. STERN'S CENTRAL PROPOSITIONS

Movement is the primary manifestation of being animate (2010:9, 19; 1985:156)

In development, the infant is predominantly sensible to vitality forms (2010:110-117; 1985:53-61)

The senses are integrated in cross-modal perception (2010:25-25, 35-36, 44, 48; 1985:59, 154-156)

The sharing of vitality forms is a direct path into another's subjective experience (2010:43)
- such as affect attunement (2010:113-115; 1985:138-142, 152-154)

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OVERVIEW

1. Stern's central propositions

2. What are forms of vitality?

3. Stern's quest for a theoretical framework

4. Investigation and support: Music and Dance

5. The Arousal Hypothesis

6. Stern's summary: Intentions and achievements

7. Further paths of inquiry

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WHAT ARE FORMS OF VITALITY?

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2.1 THREE POSSIBLE VITALITY FORMS

Exploding
Music: Poul Ruders: Gong (1992), for orchestra

Pulsing
Music: Steve Reich: Music for 18 Musicians (1976)

Fading
Music: Gustav Mahler: Symphony no. 5 (1902)
4th movement

(2010:8)

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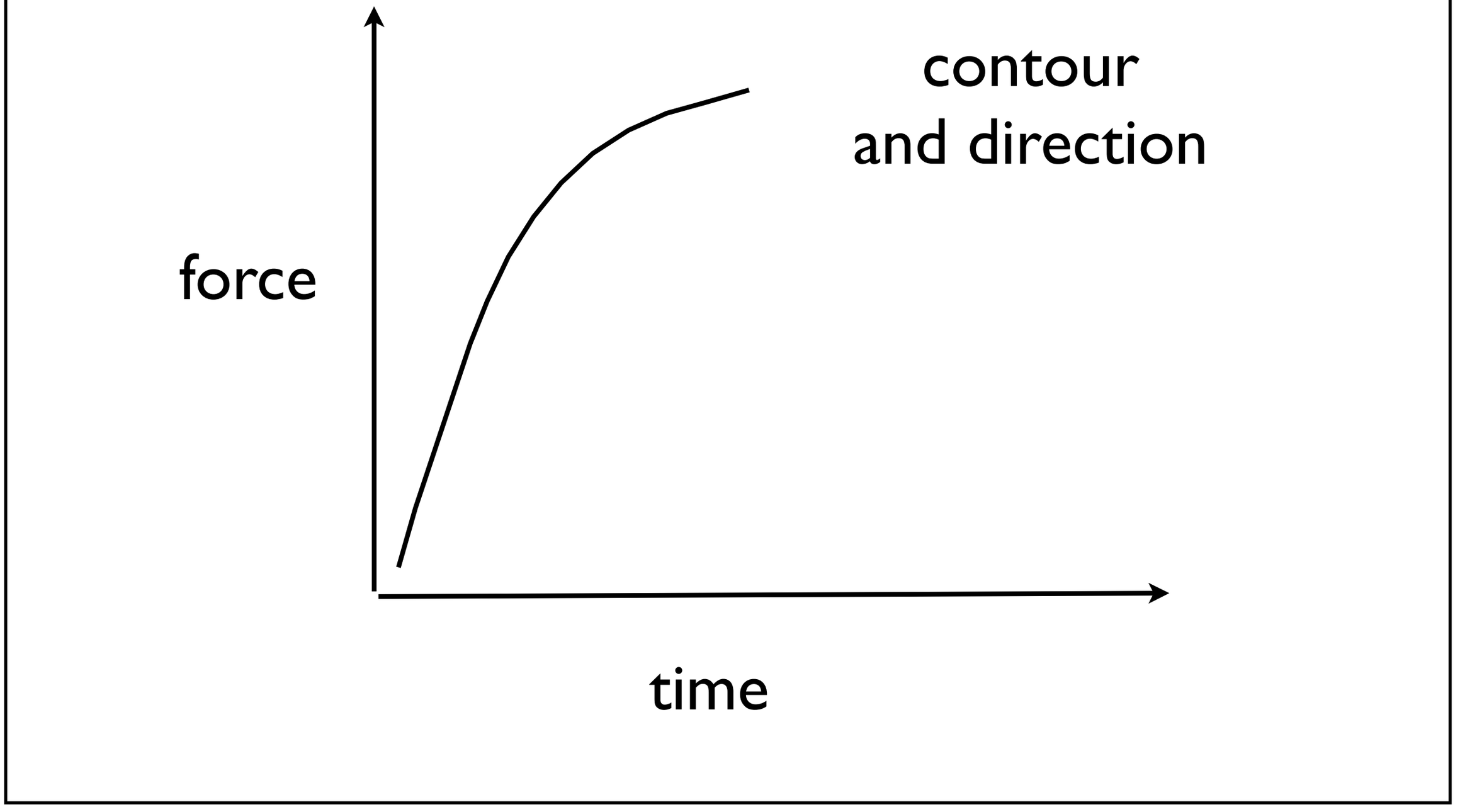
2.2 Vitality Form: Exploding



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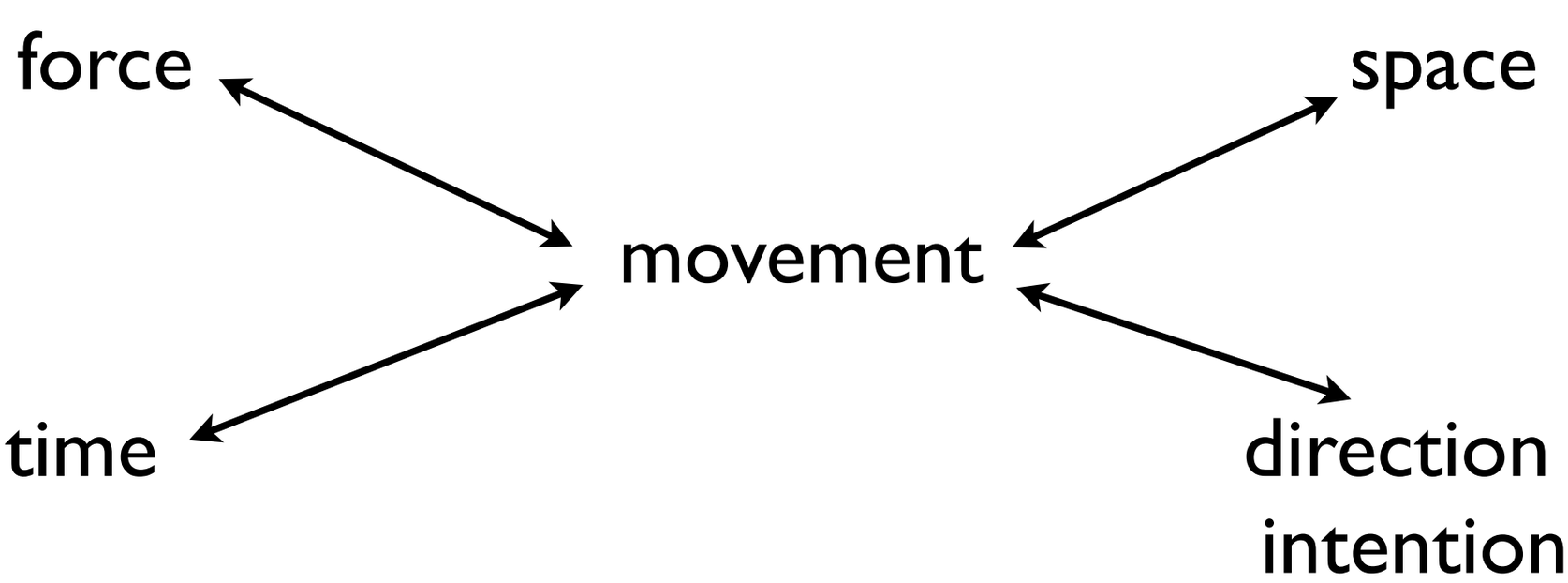
2.3. DYNAMIC FORMS OF VITALITY

”The fundamental dynamic pentad:
movement and her four daughters” (2010:4, 111)



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Tony Wigram introduces
Daniel Stern's
video keynote
presentation
"The issue of vitality"
Nordic Conference of
Music Therapy
Aalborg, April 2009.

(Stern, 2010b; Wigram, 2010.
The issue of vitality.
Nordic Journal of Music Therapy
19(2), 87-102)

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STERN'S QUEST FOR A THEORETICAL FRAMEWORK

3.1. STERN'S TEXTS AND CONCEPTS

1985/2000 The Interpersonal World of the Infant
vitality affects, activation contours (pp. 53-61, 156-161)

1999 Vitality Contours, book chapter *)
feeling flow patterns (pp. 67-72)

2004 Present Moments
vitality affects, temporal contours (pp. 36-37, 62-71)

2010 Dynamic Forms of Vitality (pp. 3-31)

*) Rochat, P. (Ed. 1999) *Early social cognition*, pp. 67-80

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3.2.1 VITALITY FORMS - ELABORATING THE CONCEPT

1985: "qualities of experience"

surging	fading away	fleeting	
explosive	crescendo	decrescendo	
bursting	drawn out		(1985:54)

1999: "feeling flow patterns"
as before, plus

accelerando	decelerando	climaxing	(1999:68)

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3.2.2 VITALITY FORMS - ELABORATING THE CONCEPT

2004: "feeling qualities captured by kinetic terms"
as before, plus

forceful/effortful	unstable	tentative	
reaching	hesitating		
leaning forward	leaning backward		(2004:36, 64)

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3.2.3. VITALITY FORMS - ELABORATING THE CONCEPT

2010: "the felt experience of force in movement"
as before, plus

swelling	disappearing	pulsing
rushing	pulling	pushing
relaxing	languorous	floating
weak easy	gentle	loosely
tense	tightly	bounding
holding still	gliding	swinging

(2010:7)

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3.3. DEFINITION 2010 of DYNAMIC FORMS OF VITALITY:

The felt experience of force – in movement – with a temporal contour, and a sense of aliveness, of going somewhere.

Forms of vitality concern the ”How”, not the ”What” or the ”Why” (2010:8)

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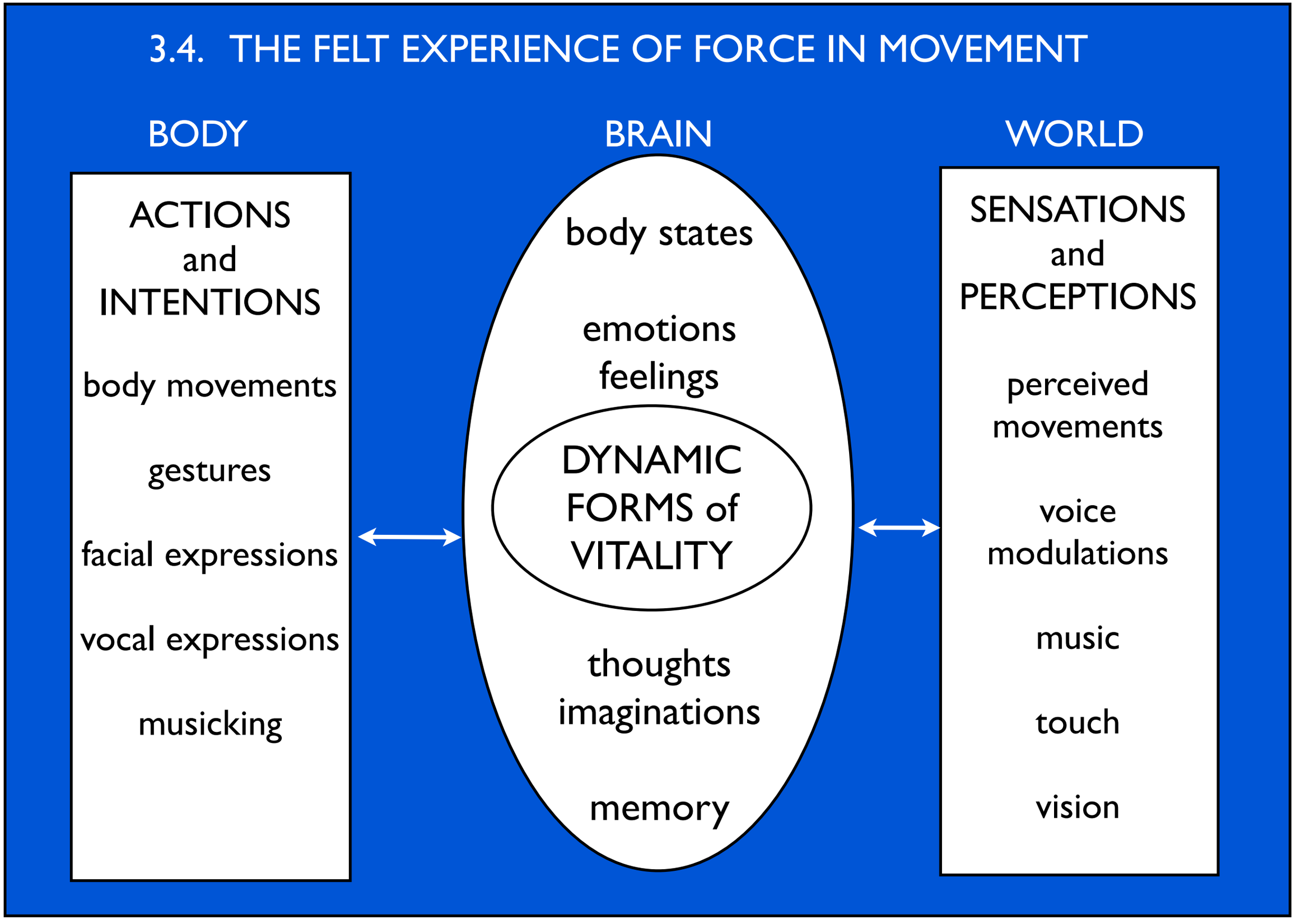
3.4. THE FELT EXPERIENCE OF FORCE IN MOVEMENT



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FIELDS OF INVESTIGATION AND SUPPORT

CHILD DEVELOPMENT (2010, Chapter 6)
CLINICAL THEORY AND PRACTICE (2010, Chapter 7)
Stern's expert summaries

MUSIC, DANCE, THEATER, CINEMA
A preliminary essay (2010, Chapter 5)

AROUSAL
Stern's central neuroscientific hypothesis (2010, Chapter 4)

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4.1 MUSIC

DYNAMIC FORMS IN MUSIC create vitality forms:

intensity crescendo decrescendo
accents attack staccato legato
phrasing tempo ritardando accelerando
(2010:82-84)

COMMUNICATIVE MUSICALITY
Is largely based on the coupling of vitality dynamics between people (2010:51-53)

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4.2 MUSIC THERAPY

The basic methods in music therapy improvisation require the use of vitality forms to share or interchange experience

imitating matching
grounding holding containing
empatic improvisation
dialoguing turn taking interplay (2010:139-141)

(Wigram 2004, Trolldalen 1997)

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4.3. DANCE

Different vitality forms result from the variations of effort and shape in dance:

force	speed	deceleration acceleration
power	strength	flexibility
growing	shrinking	spreading
enclosing	freeing	binding

(2010:88)

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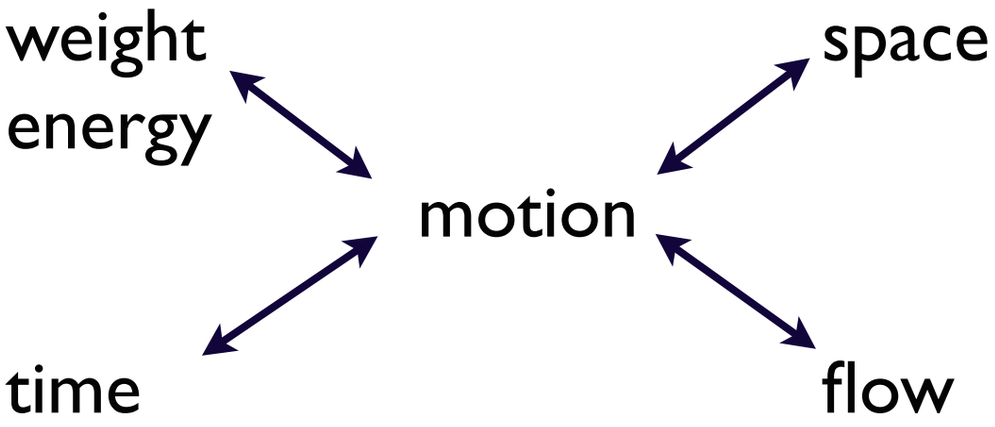
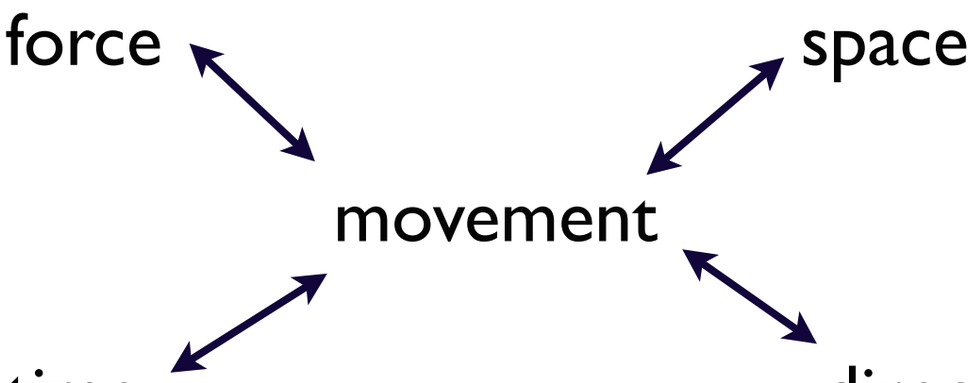
4.4
Dance theorist RUDOLF LABAN'S description of motion factors:



(Laban 1950/2011:11, 19-22)

is closely related to STERN'S description:



(2010:4, 85-86)

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4.5.
RUDOLF LABAN'S examples of MOVEMENT SEQUENCES display similarities with dynamic forms of vitality:

running	tossing	crouching	whirling
bowing	lifting	closing	opening
swaying	circling	spreading	hovering
trembling	shrinking	precipitating	sprawling
waving	drooping	perching	creeping
walking	turning	jumping	uprearing

(Laban 1950/2011:23)

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5
THE AROUSAL HYPOTHESIS

Aim: To find a possible neuroscientific basis for the emergence of vitality forms (2010:54)

HYPOTHESIS:
Arousal is the "fundamental force" for all bodily and mental activity (2010:59)

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5.1 AROUSAL is a force for behavior that

activates motivations

triggers emotions

sharpens attention

starts up cognitions

initiates movement (2010:57)

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5. 2 FIVE AROUSAL SYSTEMS based on five NEUROMODULATORS (or neurotransmitters)

Norepinephrine
Dopamine
Serotonin
Acetylcholine
Histamine

Neumodulators are produced subcortically in the brainstem, hypothalamus or basal forebrain

The arousal systems are regulated bottom-up and top-down
(2010:60-63, 69; Pfaff 2006:31-38)

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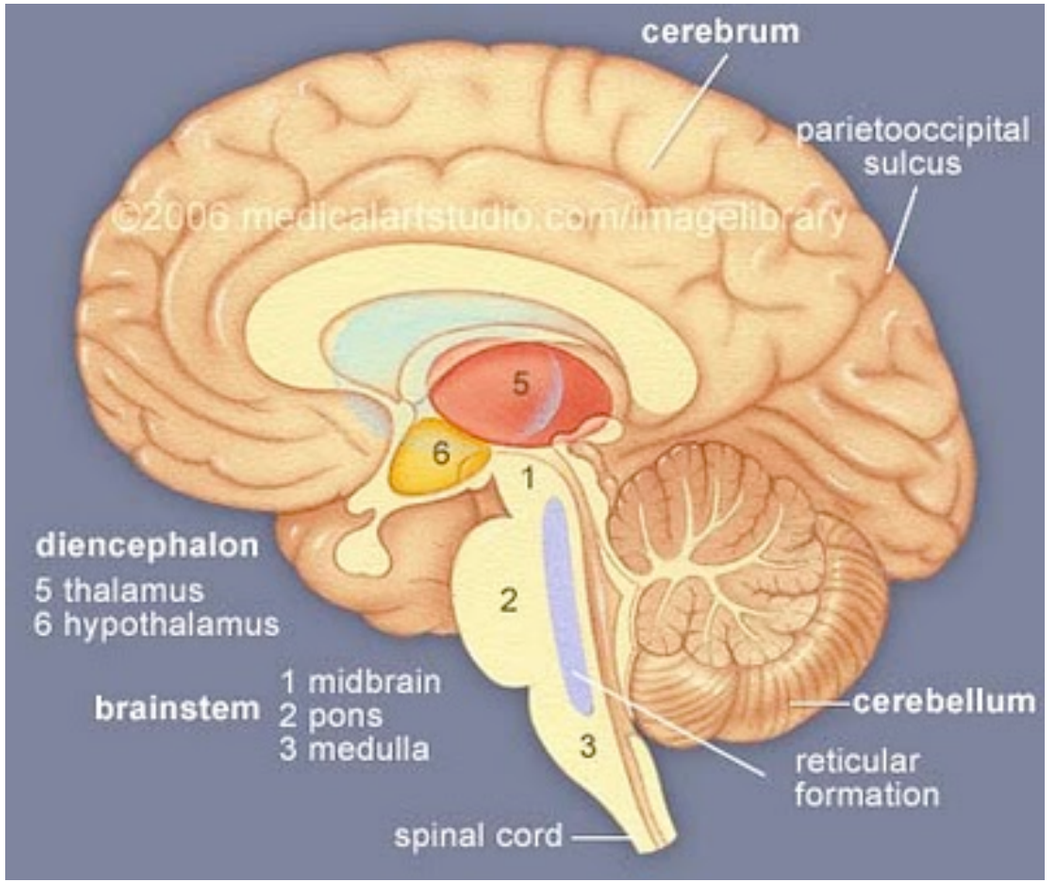
5.3
SUBCORTICAL AND CORTICAL STRUCTURES



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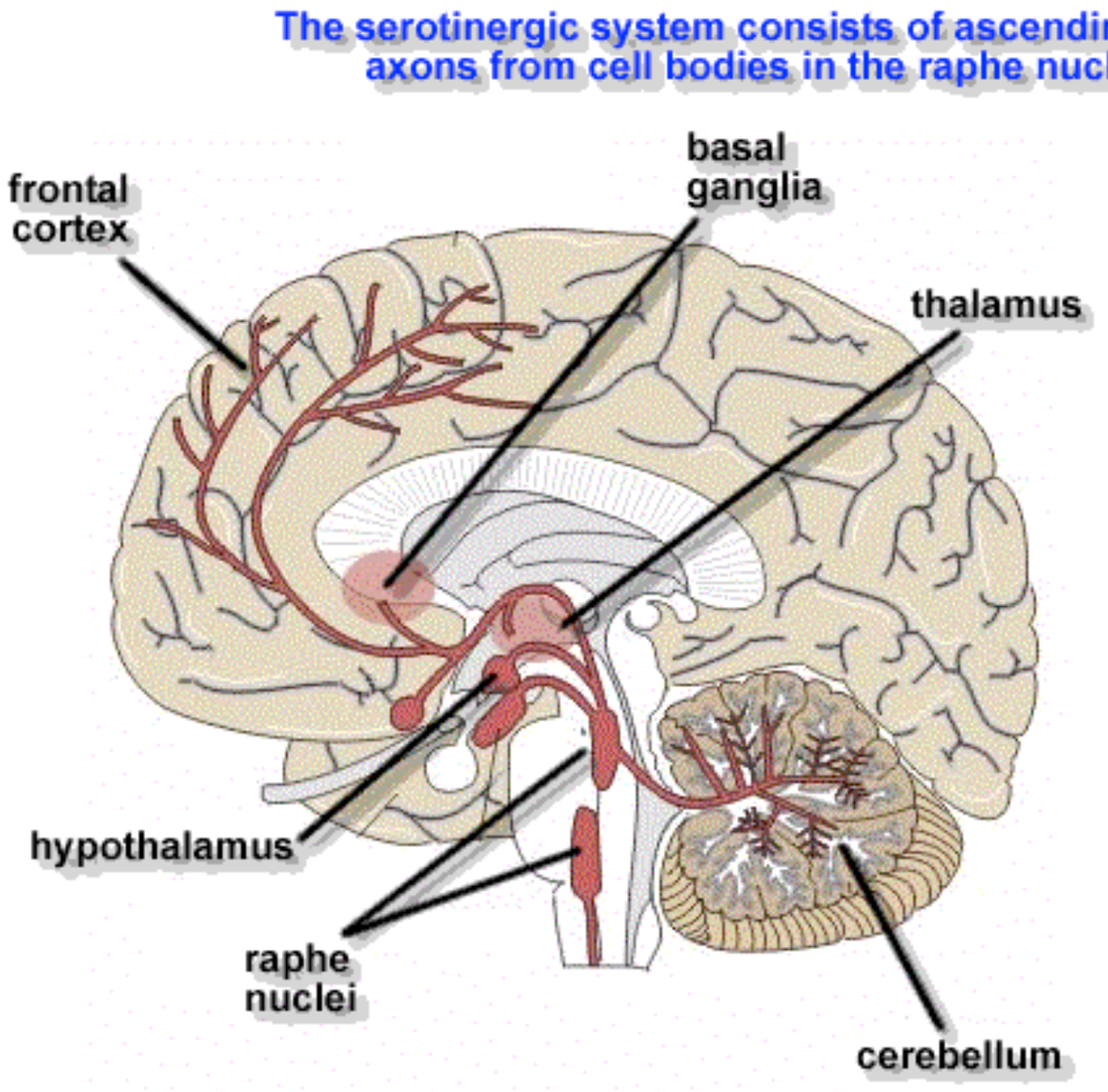
5.4 One neuromodulator: Serotonin distribution in the brain



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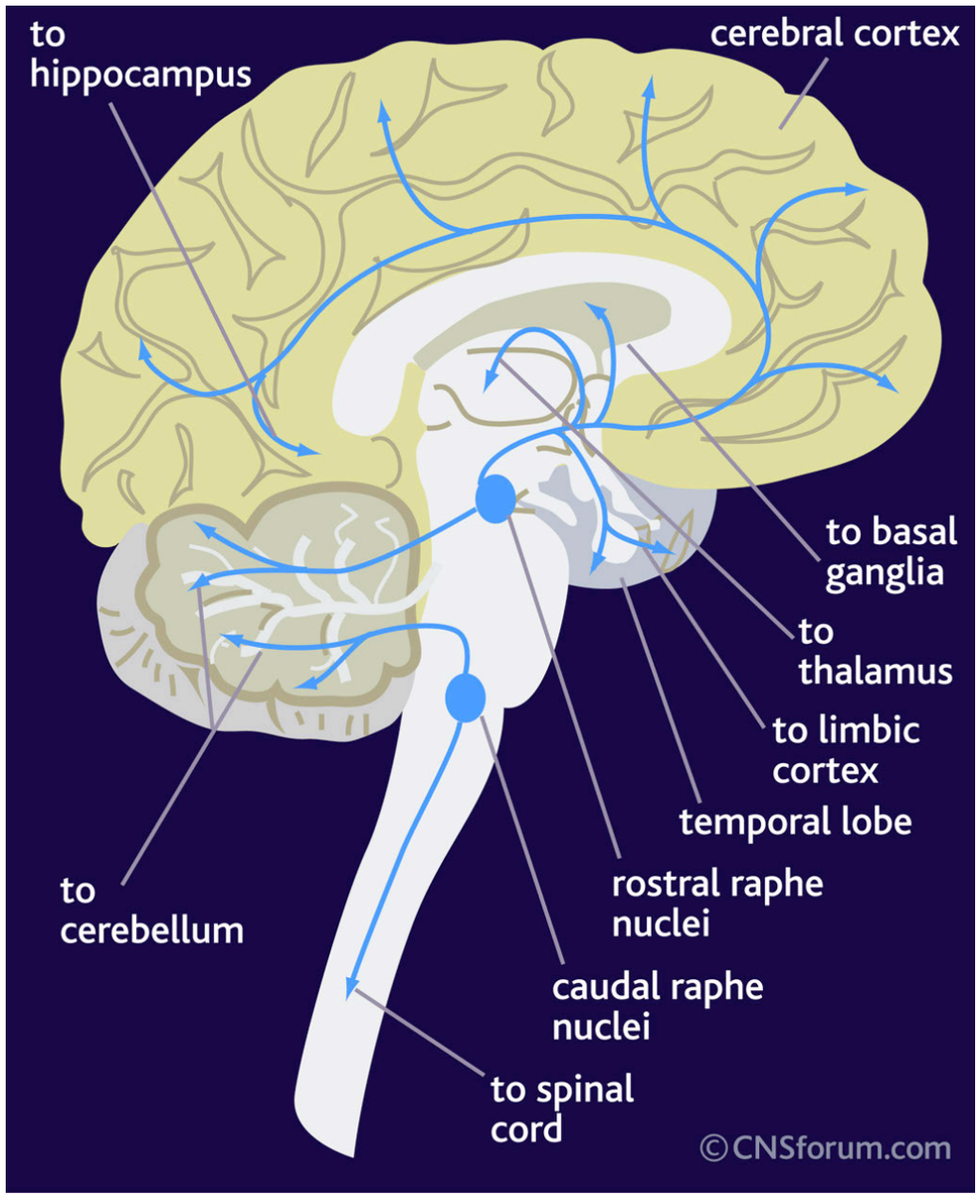
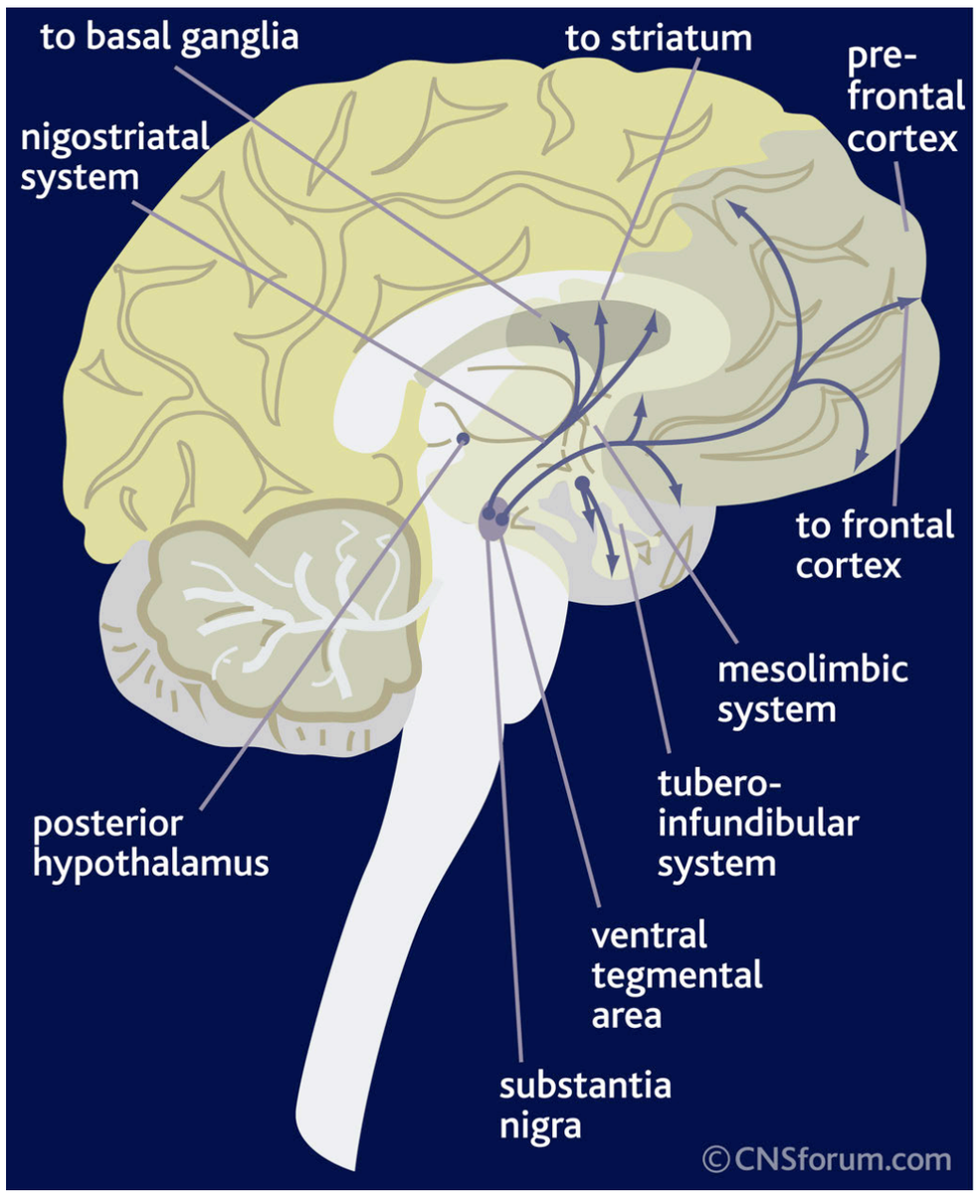
5.5. Comparison:

Serotonin distribution



Dopamine distribution



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5.6 SOME PROMINENT NEUROMODULATOR FUNCTIONS

Norepinephrine supports sensory clarity

Dopamine is important for motor control, motivation, mood and reward

Serotonin reduces impact of incoming information

Acetylcholine mediates attention

Histamine influences sleep and wakefulness

(Pfaff 2006:31-38; Panksepp 1998:107; Robbins & Everitt 1995:708-716)

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5.7 STERN'S FINAL AROUSAL HYPOTHESIS

The arousal systems could produce a multitude of highly specific and complex arousal profiles, each eliciting a specific vitality form

(2010:63)

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5.8 ISSUES FOR DISCUSSION

1) Stern refers to a limited selection of research:
Pfaff 2006, Pfaff et al. 2007, 2008; Robbins and Everitt 1995

2) Stern refers to five arousal systems:
Norepinephrine, Dopamine, Serotonin, Acetylcholine, Histamine.
A multitude of other neurochemicals are active as well: other neuromodulators, endorphins, numerous neuropeptides

3) Stern does not take other functions of the nervous system into consideration

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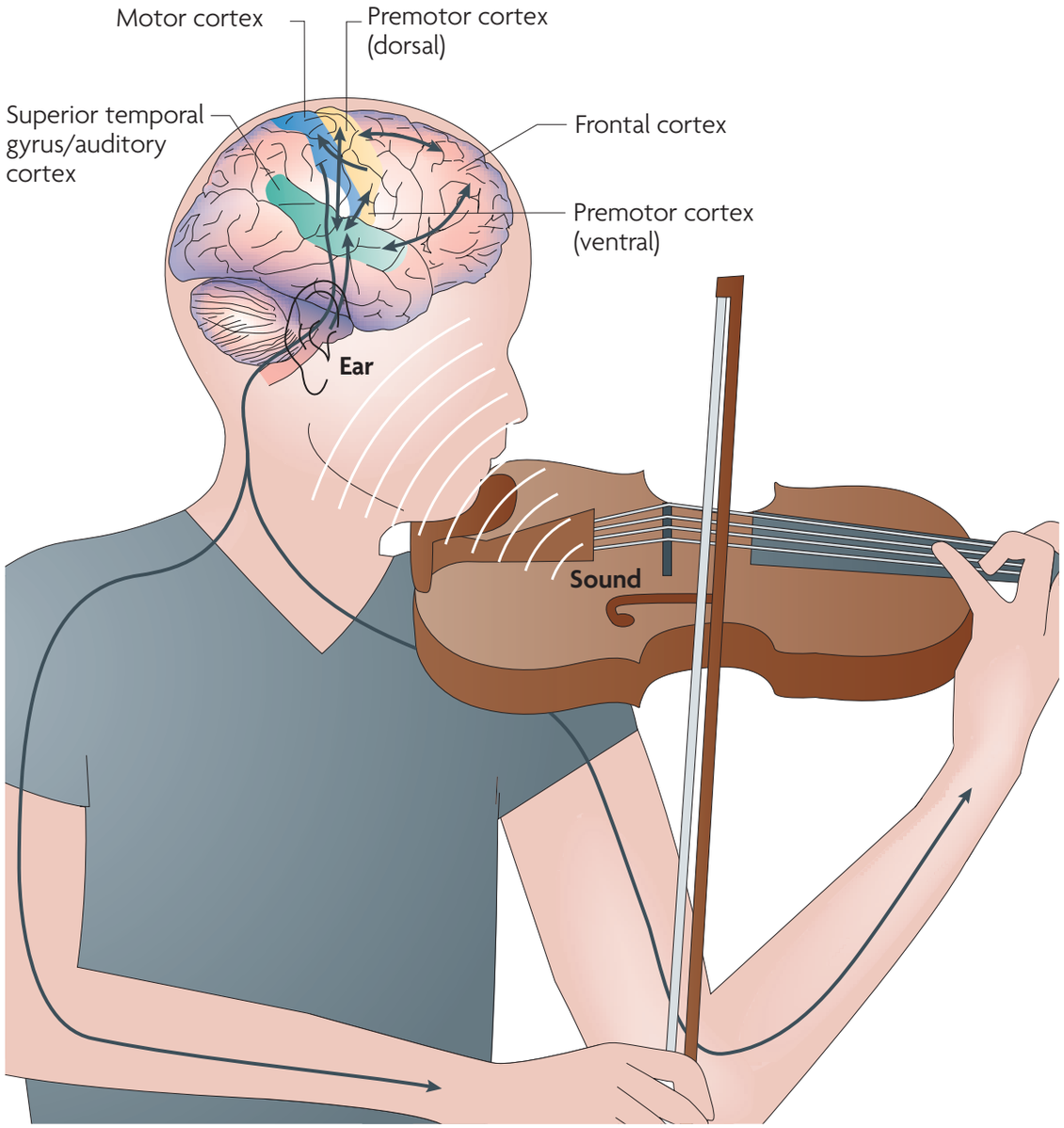
5.8.1. Other functions of the nervous system: Auditory–motor interactions during musical performance



(Zatorre et al. 2007)

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6. Stern's summary:
INTENTIONS and ACHIEVEMENTS

To demonstrate that the domain of dynamic forms of vitality exists

To describe that dynamic forms of vitality are ubiquitous as a part of all experience

To influence some of our current notions and suggest further paths of inquiry

(2010:149)

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7. FURTHER PATHS OF INQUIRY

Neuromodulators and music

Blood & Zatorre 2001; Salimpoor 2011; Chanda & Levitin 2013

Brainstem responses to music

Kraus et al. 2009

The Auditory Neuroscience Laboratory at Northwestern University, Illinois

http://www.soc.northwestern.edu/brainvolts/publications.php

Embodied music listening

Panksepp 1995; Grewe et al. 2009; Altenmüller & Schlaug 2012.

Overview in Christensen 2012:129-140

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FURTHER PATHS OF INQUIRY…

Body-oriented psychotherapy

Geuter 2012

Auditory-motor interactions

Zatorre et al. 2007

Mirror neuron systems

Gallese & Lakoff 2005; Rizzolatti & Craighero 2004;
Overy & Molnar-Szakacs 2009

Neural correlates of 'vitality form' recognition: an FMRI study dedicated to Daniel Stern

Di Cesare et al. 2013

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Thank you for your embodied listening!

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LATEST NEWS

Mona Lisa Chanda and Daniel J. Levitin (2013).
The neurochemistry of music.
Trends in cognitive sciences, April 2013, Vol. 17 No. 4, pp.179-193.

We examine the scientific evidence that music influences health through neurochemical changes in the following four domains:

(i) reward, motivation and pleasure

(ii) stress and arousal

(iii) immunity; and

(iv) social affiliation (2013:179)

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These domains parallel, respectively, the known neurochemical systems of

(i) dopamine and opioids: REWARD, MOTIVATION, PLEASURE

(ii) cortisol, corticotrophin-releasing hormone (CRH), adrenocorticotropic hormone (ACTH): STRESS, AROUSAL

(iii) serotonin and the peptide derivatives of proopiomelanocortin (POMC), including alphamelanocyte stimulating hormone and beta-endorphin: IMMUNITY

(iv) oxytocin: SOCIAL AFFILIATION (2013:179)

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It appears then that it is not just the specific neurochemicals (e.g. dopamine, opioids, norepinephrine) that lead to feelings of pleasure, but their interactions with receptors in specific sites of action within the brain.

Thus, dopamine in one region may affect attentional control, in another region learning, and in yet another motivation.

(Chanda and Levitin 2013:180)

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ADDITIONAL INFORMATION

The conscious waking state is turned on by neuromodulators such as acetylcholine, norepinephrine, and dopamine. Together, they enable a huge repertoire of different cognitive tasks. Each of those tasks involves a combination of local neurotransmitters like glutamine and GABA, along with neuromodulators that control the overall brain state that is needed for a task like perception or working memory to take place.
(...)

Dopamine modulation is involved with basic functions like pleasure and reward seeking, sleep and waking, nicotine and stimulant addiction, working, memory, voluntary motor control, eye movements, and goal-directed learning. It is a huge set of functions.

Baars, B.J. & Gage, N.M. (2010). *Cognition, Brain and Consciousness*. Second Edition, p. 540.

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