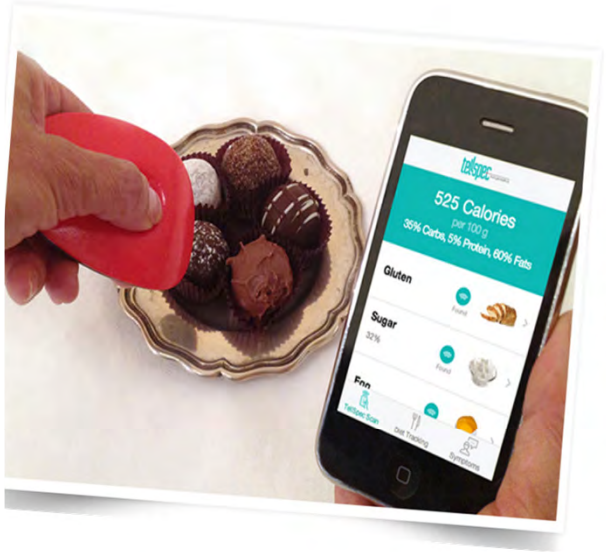
Abstract: Food behavior is increasingly studied experimentally in fields such as public health nutrition, health promotion and consumer science. At the same time new development in sensor technologies have made the measurement of the impact of such interventions easier and the use of automated intelligent devices for measuring and estimating food intake and behavior is increasing. The aim of this presentation is to contribute to the advancement of the science of automated measuring of food behavior using intelligent devices by proposing the Intelligent Buffet (IB). The presentation will present the features and abilities of the Intelligent Buffet (IB) for measuring food intake and to present examples of experiments that it can be used to measure and give an account of the context in which the IB functions – namely the Foodscape Lab (www.foodscapelab.aau.dk). It will provide examples of the use of the IB and the types of questions that can been studied. Finally it will discuss the potential of the IB technology in commercial out of home eating settings and its potential to allow for convenient day to day monitoring of dietary behaviour.

The IB is part of a trend of intelligent food-devices



The TellSpec uses spectrometry

TellSpec will identify allergens, chemicals, nutrients, calories, and ingredients in foods or beverages.

The e Button uses picture recognition (M Sun, Pittsburgh University

The DIMS uses picture recognition and contactless technology
(Ofei & Dobroczynski: Aalborg University)

The IB can estimate

”*who* is eating

what in

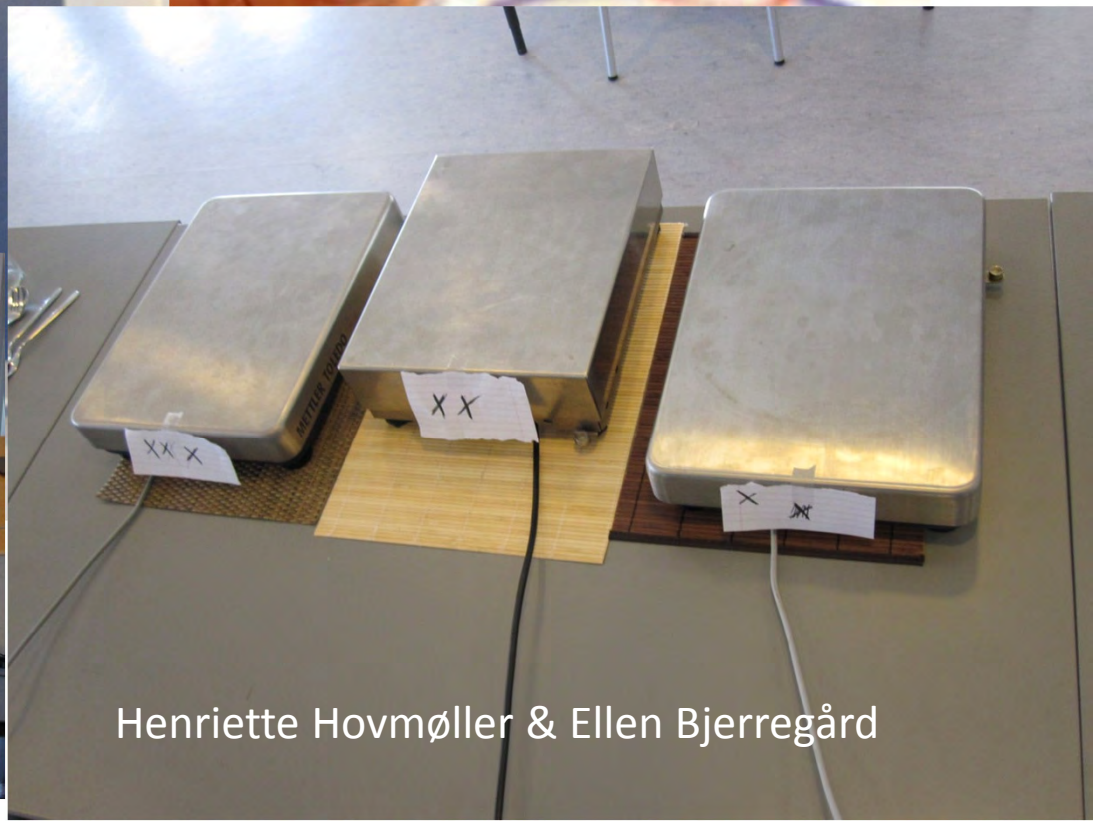
which amounts at

what time”

Aims and objectives

- to contribute to the advancement of the science of **automated** measuring of **food behavior** using **intelligent devices**.
- to remove **method bias** and to have experiments themselves look more realistic.
- to present the **features and abilities of the Intelligent Buffet (IB)** for measuring food intake and to present examples of experiments that it can be used to measure.
- to give an account of the context in which the IB functions – namely the **Foodscape Lab** (www.foodscapelab.aau.dk)
- to provide **2 examples** of the use of the **IB**.
- to discuss the potential of the IB technology in **commercial out of home eating settings** and its potential to allow for convenient day to day monitoring of dietary behaviour.

Early version made by IFS students
– the FoodScale Tracker



Henriette Hovmøller & Ellen Bjerregård

Learning insights from the pre-IB

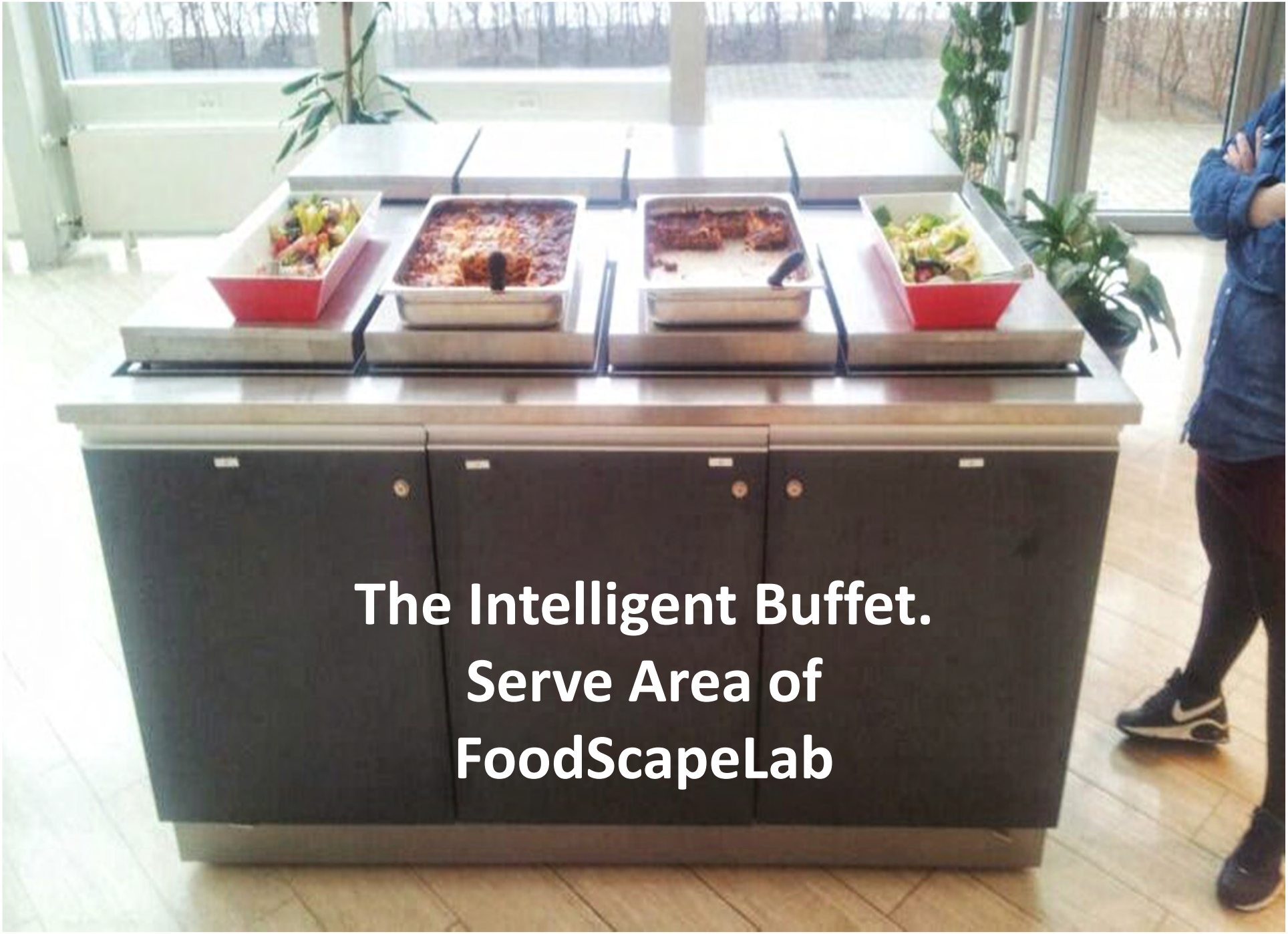
- Method bias
- Not flexible
- Requires people being involved in the experiment
- The experiment is not really realistic - a clear "lab" influence is visible

FoodScape lab

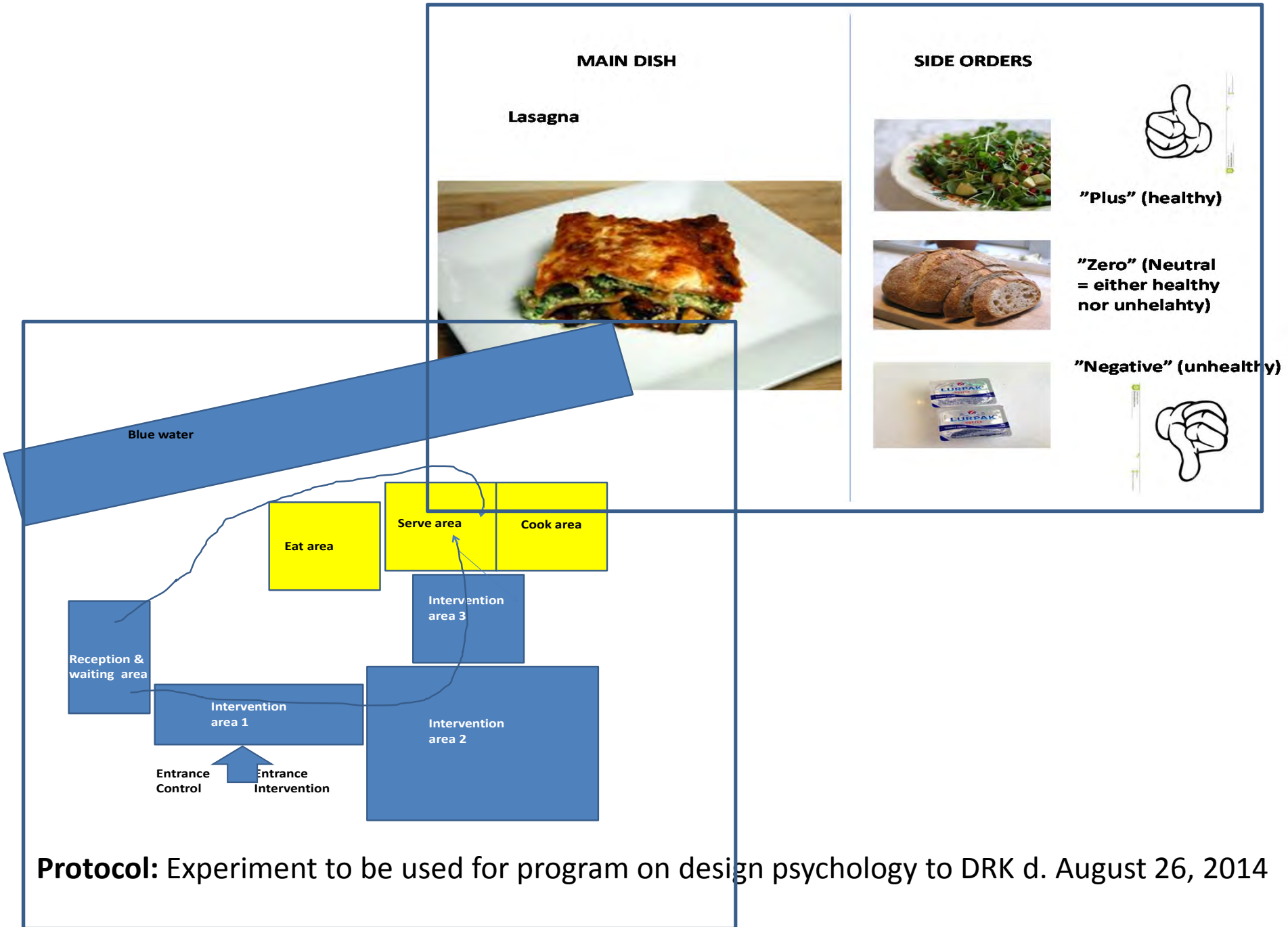
floorplan

The overhead (camera) view of the IB

Eat area overhead cam


The Intelligent Buffet.
Serve Area of
FoodScapeLab


Dismanteling the Intelligent Buff



Protocol: Experiment to be used for program on design psychology to DRK d. August 26, 2014

Foodscape Lab

control & analytics

- Control room: setting up, controlling cameras and recording
- Analytics room: post experiment analysis of data

Example: experiment set-up

1. **Protocol** of the experiment is developed.
2. What kind of **hypothesis** should the experiment be testing.
3. The development of the intervention/experimental idea can be **guided either by theory** or by pure speculation.
4. Test persons are **recruited.**
5. Video recording **equipment** is set up to record the full experiment.
6. Test persons are **registered** and enter in the eat area of the lab
7. They will do **their food choices** while their behaviour is detected by the IB controller software as well as recorded by the overhead video cameras.
8. The subjects **swipe the chip** before they take the food

Example 1: *Nudging young men to eat more Fruit & Vegetables*

- **Aim:** how choice architecture in a university canteen could be used to increase intake of fruit and vegetables single lunch serving among men aged 18- 29.
- **Method:** Determining the difference in the amount of self-served salad when increasing the amount of salad by 50 % and the accessibility of vegetables in trial compared to a control group.
- **Results:** Although the study showed no significant difference it provided valuable insight in nature of buffet choice dynamics on efficient use of the IB.

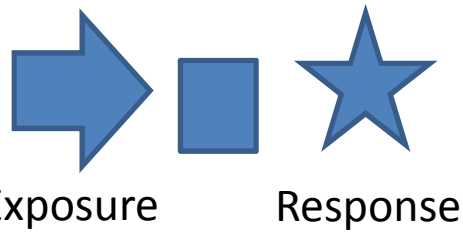
(Nielsen et al 2013)

Example 2: Beat in the Music's Influence on the Food Intake study

- **Aim:** how the beat of background music would affect intake during a meal.
- **Method:** A non participant observation approach was used for the experiment that was set up in the lab and that used campus students as the study subjects. The experiment investigated intake at no beat, down-beat and and up-beat conditions and was conducted using the Observer XT11 for observation of behavior and the PanelCheck V 1.4.0 for statistical analysis.
- **Results:** From the study it was concluded that the beat in the music increased the food intake as well as the number of bites.

Jensen et al 2012

Analytics Software



- IB data analytics software
- Observer XT
- Nvivo
- Arch GIS
- Video & picture processing
- Statistics, SPSS, SAS; R & Stat
- Dietetics: Master cater. Nutrients
- Simapro LCA. Carbonequivalents

Interoperability and detailed data tracking

1. The IB can in theory cooperate **with any other contactless tracking system** – for example it can work with hospital-issued patient identification wristbands.
2. On top of that it was designed to be **able to work with the DIMS**. Datasets from DIMS can be imported into the IB analyzer and the results can be joind to even further simplify data analysis.
3. The IB comes also with extra facilities to simplify data collection and analysis in experiments – like **participant registration** or **detailed data analyzer** (especially useful when participants try to cheat).
4. Feeds from IB can also be **used to trigger any external device** – this of course opens a whole new world of possibilities.

Future plans

- Remove more bias
- Experiments between different ways of conducting the same experiment on IB using tracking methods.
- Testing virtual and fake foods
- Developing micro indoor tracking
- Strenghten mobility, exchange & networking with other labs (ETH, WUR, Inst. Bocuse etc)

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- FSL facilities are offered for evidence based research and education at Aalborg University, including Integrated Food Studies and PhD courses.
- The services offered are available for a broad range of research projects as well as for external users.