Supporting mindful eating: InBalance chopping board

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1 Introduction

In our affluent Western society, food is easy to obtain and high calorie food is presented to us everywhere. And apparently hard to resist, since obesity is a growing problem, with an increase in a range of health issues attributed to overweight, such as cardiovascular diseases and diabetes. In the past, overweight and obesity were considered problems that could be simply solved by adhering to a diet prescribed by medical practitioners or dieticians. However, recent studies indicate that weight gain and obesity is to a large extent a behavioural problem, i.e., most overweight and obese people experience problems with controlling, or regulating their eating behaviour (Jansen et al., 2009; Van Buren & Sinton, 2009). The strong behavioural aspect of obesity and weight gain explains the poor long-term results of most diets. It is estimated that less than 5% of those who have lost weight after dieting will have maintained these losses after 4-5 years (Kramer et al., 1989). On the long run, a diet does not change the behaviour patterns that caused the weight gain. It is not sufficient to know how to lose weight: the psychological processes that lead to behaviours associated with weight gain should also be dealt with (Jansen et al., 2009).

One of the reasons why changing eating behaviour can be difficult is that many of the decisions concerning food intake are made mindlessly (Wansink, 2006). In exploratory interviews that we conducted on mindful and mindless eating we learned that many people who actively try to manage their weight are already aware of the (mindless) calories consumed during snacking. But it appeared that they often forget that when they are taking too large portions during dinner time they also consume too many calories. It seems as if they lose control when they finally have the feeling they are allowed to eat. Baumeister et al. (1998) compares the amount of self-control of an individual with a rechargeable battery: if the battery drains there is no self-control left, until the battery is recharged and that takes time. Following the reasoning of these researchers it can be stated that when dieters restrain themselves from eating snacks, there is no self-control left during dinner and they consume more than they intend to. The participants of the interviews indicated that they consider the consumption of these calories to be problematic, as it occurs daily and therefore has a big impact on their daily food intake. Besides this lack of self-control, a lack of knowledge on what a healthy portion size is and the influence of external cues (e.g. size of packaging or a plate) are found to make decisions on healthy portions sizes more difficult (Wansink, 2004, Jansen et al., 2009, van Buren & Sinton, 2009).

Following a user-centred design approach, we investigated how to make people more mindful about their eating behaviour during dinner time in order to persuade them in adopting a healthier lifestyle. To establish long-term behaviour change, we aimed for a product that fits with regular cooking habits, and matches the user’s cooking skills and habits. To limit the scope of our design space, we decided to focus on end-consumer solutions that make use of state-of-the-art technology and that furthermore do not require a fundamental change in other parts of the current food value chain (e.g. in agriculture, food production and distribution, etc.).

2 Conceptual design

We explored three design directions that we thought might influence the consumption of excessive, mindless calories during dinner. One direction focused on providing the user with information on the proper portion size. The other two directions focused on extending the eating time, either by slowing down the eating rate or setting a ‘second serving-timer’, so the user can make the decision to take a second serving after the satiety response has been activated in the brain. For each direction, product ideas and usage scenarios were created, also taking into account guidelines based on the Behavior Model for Persuasive Design (Fogg, 2009). Six ideas were evaluated with potential end-users, leading to the decision to proceed with the idea of a chopping board with integrated scale, providing users with feedback on a healthy portion size and a balanced composition of ingredient groups (vegetables, proteins, grains, etc) of their main meal.

Analysis of current user behaviour indicated that most people are not monitoring their food intake in precise detail, because it takes too much (cognitive) effort and it is also seen as something one does more precisely if one has to follow a strict diet, but not when one simply wants to globally observe healthful intake. The
chopping board idea aimed to facilitate this food intake monitoring process with only little cognitive effort from users. A chopping board was considered very appropriate for this task, as it is used at the moment users are already concerned with how much food should be prepared. Therefore a chopping board offers the opportunity to give portion size advice at the right moment without it being perceived as unsolicited advice. Furthermore, a chopping board is a generally accepted kitchen tool that is part of the current cooking process for many people.

As part of the user-centred design approach, three different chopping board concepts were evaluated by means of mock up models displayed in a kitchen. The concepts varied on several aspects, including size, interaction style, data display, materials and aesthetics. The evaluation indicated that participants preferred a slim and light weighted chopping board that was easy to store and clean and could blend into their existing cooking behaviour.

3 Concept development, prototype, and user test

Based on the results of the concept evaluation, a more detailed design was developed. The “InBalance” chopping board includes a scale in a high quality plastic casing, on which thin chopping sheets are placed. The sheets can easily be cleaned in a dishwasher, and be replaced if they wear out. Since proper portion size depends on user characteristics as gender, age, weight and height, physical activity, etc, the scale needs to be ‘told’ who the current user is by linking the user’s profile stored on a token to the scale. After identification by means of the (digital) user token, users indicate whether the ingredient that is placed on the scale, is cooked or uncooked and to which food group it belongs (vegetables, meat/fish/meat replacements or grains) by pressing buttons on the board. Since means to automatically detect ingredients (in particular fresh ingredients – no barcode nor tag) are still not fully mature, we decided to adopt this user involvement in identification. In addition, users have to indicate whether the ingredient is a food product that one can eat always (“go”, like vegetables), sometimes (“slow”, such as chicken with skin), or only very rarely (“whoa”, such as pork chops) (CATCH, 2002). This categorization is based on nutritionists’ recommendations. Although the chosen method for ingredient categorisation seems shallow, it was deliberately chosen over a more detailed ingredient specification, for a number of reasons: we expected that users would find this easier to work with, it would make the interaction with the chopping board easier and faster, and based on discussions with nutritionists it appeared to be a very workable and functional approach to ingredient classification. As a result of the user’s input, a row of LEDs indicate the share of the ingredient currently on the board compared to the target portion size of that particular food group for the current user. The LEDs of this ‘portion size score’ are white, because this colour is neutral and does not refer to ‘good’ or ‘bad’. Only the LED that indicates that the target portion size is reached becomes green, indicating this is the ideal situation. The user can press the ‘save’ button to save the portion size score onto the user token. The data on the user token can be uploaded to a personal website, which presents an overview of the users’ achievements and coaching, keeping the user motivated to reach his goals. The system allows currently up to two separate tokens to be used with the board, so meals for up to two persons can be prepared at the same time.

The final concept was evaluated in the kitchen of ExperienceLab, a complete house that is used at Philips Research to conduct user studies in a controlled environment. For this test a functioning prototype was built. Ten participants individually prepared a meal using our product concept. Our main questions concerned people’s overall attitude towards such a tool, the interaction with the current prototype, and the perceived effectiveness of the solution.

![Figure 1. The functional prototype](image1)

![Figure 2. Variation Balance on the website](image2)
4 Results and Conclusions

Overall, the participants had a very positive attitude towards the product concept. They all mentioned that the usage did not take much (cognitive) effort and they did not perceive the usage as obtrusive during the cooking process. “It was very clear actually...” (participant IX), “I like it! Very easy. It did not take any extra time. Ping,Ping, done!” (participant VIII).

Although participants agreed it might be difficult at the start to learn which ingredients are ‘go’, ‘slow’ or ‘whoa’, they did not perceive this as a problem. To the contrary, many commented they liked this aspect of the product, because it confronts them with their food choice and enables them to make better choices the next time they are buying food. Example ingredients for each category are printed on the board (the blocks of text printed on the board, see figure 1), to help users get started. The participants indicated that they thought that the product would keep them motivated to learn more about healthy and less healthy ingredients. “If you are interested in mindful eating you don’t mind having to learn which products are ‘go’, ‘slow’ or ‘whoa’” (participant VIII).

Interestingly, the participants were highly focused on the getting the amounts precisely right – so, precisely 100%; however, for ‘go’ ingredients such as vegetables, it is actually not an issue to eat more than the indicated 100% -only for more calorie intense ingredients such as meat, going over this 100% is ill advised. This is something that for a final version needs to be further investigated. Participants also had different motivations for either wanting to weigh raw ingredients (so you do not cook more than what you really need, also to limit food waste), or cooked ingredients (in case one want to prepare food for several days in advance, and eat some now, the rest at a later day).

The participants experienced rather few usability issues during the test – some forgot initially to press the save button after having weighted some ingredients, but the blinking light helped them to correct that omission. Only one participant persisted in this, and did not save the results at all; afterwards in the closing interview she indicated that she expected that if she would be asked to use the board again, she would not make that mistake again, now that she had seen how it all works. Overall, the participants thought that the interaction with the device was easy to learn, certainly after one trial.

The results suggest that the InBalance chopping board could be effective in facilitating users to eat more mindful in order to manage their weight by increasing people’s awareness and knowledge of healthy ingredients and portion sizes. The participants perceived the concept as easy to use and easy to integrate in their current cooking behaviour, allowing them to better control their portion sizes during dinner. Since the evaluation mainly focused on users’ initial reactions to and interactions with the product concept, a next step should include an evaluation of the long-term effects and effectiveness of our concept in changing people’s lifestyle with a longitudinal field study.

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References