SnackBox: Research and Design of an Interactive Intervention for People at the Early Stages of TTM to Regulate Healthy Snacking at Home

Master thesis

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Graduation date: May 15, 2020

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Abstract

Research shows that people, who are at the contemplation stage of Transtheoretical Model of Behavior Change (TTM), experience multiple personal challenges, and therefore, need more guidance and knowledge in the process of adopting new behavior. In 2017, design researchers from the University of Twente (Ludden, Ozkaramanli, Karahanoglu , 2017) proposed three possible strategies (guided flexibility, accounting for emotional gains and losses, dynamics of interventions) which could help people to overcome those challenges. This thesis further investigates the applicability of the aforementioned strategies that also work as the guidance of the intervention design proposed in this thesis. The goal of the thesis is to propose an interactive intervention concept to be used by people who experience challenges at decision making moments in the domain of healthy eating.

In this thesis, complying with the knowledge gained from literature and multiple theories, a theoretical framework is presented in order to shed light on the process of self-initiated change of snacking at home. The framework includes constructs from Social Cognitive Theory (SCT) and delivers strategies in regard to a dynamic interplay of personal, behavioral, and environmental influences of behavior change. This framework combines three strategies proposed by the previously mentioned research. Following these, personal intentions, attitudes, feelings and common dilemma scenarios of unhealthy eating behavior are investigated. The results show that “snacking at home” is a commonly mentioned unhealthy eating behavior, especially among young adults, which is difficult to overcome even if desired.

Based on the theoretical framework, accompanied by user research and design workshops, a set of smart intervention concepts are proposed. These suggest a deeper understanding of the combined effect of self-efficacy, self-regulation and facilitation strategies, in order to motivate people to gradually adopt healthy snacking habits. In the end, the thesis proposes one final interactive intervention concept which could help people to progress through the contemplation stage, and pursue a long-term goal of healthy snacking at home.

Key words: behavior change, healthy snacking, contemplation stage of Transtheoretical Model (TTM), Social Cognitive Theory (SCT), interactive intervention

CONTENTS

Abstract

Chapter 1. Introduction

1.1 research background 1
1.2 research goal 3
1.3 research questions 4
1.4 Research and Design Approach 5

Chapter 2. Literature Review

2.1 Eating behavior 7
2.2 Theories of behavior and behavioral change 8
2.2.1 The Transtheoretical Model (TTM) 8
2.2.2 Application of TTM 9
2.2.3 Limitation of TTM 10
2.3 Conclusion 11

Chapter 3. User Research Study

3.1 Goal of the user research 12
3.2 Methodology of user research 12
3.2.1 Part 1 of user research 12
3.2.2 Part 2 of user research 14
3.2.3 Description of 4 scenarios 15
3.2.3 Designing research questions of Part 2 18
3.2.4 Participants 19
3.2.5 Research tools 20
3.2.5 Flow of the interviews 20
3.3 Result of the user research 21
3.3.1 Participants 21
3.3.2 Result of part1 21
3.3.3 Result of part2 22
3.4 Conclusion 27

Chapter 4. Development of a Design Framework

4.1 Theoretical basis 28
4.2 SCT and user groups 28
4.3 SCT and three focus areas of the study 29
4.4 Relating Transtheoretical Model (TTM), Self-efficacy(SE) and SCT 30
4.5 Developing framework with the scenarios 32
4.5.1 Scenario 1 32
4.5.2 Scenario 3 34
4.6 Conclusion 36

Chapter 5. Design Workshop and Ideation

5.1 Participants 38
5.2 Plan of the workshop 38
5.2.1 Steps of the process 38
5.2.2 Equipment 43
5.3 Outcomes and reflection of the workshop 44
5.3.1 outcomes from brainstorming 44
5.3.2 outcomes from visualization 46
5.4 Conclusion 50

Chapter 6. Development of Final Concept and Evaluation

6.1 Snacking behavior 52
6.2 Research of current products on market 52
6.3 User testing of the initial idea 53
6.4 Concept development 55
6.5 Final concept 55
6.5.1 Product description 56
6.5.2 Materials 58
6.5.3 Product usage 56
6.5.4 Interface 62
6.5.5 Target group 63
6.5.6 Final scenario 64
6.6 The combination with interventions 65

Chapter7. Discussion of Final Concept

7.1 Summary of findings 67
7.2 Suggestions for future research 68
7.3 Lessons learned 70
7.4 Reflection 70

Reference 71

Appendix 1 The format of questions in user research
Appendix 2 The results of user research
Appendix 3 Personas for workshop
Appendix 4 Strategy cards for workshop
Appendix 5 Workflow for workshop
Appendix 6 Sketching of concept development
Appendix 7 Three-views picture of parts

Chapter 1 .

Introduction

This chapter presents an overview of healthy eating, the studies on healthy behavior change. The gap in the domain of eating behavior and the basis of this research are provoked in the background. Then the goal, design questions, and design approach of the thesis assignment are introduced.

1.1 Research Background

The association between nutrients, foods, and dietary patterns provides significant implications for people's health and well-being. Healthy patterns of eating behavior contribute to the prevention of obesity and reduce the risks for chronic conditions such as cardiovascular diseases, cancers, chronic respiratory diseases, and diabetes (Bowen K.J., et.al 2018, Ness & Fowles, 1997). The quantity and quality of food are influential factors in dietary intake. Some most common unhealthy eating habits include low intake of fruit and vegetables, excessive consumption of energy-dense but nutrient-poor snacks and drinks rich in sugar and fat(Cock, N., et al. 2017).

Over the past few years, with the advent of technology, a vast number of health-related mobile apps, wearable devices, tracking products have been developed, which allows users to improve fitness or eating habits (Gowin, M., et al. 2015).An increasing number of nutrition apps help people to monitor their food consumption through calorie counting, providing healthy recipes, nutrition information, creating food diaries and ect., to lead to health behavior change to some extent(West, J.H., et al. 2017). Though these behavioral change programs are more effective than self-help programs, most of these systems still have limitations of leading people to sustained behavior change and weight loss (Ludden ,G, 2017; Purpura ,S.,et.al 2011). These behavioral change systems usually end up with the failures that participants' inability to persist the recommended diet and exercise changes(Garner D.M.,et.al 1995).

Abound diet programs rooted in efficiency and calculability perform a parallel way of quick, mindless and convenience: counting calories and the right amount of nutrient components(Purpura, S.,et.al 2011). Though these approaches could be convenient and efficient for executing an action, Prochaska noted that a vast majority of people who involve in habitual unhealthy behavior are not in the action stage of change(Prochaska, J. O.1992). Because these systems primarily focus on the people who have already had determination of behavior change, while to the people who have not yet decided to change a behavior, they are less active (Ludden G., et.al 2017). Plus, The popularity of diet and exercise planning tools stimulates a shift of responsibility from individuals to external sources(Mamykina, L.,et.al 2008). Taking people in the early stages of change into consideration, despite behavior changes promoted, the lack of an inherent understanding of individuals' actual personal situations neglects the value of personal experiences and emotions of food and exercise(Purpura, S., et al. 2011).

Given current products and designs less often cover the group who just start to think about adopting healthier eating habits and still in consideration, and the increasing need in the market for effective strategies to improve adherence to long-term dietary guidance and to limit unhealthy eating among populations who lack motivation, additional research is needed to address evidence gaps. Instead of presenting the complicated task of quantitative measurement, more discussion of guiding a user through personal experience should be provoked.

First introduced in the 1970s, behavioral treatments are remarkable(Jeffery, R.W.,et.al 1993). Introducing interventions integrating models of behavior change could be an effective way of monitoring and shaping people's behavior (Glanz, K., 2015). In the domain of healthy eating, a dilemma driven approach to design for the early stages of health behavior change provides some potential implications (Ludden, Ozkaramanli, Karahanoglu, 2017). The theoretical basis of the study is the Transtheoretical Model Constructs(TTM)(Prochaska & Velicer, 1997) and self-control dilemmas (Ozkaramanli, Ozcan, Desmet, 2017).TTM focuses on an individual's attitudes and motivation to new healthier behavior and provides strategies, or processes of change to guide the individual(Prochaska, J. O.et.al,2005). It identifies the stages of behavior change and allows better-adapted interventions based on the individual's stage to avoid making efforts in the opposite direction. And self-control dilemmas are the forced-choice situations where people experience conflict between a long-term goal (or personal value) and an immediate desire(Ozkaramanli, D. et al. 2017). Especially in earlier stages of personal behavioral change, people's motivations for healthy behavior are gradually building, and they can more often feel struggling when facing healthy/unhealthy choices.

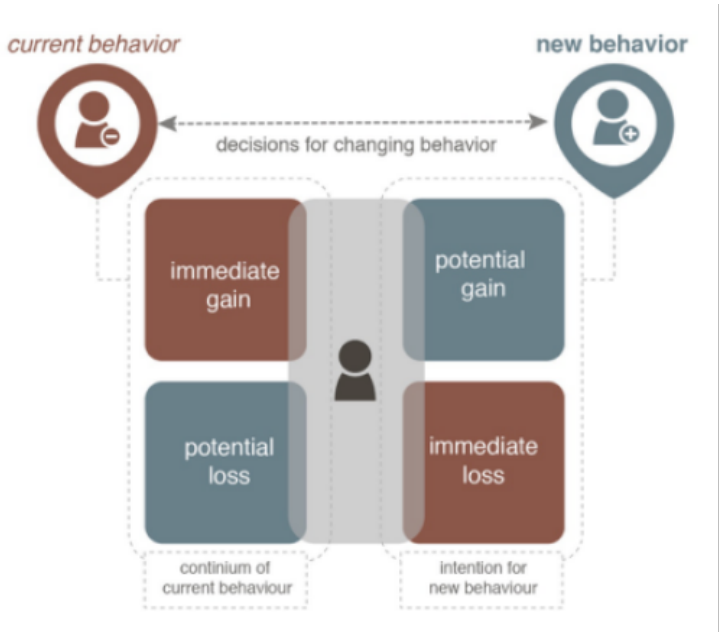

figure 1.1. Framework of dilemma's with 'grey area' in between current behaviour and 'new' behaviour.(Ludden, Ozkaramanli, Karahanoglu 2017)

The study raises a framework of dilemmas(Figure 1.1). It suggests that an intervention is better not force the user to make "black/white decisions" but facilitates some grey areas, which is a state between current behaviors to new behaviors (Ludden G., et al. 2017). Applying proper behavior change interventions and flexible design guidelines in the process could help people progress through the "grey area" between

current and new behavior. Three focus areas - guided flexibility, emotional gains and losses, and dynamics of intervention - are implemented in healthy eating. Guided flexibility facilitates long-term participation; emotional gains and losses are an influential factor that people usually experience in changing processes; dynamics of interventions relate to user-engagement(O'Brien, 2008).

A further understanding of the strategies, and this study is worthwhile. Because instead of simply giving an answer or making decisions for users and informing them to follow like the most existing products or services on the current market, the study focuses on the constructs of attitude, personal beliefs in the early stages. Thus, this thesis assignment is a further study of these focus areas and an attempt that integrates these focus areas into designing and testing interventions for promoting personal behavior change of healthy eating.

1.2 Research Goal

Following the basis of the previous study introduced above ("Can you have your cake and eat it too? A dilemma driven approach to design for the early stages of health behavior change", 2017), guided flexibility, accounting for emotional gains and losses, and dynamics of interventions could be three focus areas in design, which help people make decisions in dilemmas of the early stage of changing an unhealthy behavior into a healthy 'new' behavior. They highlight that an intervention does not force the user to make "black/white decisions," but help people to progress through a process of change by facilitating some grey areas when they face dilemmas of whether to eat or not to eat.

The further study of the three focus areas aims at (1) comprehension about strategies and processes of promoting change towards healthy eating behavior (2) provoke interventions as the guidelines to help people go through the "grey area."

The goal of this thesis assignment is to propose an interactive intervention concept that enables users more likely to make healthy decisions when they experience challenges at decision making moments and provides them with long-term guidance of personal strategies in the domain of healthy eating.

During the early stage of behavior change, it is essential to cultivate the user's consciousness of doing appropriate actions and reflecting on their behaviors, rather than directly providing instructions in every situation and force them to accomplish the complicated task of calories. Thus, the design of intervention emphasizes the reflection in the process of positive changes and provides enough freedom for users to define their own meanings and values of health.

The deliverable of the project is a framework of the intervention and design in the form of a prototype of a product or an application based on the framework and the results of a user study. At the late stage of design phases, there is a user testing and evaluation of the design.

1.3 Research Questions

The thesis assignment builds on the theoretical basis of the Transtheoretical Model Constructs(TTM) and self-control dilemmas. However, very vast theoretical strategies of behavior change and various types of dilemma scenarios in the "grey area" have not been fully defined. A general discussion is not pertinent

enough for a practical design in this assignment. Strategies need to build on one specified eating behavior that people most often experienced at decision making moments and its relevant target group. After more understanding of this behavior and target group, then interventions of strategies could be designed and tested as guidelines for the people who suffer from similar unhealthy behavior. Therefore, the research starts with a very general question, and focus gradually narrows down by following sub-questions that contribute to the main question.

Main question:
How to promote people making more healthy decisions and move through the stage between current and new behavior with strategies and processes of behavior change in healthy eating?

Sub-questions:
❖ How to explain the eating behavior change under the framework of TTM?
❖ What is the potential entrance point which is appropriate for further user research and theoretical study within TTM?
❖ What kind of dilemma that people most often experience?
❖ What are people's current eating behaviors in a dilemma?
❖ What factors make it difficult for people to make a decision?
❖ How do people feel about their decisions?
❖ What behaviors in the dilemma could be improved to promote healthy eating?
❖ What could strategies of intervention be applied to trigger people to making healthy decisions?
❖ How to integrate strategies of intervention and three guidelines (guided flexibility, accounting for emotional gains and losses, and dynamics of interventions) into a framework?
❖ How to integrate the framework into a design?
❖ What is the required functionality of the design that can help in the dilemma scenarios?
❖ To which extent, a design of intervention could modify a specific unhealthy eating behavior?

1.4 Design Approach

The whole process of the assignment, which combines theoretical exploration and design, is divided into four phases: general review, user research, analysis and framework, design, and reflection. As figure 1.2 shows, a very broad question is raised at the beginning, and focus gradually narrows down during the process by combining real feedback of the user research and outcomes of the literature review. Each phase targets to answer sub-questions of the assignment step by step, and eventually contribute to the main research question:

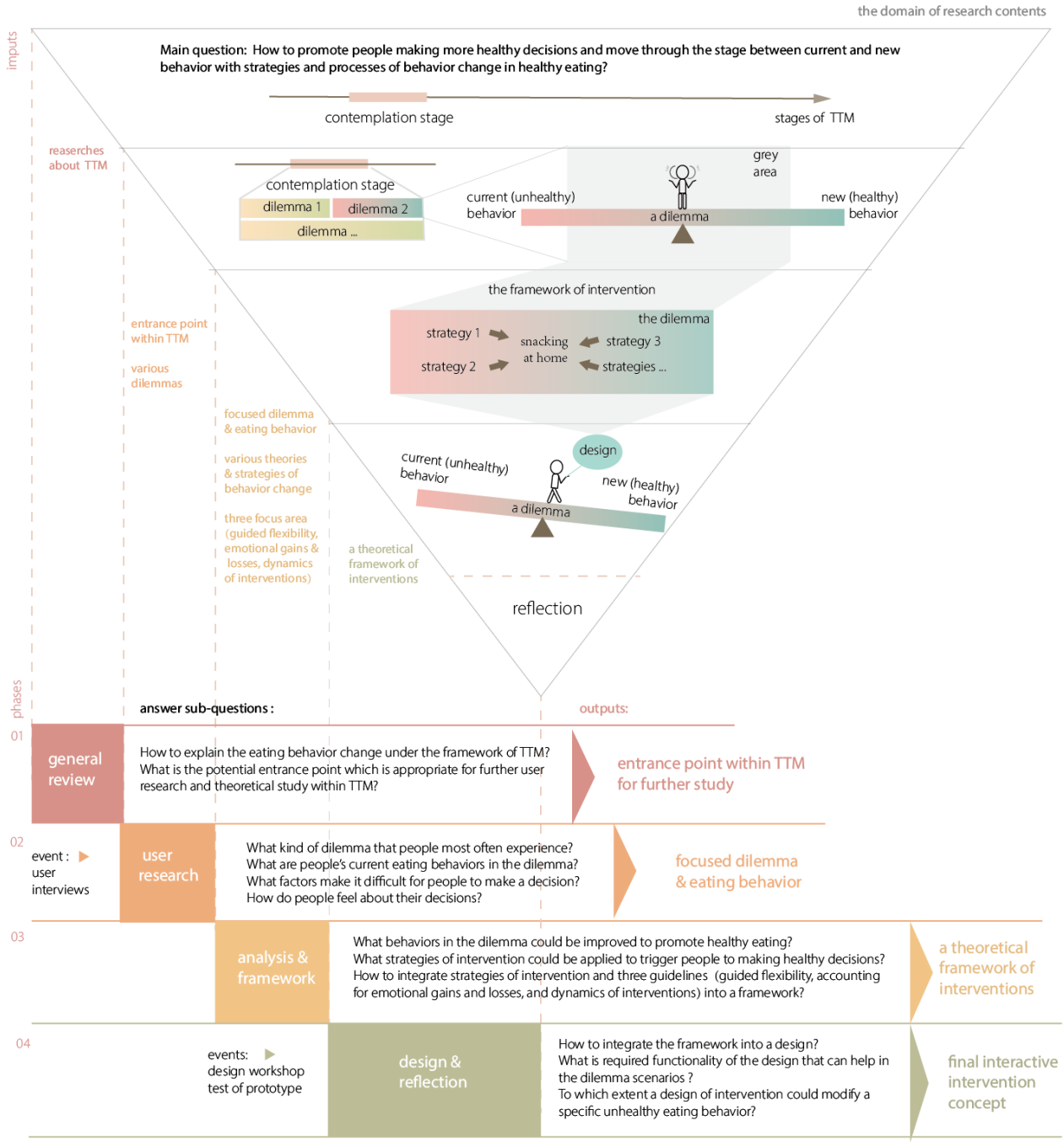

figure 1.2 the outline of the assignment

Stage is a construct, not a theory (Prochaska,J. O., et al.2008).As shown in the top of the inverted triangle in the figure1.2, since the basis of the main question is TTM, in the first phases of general review, a literature review of TTM helps to propose cut-in points within TTM, which can initiate further user research and theoretical study. User research is conducted in the second phase. A self-administered questionnaire is used in interviews, which included questions on eating habits, beliefs, and attitudes towards healthy eating, diverse dilemma scenarios, and psychological factors. The results of user research show that "snacking at home" is a commonly mentioned unhealthy eating behavior that young adults feel challenging to overcome. Circling around snacking behavior and combining it with a deeper understanding of three

focus areas, a discussion of strategies in theories is provoked, so as to raise a theoretical framework of interventions. Based on the theoretical framework, accompanied design workshops, a set of smart intervention concepts are proposed, which aims at motivating people to adopt healthy snacking habits gradually. In the end, the thesis proposes one final interactive intervention concept which could help people to progress through the contemplation stage and pursue a long-term goal of healthy snacking at home.

Chapter 2 .

Literature Review

This chapter aims at proposing an entrance point within TTM to initiate further user research and theoretical study. It first presents a review of studies relating to eating behavior and theoretical models of behavior and behavior change, summarizes some of their central elements and cross-cutting themes that focus on healthy eating, and then explores the limitations of TTM. In the end, potential directions that can strengthen the advantage and reduce the limitation of TTM are proposed for the research.

2.1 Eating Behavior

The association between nutrients, foods, and dietary patterns provides significant implications for people's health and well-being. Healthy habits of eating behavior contribute to the prevention of obesity and reduce the risks for chronic conditions such as cardiovascular diseases, cancers, chronic respiratory diseases, and diabetes (Bowen K.J., et al. 2018, Ness & Fowles, 1997). The most crucial driving factor for eating is hunger(Bellisle,2006), but the determination of what to eat, when to eat and how to eat is more than physical and nutritional needs. Generally, several factors listed as following that affect eating behavior(Bellisle,2006):

- Biological determinants such as hunger, appetite, and taste
- Economic determinants such as price and availability
- Physical determinants such as access, education, cooking skills and time
- Social determinants such as class, culture, and social context
- Psychological determinants such as mood, stress, and guilt
- Attitudes, beliefs, and knowledge about food.

In reality, the food choices and eating behavior could be a multi-impact of several different factors and are even more complicated. Because people's food preference changes continuously throughout the whole life under the influence of these factors and forces on eating behavior, vary from individual to another and different degrees(Ventura, A.K., et al. 2013). Therefore, one type of intervention is impossible to modify eating behavior entirely and to be applied to all groups. Instead, the interventions need to target different groups of people in regard to specific environmental contexts and various factors that influence their decision to eat.

To figure out what interventions work for particular groups of people, the environmental context needs to be set. Evidence shows that targeted interventions based on studies in schools(Lowe, C.F, et al. 2004; Snyder, M.P., et al. 1992), workplaces(Patterson, R.E., et al. 1997; Lassen, A., et al. 2004), supermarkets(Flint, E., et al. 2012), primary care and community-based studies (Stevens, V.J., et al. 2002) got positive outcomes. The reasonable success of targeted interventions indicates that diverse strategies are for different groups of population and different sides of eating behavioral change.

2.2 Theories of Behavior and Behavioral Change

In broad, health behavior refers to not only observable, apparent actions but also the mental events and feeling states that enhance the quality of life and improve people's satisfaction and health outcomes (Parkerson, et al. 1993; Gochman, 1997). The target audiences of health behavior include individuals, groups, organizations, communities, or some combination of these. For researchers, the task of health behavior is to understand health behavior and to apply theoretical study and knowledge of behavior to practical strategies to enhance health status effectively. Since individuals are the elemental composition of groups, communities, or larger units when referring to health behavior theory, the assignment addresses individual strategies of health behavior.

Theories that center on beliefs and actions of individuals were characterized as one of the earliest theories and were still widely practiced today(Brewer, N.T., Rimer, B.K., 2008). Some typical theories which focus primarily on individual health behavior include Health Belief Model (HBM), Theory of Reasoned Action (TRA) (Fishbein & Ajzen,1975) and its companion, the Theory of Planned Behavior (TPB)(Ajzen), The Transtheoretical Model (TTM) developed by Prochaska, DiClemente, and colleagues (Prochaska, DiClemente, Velicer, Rossi, 1993), and Weinstein's Precaution Adoption Process Model (PAPM). HBM, which started from research on disease prevention, is to explain and predict health-related behaviors by understanding why people do or do not accept preventive health care regimens or services. TRA and TPB discuss intentions to perform specific actions and a reasonable process of decision making. PAPM provides a heuristic framework about how a person comes to decisions and translates that decision into action by stages. TTM identifies itself from other individually oriented models of health behavior by emphasizing on the behavioral changes rather than predictable variables in cognition such as perceived risks.

2.2.1 The Transtheoretical Model (TTM)

The Transtheoretical Model (TTM)(also referred to as the Stages of Change model)(Prochaska 1979) explains how people change on their own, by systematically integrating the stages with processes of change across diverse theories of intervention (Prochaska, et al. 1992). It focuses on and professionally facilitates the self-initiated change of addictive behaviors, such as alcohol abuse, smoking, and obesity.TTM identifies five stages - pre-contemplation, contemplation, preparation, action, and maintenance - in the modification of addictive behaviors(Prochaska, et al. 1992).

Precontemplation is the first stage where a person has no intention to change behavior in the predictable future, typically within the next six months. People in this stage are usually uninformed about the consequences of their current behaviors and unaware of their problem. They often show ignorance of high-risk behaviors and resistance to recognizing or modifying a problem, like "I don't have any problems," or "Maybe I have some faults, but I won't change."

At the contemplation stage, people are aware of problems in their behaviors and intend to overcome them in the next six months, but without moving to significant actions. One important hallmark of the contemplation stage is the weighing of the pros and cons of changing the behavior. People usually struggle with positive outcomes of quitting the addictive behavior and the cost of effort, energy, and loss to overcome the problem.

The preparation stage is a combination of intention and actions. Individuals are usually prepared for action in the next month. Maybe they have a plan of action and start to take some small steps in reducing their problem behaviors but have not yet reached an effective accomplishment.

At the action stage, observable modifications of the addictive behavior are achieved by individuals within the past six months. Individuals acquaint and practice the techniques for keeping up their commitments of changing behavior, avoid temptations to slip back, and eventually reach a particular standard of new behavior.

The maintenance stage is a continuation of behavior change. People are less tempted to and can get rid of addictive behavior, and consistently keep the new behavior for more than six months or even last a lifetime.

In real life, not all people can successfully modify their problem behavior and consistently maintain the new behavior on their first attempt and at one time. Sometimes they may experience several relapses and make more than one attempt before they totally ease from problem behaviors. Therefore, instead of a linear progression through the stages, TTM presents as presents a spiral pattern (Prochaska, et al. 1992).In this spiral pattern, relapse in self-change is permitted. Even though people progress through the action stage, they may recycle back to the contemplation or preparation stages and can yet remain there for some while (Prochaska & DiClemente, 1984; Prochaska, et al. 1992). Nevertheless, the investigation of the dynamics of relapse is not meaningless. By recycling through the stages, relapsers are able to learn from their failures and more likely to succeed gradually over time.

2.2.2 Application of TTM

TTM especially emphasizes stages beyond action, including stages from the conscious raising to the maintenance of the behavior. It was widely applied to promote healthy behavior, especially self-change of addictive behaviors such as alcohol abuse (Felicíssimo, F.B. et al. 2014), smoking cessation (Aveyard, P. et al. 2009; Cahill, K ., et al. 2011). It also supports the use of stage-matched behaviors such as exercises (Spencer, L. et al.,2006) and weight management (Johnson, S. S., et al. 2008). In this research, the dietary change is the focus, where the steps required for changing the eating habits may differ from those involved in maintaining a healthy eating behavior.

In the treatment of TTM, matching treatments to the individual's stage of change is essential (DiClemente, 1991; Prochaska, 1991). Because some action-oriented strategies could be effective in the preparation or action stage, while ineffective to the persons in pre-contemplation or contemplation stages (Prochaska, 1992), strong support from TTM is providing authoritative information on treatments of choice according to different stages of change.

Stages of Change in Which Particular Processes of Change Are Emphasized

Precontemplation	Contemplation	Preparation	Action	Maintenance
Consciousness raising				
Dramatic relief				
Environmental reevaluation				
	Self-reevaluation			
		Self-liberation		
			Reinforcement management	
			Helping relationships	
			Counterconditioning	
			Stimulus control	

table 2.2.2 retrieved from Prochaska (1992)

The stages of change present when the shifts in beliefs and behaviors happen to individuals while integrating change processes across problems describes how the shifts occur. Table 2.2.2 illustrates ten types of processes which are most widely used and investigated associating with stages. Each process includes corresponding techniques, methods, and interventions.

Self-efficacy (Bandura 1982) and decisional balance are two critical factors that drive the movement between stages(Heimlich & Ardoin 2008; Armitage, et al. 2004). Decisional balance reflects an individual's assessment of the pros and cons of a behavior. A representative character of the contemplation stage is the weighing of the pros and cons of the problem and its solution(Prochaska, 1992). Individuals usually struggle with evaluating the short-term benefits of addictive behavior and the costs of effort and the loss to overcome the problem for the long-term goal. Temptation, during these processes, reflects how strong the desire of a person in weak situations to perform a specific behavior is. Some everyday attractions are negative affect or emotional distress, favorable social conditions, and craving (Prochaska, J.O., et al. 2013). When relating the temptations to a specific program - a behavioral weight control program - the most common type of attractions still needs to be researched and categorized.

2.2.3 Limitation of TTM

In TTM, personal consciousness is regarded as the prerequisite basis before people begin to take small steps toward action. However, some criticisms point out that consciousness alone does not necessarily lead to behavior change (Prochaska, 1992). Generally, the effects of consciousness are indirect - consciousness cannot produce behavior directly by itself (Baumeister, R. F., et al. 2018). The relevance of consciousness more likely to reflect on the people's imagination of various possible futures and simulations of good/bad outcomes led by their actions(Baumeister, R. F., et al. 2018). Sometimes, with the stimulation of an event(prompt), a change could happen and lead to a chain of reactions (Richard, K., 2016). Thus, in the complex phases of contemplation and reevaluation, in which people always weigh the pros and cons in conflicts between modifying behavior and satisfying immediate desires, whether it is possible to develop an approach that combines internal and external interventions to merge the gap between intention and action could be an entry point of the following user studies.

Despite the collective benefits of applying theory in design studies and interventions, one approach is probably not enough for the problems in eating behaviors. In the absence of evidence on which theory is

better, it is necessary to choose theories according to assessments of the construct of the theory, the appropriation of the theory towards specific context, specific behavior, and the groups of interest. For designing the framework of intervention to be effective, an understanding of relevant groups, including their beliefs, attitudes, skills, current and past behaviors of eating, is indispensable.

2.3 Conclusion

Doing the right things (processes) at the right time (stages) is a useful and essential concept in self-change. In the early stage of behavior change, people's beliefs and attitudes are the focus; otherwise, actions without insight more possibly result in temporary change. A positive intention cannot fully guarantee a successful behavior change(Gollwitzer, P. M.,1999), particularly not for habitual behavior like eating, which is closely associated with personal factors and environmental opportunities. In addition to TTM, supporting theories for intervention are needed to bridge the gap between intention and action. Research that integrates potential determinants from the environmental and individual aspects also should be conducted to develop interventions accordingly.

Chapter 3 .

User Research Study

This chapter demonstrates how applying the theory of the Transtheoretical Model of Behavior Change, and scenario-based design perspective can support delivering user research. Both the process of user research and the results are presented.

3.1 Goal of The User Research

The project, which is designed for the early stages of healthy eating behavior change, emphasizes the contemplation stage of TTM and focuses on guided flexibility, emotional gains and losses, and dynamics of intervention. Understanding the relationship between people's intentions and actions in general people's healthy eating behavior and decision-making moments is the goal of the user research. Thus people's beliefs, attitudes, skills, the context of eating, current and past actions of food are all important contents of user research.

3.2 Methodology of user research

The user research is divided into two parts.

	Time division	Question type	Information type
Part 1	10 minutes	General questions about healthy eating	- Behavioral beliefs
Part 2	20 minutes	Question relating four dilemma scenarios Question relating participant's dilemma	- Environmental context - People's own strategies - Experiential attitude or affect

table 3.1:structure of the research

The whole process took around 30~35 minutes.

3.2.1 Part 1 of User Research

The first part includes general questions based on empirical integration (Prochaska, DiClemente, Norcross, 1992) of TTM. Stage constructs represent a temporal dimension. The goal of the first part was understanding what beliefs, motivations, and barriers in processes of change need to focus on to progress through stages. Table 3.2 shows how questions are organized.

In TTM, processes of change provide important guides for intervention programs. Self-reevaluation, environmental reevaluation, self-liberation are the processes that apply to move from the contemplation stage to the preparation stage (Prochaska, 1992). Environmental reevaluation is affective and cognitive

assessments of how personal behavior affects one's social environment. Self-reevaluation combines both cognitive and affective assessments of one's self-image with eating behavior. Self-liberation is about one's belief in their commitment. The user research takes these three processes as a basis of guidance and collects information about people's cognitive and affective assessments and their own behavioral beliefs and actions in daily life. When interviewed, people will be invited to provide four types of information:

1. Positive or negative feelings about performing the behavior (experiential attitude, affect)
2. Positive or negative outcomes of performing the behavior (behavioral beliefs)
3. Situational or environmental facilitators and barriers that make the healthy eating behavior easy or difficult to perform (environmental context, temptations)
4. Individuals ' own strategies before and after performing the behavior (own strategies, beliefs)

Stage / process		Questions
General questions	Attitude / beliefs	- What do you think a "healthy eating behavior" is? And what "unhealthy eating behavior"? - What do you like the most about healthy eating? What do you dislike the most about unhealthy eating?
	Eating behavior	- Do you have different eating habits during the weekdays and weekends? How does it change? - What about vacations? How does your eating behavior change by then? - Do you have any example of suffering from the unhealthy decisions you sometimes make?
Contemplation stage	Environmental-reevaluation	- What factors influence your eating behavior? How do you feel about it? - To what extent these effects will change/help you to keep your eating behaviors?
	Self-reevaluation	- How do you define your eating habits? What kind of diet do you have? Could you tell a bit more about it? How do you feel about it? - What kind of benefits do you experience with keeping your eating habits?
Preparation stage	Self-liberation	- Have you ever taken some significant steps toward healthy eating behavior (such as having a diet plan, consulting a counselor, talking to their physician, buying a self-help book)? What factor triggers you to acquire the knowledge and eat healthy?

table 3.2

3.2.2 Part 2 of User Research

The second part delivers more detailed questions relating to the personal experience of specific dilemmas. These dilemmas involve a balance between the size and the delay of an experienced benefit and are illustrated by four different types of scenarios with storyboards. To better support, the communication process in the research scenario is an indispensable tool, because scenarios can serve as a 'common language' that everyone can easily understand, regardless of the participant's field of knowledge or background (Mieke, Mascha, 2013). After being visualized in the form of storyboards, images of different scenarios speak more powerfully than just words and capture the attention of participants easily. Because in user research, people are sometimes hardwired to respond to stories, but the sense of curiosity would draw them in and engage more(Babich, 2017). Especially in an interview, it provides a starting point for discussion and helps participants to recall and share their experiences in a short time. By telling a story that people could see and relate to, they are possible to empathize with characters who have challenges similar to themselves in real life. Plus, after combining their insights with their own experiences as an actor in the scenario, interviewees could possibly generate a multitude of scenarios and jump out of the designer's presumption.

Every personal dilemma scenario indeed represents a design challenge, while focusing on a specific dilemma to construct a feasible design problem is necessary. Therefore, the goal of the second part was finding out what types of a dilemma is common and intertwined to most people, understanding the beliefs, motivations, emotions, and barriers behind their behaviors, and knowing the environmental and other possible external factors that influence them.

Variables of the context and whether they can make a decision on food tentatively, four scenarios are built and described as follows (table 3.3). These dilemmas, on the one hand, involved in a long-term goal that promises more substantial benefits (e.g., a good physical state) than the immediate desire. On the other hand, the benefits of the disire (e.g., eating a bowl of potato chips) are experienced immediately, while the benefits of the long-term goal are delayed.

No.	Scenario	Context	Autonomy of food
1	At party	social	Select food from organizers (limited choices to food)
2	In office	social	Accept food from others (no choice to food)
3	At home	individual	Select food by oneself (free choices to food)
4	Family meeting	social	Cook for others (free choices to food)

table 3.3 four scenarios

It is essential to point out that these scenarios are typical and common scenarios in life and impossible to cover all the problems. They are used as a communication tool to help participants understand the goal and concept of the project. To reduce the objective influence from the interviewer, the scenarios and questions are semi-structured in the interviews, so that participants can fulfill their own story with flexibility

and provide accurate and sufficient information in an organized way. Participants are able to choose none of the scenarios if they experience neither scenarios. Then they will be invited to describe their own experience, and relevant questions will be raised to them.

3.2.3 Description of 4 Scenarios

Scenario 1

Mary got a message from her friends that they planned to hold a party on Friday evening. She was excited because there was a long time that she did not get together with her friend. Because she was swamped and stressed these days, and this would be an excellent chance to relax. But she was still a little bit worried since she was keeping a diet these days. If she went to the party, she would definitely eat food with high fat and sugar such as cakes, cola. While she also thought this could be a good excuse for her to have a big meal because she had not eaten them for a while and wanted them so much.

Mary dressed and made herself up. She felt happy today, anyway, it was a Friday, and there was a beautiful evening waiting for her. She gave a quick glimpse of the mirror before she went out of the room. She looked good, the diet and exercises made some efforts which enabled her to enjoy a healthy lifestyle more (or probably not so good, she was still fat, not so confident). Though she did not know whether she could hold on tonight, she did not overthink, picked up her keys, mobile phone, and handbags wore shoes and left home.

She met her friends and chatted while they were preparing food together. Except for the prepared food, other people also brought some beautiful desserts. On the table, there were fruits and snacks. She wanted some drinks and headed to the table. There were various choices, tea, juice, cola, and beers. She …

All the food was prepared, and everybody sat together, talking, and eating. After she took a try at each cuisine, she was almost full. The food was delicious, but she did not know whether she should continue to eat more. There was a long time before the end of dinner, and other people were still eating. She …

figure 3.4 scenario 1

Scenario 2

Lucy has just graduated from university and is a newbie in the company. She likes her job and enjoys relationships with her new colleagues. They are always friendly and accommodating at work.

Lucy starts to eat a less sugary diet these days, which means that she needs to eliminate the most prominent sources of sugar, such as sugary beverages and baked goods, such as cakes, muffins, and brownies. She quite enjoys the diet because she can see that her skin is clearer and has a better sleep at night. And she feels a sense of achievement from her strong self-control ability.

One afternoon at work, her colleague brought a home-baked cake to celebrate her(colleague's) birthday. Everyone has a piece, and she feels that, as a good colleague, she should join the celebrations. However, she does not want to break the rules of her diet and change her well-prepared plan for dinner because of this. Hearing the happy chatting and laughing from the colleagues not far away, she wants to join them, but she is still sitting on her chair with very conflicting feelings and pretends to be busy with work. At the moment, the colleague walks to her with a smile with a big piece of cream cake holding in hand and says, " Hey Lucy, take a rest, come and join us ~" Lucy stops her work, turns her head, and looks at the colleague, says "..."

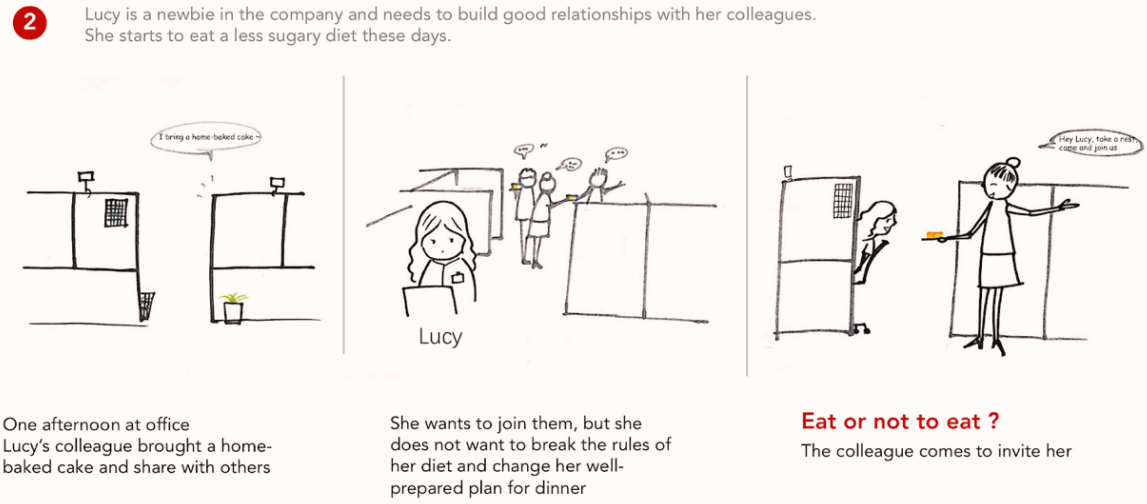

figure 3.5 scenario 2

Scenario 3

Jackson is a second-year student in university and rents an apartment with a boy. Though they live together, they have a totally different lifestyle. Jackson always keeps a healthy and regular schedule.

After finishing today's study loads at the library, Jackson comes back to his apartment. There is nobody at home on this rainy night. Lying on the sofa in a cozy posture, he opens the laptop and decides to watch a movie. The movie is not as interesting as he expected, but at least, it is enough to kill some time. He takes a glance at the clock, it is 9:05 pm and he does not want to go sleep that early. He feels bored and

looks around with the movie playing. At the moment, he sees a tin of cola, a bag of popcorn and a bag of potato chips on the tea table. They are half open and he can grasp it right away if he wants. There is nothing better to eat than potato chips while watching a movie, he thinks. He wants to take some, but he knows that it is not a good choice, because he will go sleeping in one hour. Right now, he cannot totally focus on the movie and he can even see the bright yellow of the potato chips from the open mouth of the bag under the warm orange light. He…

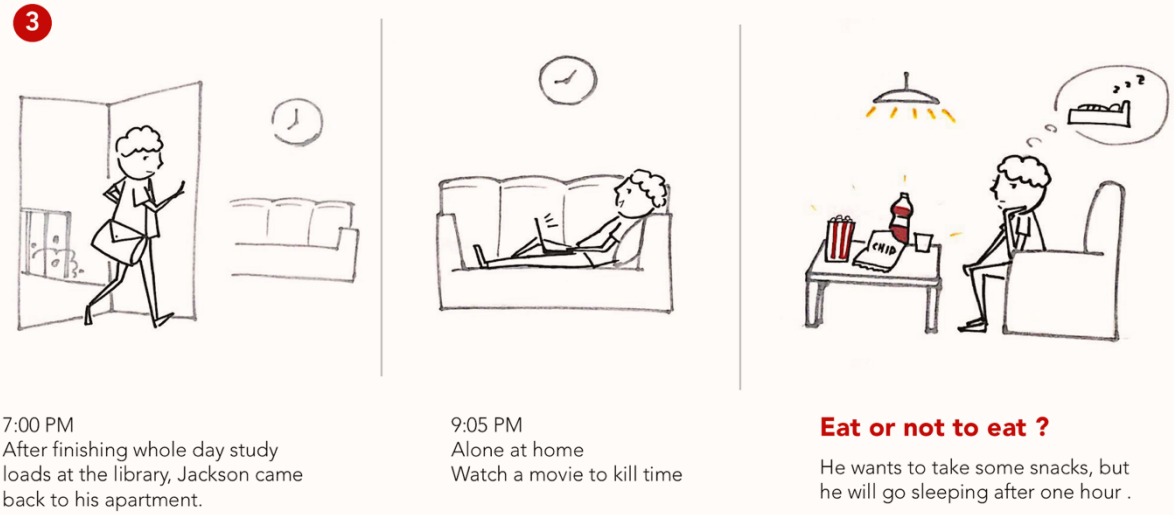

figure 3.6 scenario 3

Scenario 4

Julia and her brother go to visit their grandmother and have a family dinner together with his other family members on the first Sunday of each month. The warm atmosphere and joy time with family always brings them happiness.

This afternoon, Julia went to her grandmother's house as usual. The moment she entered the room, her lovable and chubby nephew ran to her with a big smile and gave a cookie to her with his little hand. She took the cookie from her nephew's hand and saw that people were sitting in the living room, chatting, and sharing afternoon tea. She walked towards them.

Around 5 o'clock, she started to prepare dinner with other family members. They have prepared roast potatoes, steaks, salads, and fruit dishes. She planned to make a chicken broccoli stir fry, but her brother suggested making deep-fried chicken. Indeed, to her, fried chicken was much easier to cook and took less time. She looked around and glanced at her little nephew sitting in front of the television, and he was drinking cocoa milk and took another cookie into his mouth. She …

Around 7 o'clock, she finished the last dish. People sat by the table and appreciated the food a lot…

figure 3.6 scenario 4

3.2.3 Designing Research Questions of Part 2

During the processes of change in TTM, each stage consists of the various experiences of eating behavior. To understand a general human behavior in an eating experience, one experience is split into 3 phases chronologically: participation(before eating), engaging(eating), reflection(after eating). And they are divided into three blank boxes in a green line. To find out a dilemma scenario which is common and intertwined to most people, participants will choose one scenario that he/she experiences most often and will be asked to fulfill their own stories.

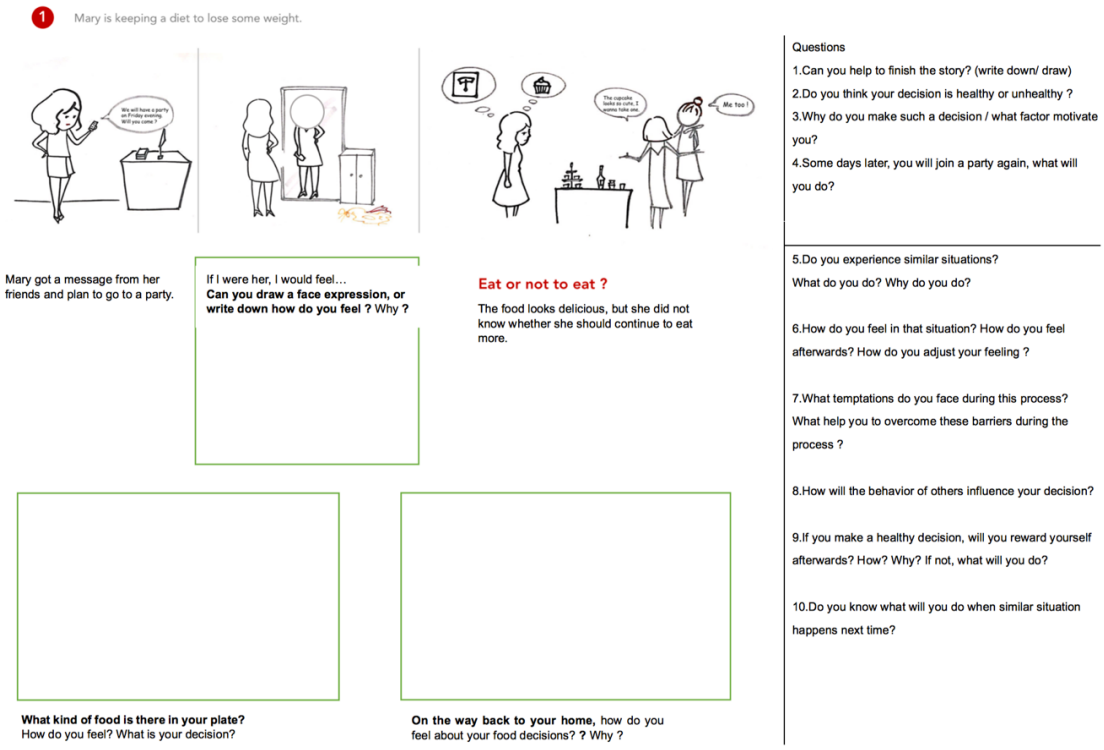

figure 3.7 questions of scenario 1

Under each phase, the information of people's actions, thoughts and feelings/emotions will be collected. Participants can write down or draw up their ideas in the box. Take scenario 1 for example (figure 3.7):

Considering the goal of the user research in chapter 3.1, various types of information will be collected. Table 3.8 shows questions relating to different types of information. The explicit questions would be adjusted accordingly relating to each specified scenario.

Information type	Relate the storyboard	Similar experience
Behavior / actions	- Can you help to finish the story?	- Do you experience similar situations? - What do you do?
Experiential affect	- How do you feel about it ?	- How do you feel in that situation? - How do you feel afterward? - How do you adjust your feeling?
Behavioral beliefs Environmental context	- Why do you make such a decision	- Why do you do it?
Behavioral beliefs Experiential attitude	- Do you think your decision is healthy or unhealthy?	- What do you think about it
Environmental context	- What factor motivates you?	- What temptations do you face during this process? - What things make it easy/hard for you to promote healthy eating?
People's own strategies Behavioral beliefs	- If a similar scenario happens again, what would you do? Why?	- If you start a healthy eating plan, how certain are you that you can keep it? Will you enjoy it? Why? - Will you reward yourself ? How? Why? - Do you know what you will do when a similar situation happens next time? - Can you share a healthy eating experience(alone) that you enjoy most? Why do you enjoy it?

table 3.8 questions relating to different types of information

3.2.4 Participants

The study faces people's daily eating behaviors regardless of their nationality, gender, occupation, educational level etc. Considering the accessibility of the researcher to the samples, the most

participants were students or employees of the University of Twente. In the user research, personal information that can identify them, such as name, age, gender and work status was collected but kept in a secure and safe place.

3.2.5 Research tools

The user research will be delivered in the form of individually face-to-face interview. The tools (figure 3.9) that are used in the process includes:

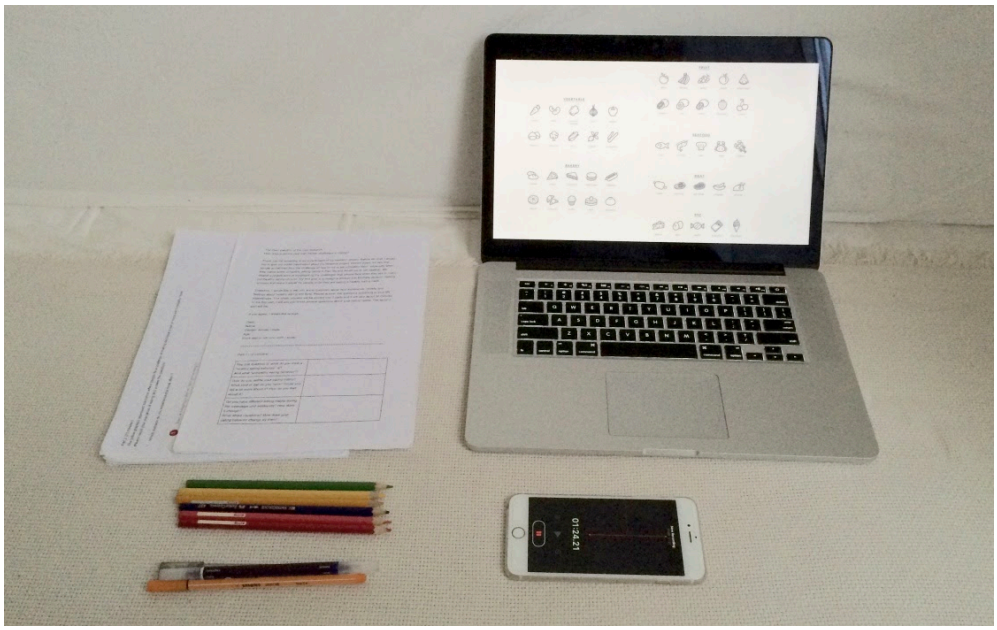

figure 3.9

Questions presented in visual documents printed in A4 (appendix 1)

- *Participants can read the questions and storyboards to get the information.*

Color pencils, pens

- *Participants are free to choose either draw or write down their ideas. Except for graphics and words, different colors also convey information. They can highlight some key points with* color pencils.

A voice recording equipment (App on iPhone)

- *The audio data of the participants in the whole process will be collected for analyzing.*

A laptop

Showing different types of food icon with English words

3.2.5 Flow of the Interviews

Step 1:the participant is invited to read the informed consent form

Step 2:the interviewer briefly introduces the project and the process of the interview to the participant

Step 3:the interviewer delivers research documents to the participant and start audio recording

Step 4:the interviewer asks general questions of part 1

Step 5:the participant is asked to choose one dilemma scenario they experience most often in a visual document of part 2, and the interviewer asks specific questions relating to the scenario

Step 6:the interviewer stops audio recording and collects the research documents

3.3 Result of the User Research

In total, 32 participants are interviewed in total about their eating habits and relevant experience of eating. The whole raw data from the interviews are shown in appendix 2.

3.3.1 Participants

Because of availability sampling (Saunders, M., et al.,2012), the main participants are studying or working at UT. Most of them have received relevantly high educational levels. Five of the participants have a Ph.D. degree, 22 were master students, and 2 were bachelor students. The other 3 participants go into a career as a pharmacist, a nutritionist, and an agency of medical instruments, all of which are health-relevant domains. Most of them are young and middle-aged adults, and 29 of them are aged between 20 and 40. The gender ratio is almost equal (female: male = 17:15). Among them, 4 of the participants are in the process of changing their eating diet, 2 participants are vegetarian, and one person consistently kept a diet in the past six months and successfully lost weight.

Generally, they have a basic knowledge of healthy and unhealthy eating, recognize some unhealthy behavior of their daily life, and can provide some pertinent and unbiased descriptions and comments on their eating behavior.

3.3.2 Result of Part1

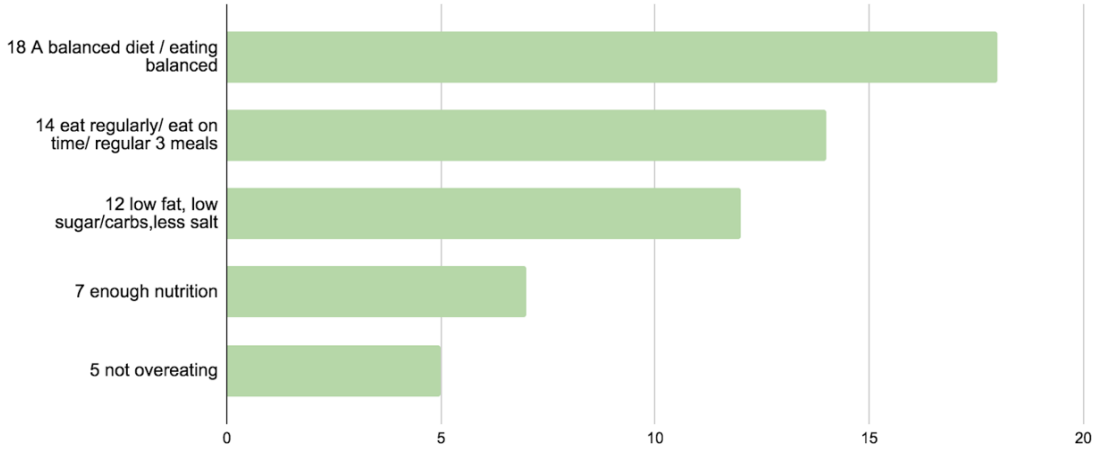

table 3.9 beliefs about healthy eating behaviors

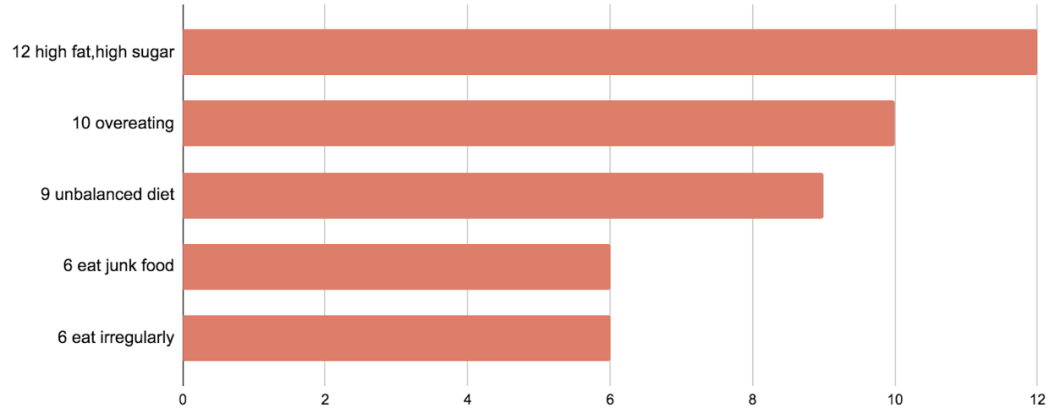

table 3.10 beliefs about unhealthy eating behaviors

The first part consists of some general questions about participants' daily eating habits and their attitudes/beliefs to healthy eating behaviors(table 3.9) and unhealthy eating behaviors(table 3.10). Each person can hold more than one kind of beliefs, the times of beliefs mentioned among different people are collected. "A balanced diet / eating balanced" was the concept of healthy eating that most people agreed on and were mentioned most frequently (18 times). The popular beliefs of healthy eating also lay in "eat regularly/ eat on time/ regular three meals"(14 times), "low fat, low sugar/carbs, less salt"(12 times), "enough nutrition"(7 times), and "not overeating"(4 times). By contrast, unhealthy eating behaviors(table 3.10) were most described as "high fat, high sugar"(12 times), "overeating"(10 times), "unbalanced diet"(9 times), "eat junk food"(6 times), and "eat irregularly"(6 times). When asked about their attitudes towards their eating behavior, almost half of the people(15 out of 32) held a positive attitude. In contrast, 6 people stated "unhealthy." 6 people thought "just so-so," and 3 people held mixed feelings.

Regarding eating behaviors, most people(29 out of 32), more or less had different eating habits during weekdays and weekends. Half of the people had regular meals on weekdays, and a number of them adopted an easy and simple way of eating. On weekends, 9 of them tended to cook by themselves or prepared more complex and substantial dishes. A quarter of them skipped breakfast or brunch.3 people always kept the same eating habit in the whole week. Their eating behaviors are also influenced by other factors, such as "emotion"(15 people), "daily schedule" (6 people), "eating outside with others"(6 people) and "other people's behavior"(5 people), which are commonly mentioned. A quarter of people(8 out of 32) can be influenced by two or more factors. The extent of these factors that changed/helped them to keep their behaviors were: always(5 people),often(6 people),sometimes(12 people),depends(5 people),not so often(3 people) and seldom(1 person).

When it comes to their specific steps towards healthy eating behavior, the majority of people(27 out of 32) made attempts, such as using Apps, following some vloggers, acquiring information from websites or books and consulting a counselor, etc., and 5 people made more than one attempt. Relying on Apps and websites is the most common way: 8 people use Apps as a tool to record calories, make food plans, and get healthy recipes. 8 people getting information from the other media like YouTube. People had motivations but still not acted, and 3 people did not have any plans or intentions

3.3.3 Result of Part2

The second part represents four different dilemma scenarios that people probably meet in daily life. Participants would either choose one scenario they experience most of or choose none to share some insights about their actions, feelings, beliefs, and surrounding context relating to eating behavior. Among 32 participants, scenario 3 was the most often experienced by 18 people; 9 people chose scenario 1; 3 people are for scenario 2 and 1 for scenario 4. One person did not face any similar dilemma of either scenario. Table 3.11 depicts the division of the participants in each scenario and its segments.

No.	scenario	Number of people (n)	Percentage
1	At party	9	28.13%
2	In office	3	9.37%
3	At home	18	56.25%
4	Family meeting	1	3.12%
none	none	1	3.12%

table 3.11

Though both fulfilling immediate desires and pursuing long-term goals have a positive effect on people, more than half the participants (18 out of 31) experienced negative or mixed emotions, and majority of them (25 out of 31) experienced emotional swings in their personal self-control dilemmas.

Scenario 1

The first scenario describes a person joining in a social context (friend's birthday party) and facing the choice of whether to eat or not to eat. The participants raised similar scenarios such as the BBQ party, dine together with friends or colleagues and social parties. 2 people chose to eat without any inhibitions, and they both enjoy eating very much. The rest 7 people more or less kept conscious of their eating behavior in the process, for instance, having a small try of unhealthy but tempting food, eating more vegetables, and having a mixed plate. Most people(6 out of 9) thought their decision was unhealthy compared with their daily meals; one person kept neutral, and only 2 people were satisfied with their choices.

In the research, people experienced mood swings and attitude changes before and after the party. 4 people showed happiness and excitement before the party while one showed the obvious negative feelings because of the pressure from social issues. 2 people encountered mixed emotions such as "happy but a bit stressed about tempting food" and "want to be attractive but not confident about my figure". It is interesting to note that 4 people experienced negative emotions like "guilt" or "worried," and only 2 people felt content and happy after the party.

The motivations behind their decisions are various. 3 participants were always influenced by others because when they see others trying some food, their curiosity and interest in food are also raised. Others more or less influenced the rest 4 participants, but 2 of them were uninfluenced. Caving to food and favor in food was another reason that motivates them. In the interview, though almost everyone noticed the risk of their unhealthy decisions and were conscious of their own behaviors, more than half (5 out of 9) of them would still keep their original eating habits such as overeating, intaking too much dessert or fried food. The main reason behind it was that the party and eating-out happen not so often and they have not seen any harmful effects on their body yet. One person mentioned, " I will reflect myself until the weight increases, get bad sick, or I am really unhappy with my body and myself. But, now, I am happy." 4 people said they would like to try to eat healthier within their capability next time, like " If I have a good mood", " If

I have more power of influence among people, my suggestions about healthy food are more possible to be accepted."

Scenario 2

The second scenario happens at an office where the colleague shares a cake with the person. 3 out of 31 people experienced a similar situation most often. Except for the office, this can also happen in the classroom and group discussion where classmates or teammates invite you to take some food.

All of them accepted the food considering that rejection will be impolite, and the behavior lay in sociality more than the food itself. 2 persons also expressed that they were tempted by food at the same time. Though they all accepted the food, 2 participants said whether they kept it aside or just had a small bite or eat them all depended on the relationship between the person who shares food and themselves. Actually, there is freedom for people to decide to eat or not to eat because accepting food does not mean having to eat them all. When asking their feelings, none of them showed strong antipathy and struggling with the situation. Thus, it concludes that the case does not compose a dilemma for most people.

Scenario 3

The third scenario, in which individuals face temptations of food along when they go back home after one-day work/study, was experienced by more than half the number of people (18 out of 31). A majority of them (15 out of 18) tended to eat without any hesitation, even though they had dined already. 3 participants would actively think about what they eat and why they eat. For example, they decided to eat only when they felt hungry and they tended to eat fruit or yogurt to substitute snacks like chocolate or chips.

The motivation triggering them to eat are divided into three categories(table 3.12): emotion(11 people), physical needs such as feeling hungry or tired(4 people), the favor/habit of eating(3 people). The emotion was the main factor leading to unhealthy decisions. As a consequence of pressure and anxiety, people usually tend to eat their favorite food to release negative emotions, which sometimes leads to overeating and sleeping late. And some people regarded food as rewarding for themselves to acquire more happiness. Half of the people experienced distinct negative emotions such as stressed, anxious, helpless, and uncertain before eating, but 4 people had passive feelings like guilt and self-blaming afterward. The number of people who held positive emotions also increased from 5 to 8, resulting from eating. The comparison appears that eating could genuinely bring comfort to people.

Additionally,5 people had mixed emotions: they felt content and happier together with the regret of eating too late and worry of gaining weight. Though a number of them have noticed some defective effects of their behavior, only a small amount of people (4 people) would go for healthier choices, like doing some exercise instead of eating or replacing junk food with yogurt and fruit. Most people (14 out of 18) remained the same eating behavior.

The context could also influence people's behavior. The scenario is founded on pursuing that a person stays alone. When asking about staying alone or being with others, at which circumstances they are easier to be motivated to eating, more than half of the participants (10 out of 18) said they were more likely to be tempted when they were alone, and 7 mentioned being with others at home would encourage them to eat, especially when they were staying with the person who has a similar preference of food with them. Accessibility to food is another factor. Some participants mentioned if they bought some favorable snacks,

they would like to eat them all at one time, which sometimes resulted in being too full and physically uncomfortable.

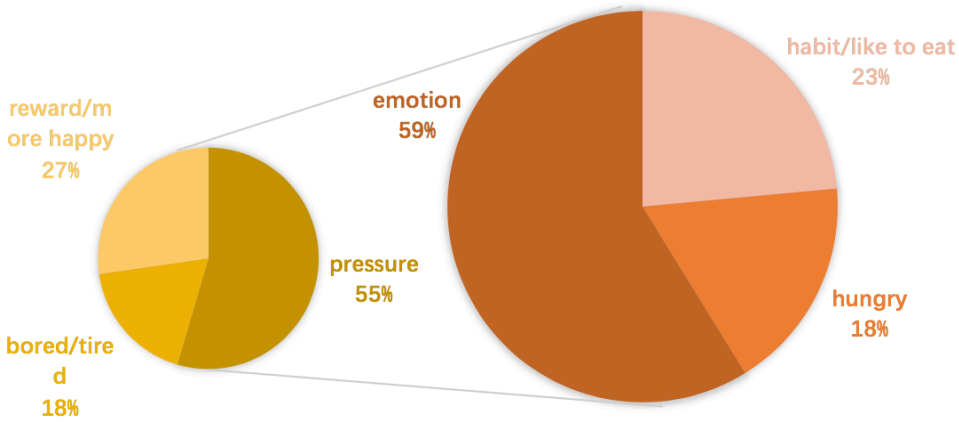

table 3.12 motivations

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food	potato chips	chocolate	Drinks	fruits	nuts	Dessert (cake, cookies)	Instant noodles	Ordering take-out	cooking
Number of people	8	5	4	4	3	3	2	1	1

table 3.13 people's first option to food

In regard to the temptation of the food itself, the following table 3.13 shows the people's preference for different types of food in the scenario. The participants are allowed to choose more than one kind of food as their first option. Quite many people prefer potato chips in accounting to the taste, crumbly texture, and the crispy sound. The chocolate came as a second favorable food. Some healthy snacks such as fruits and nuts are not as popular as the food that can bring intense stimulation to people's senses. Both more readily available to healthy snacks and less accessible to some specific food could be possible interventions.

When asked past eating experience that they enjoy most and reasons, participants gave different answers: cooking themselves when they are not busy (5 people); having a balanced diet and healthy eating behavior (5 people); replacing unhealthy food with healthy food or replace eating with exercises (3 people); eating their favorite food (2 people) or cheat meal (1person), and 2 persons are always satisfied with their current eating habits. Majority of people (16 out of 18) associated their enjoyable experience with a healthy diet because of feeling comfortable physically, getting a sense of self-control, pride, and achievement.

Scenario 4

The fourth scenario happens at a family meal: a person is preparing food for others and choosing between healthy food and unhealthy but tasty dishes to cook. Only one participant selected the scenario as the dilemma he most often faced. In his opinion, it was important to care about other people's feelings and provide various choices of food in a collective meal. Therefore, he would prepare two dishes of both healthy and unhealthy food. Because as he said " fried chicken will make everyone happy. If there are more choices for people, they can balance themselves.", and he feels this is a right decision.

None

The participant who chose none of the scenarios indicated that he successfully lost weight for 6kg in the past 4 months and kept the weight for 2 months. He regarded eating only as a way for survival, and the taste of food posed no temptation to him. When he eats alone, he prefers less processed food, attached importance to a balanced diet and nutrition, and cooks simply. When dining with others, he always controlled the intake of the food.

3.4 Conclusion

Through the user study, people's behaviors, attitudes, and feelings about eating are collected. Generally, the participants have a basic acknowledgment of healthy and unhealthy eating behavior and cognition of their own eating habits in the interviews. Considering the complexity of factors that influence eating behaviors, the following analysis will focus on dilemmas that a number of people reach an agreement on

- the first and third scenarios. Expended analysis linking the user study and theories that emphasize individual health behavior will be discussed in the next chapter.

Chapter 4 .

The Analysis of The Result

Based on the results of user research, this chapter illustrates a theoretical framework from Bandura and the development of a framework reproduced from Bandura. Various interventions and design suggestions relating to the framework are analyzed in different dilemmas of eating.

4.1 Theoretical Basis

Social Cognitive Theory (SCT) developed by Albert Bandura emphasizes reciprocal determinism (figure 4.1 Bandura 1986) that reveals the interaction between people and their environments. The model of causation involving triadic reciprocal determinism (Figure 4.1) is a fundamental concept of SCT, where human behavior is the product of the dynamic interplay of personal, behavioral, and environmental influences. The influence of these different sources is not equal, nor at the same time.

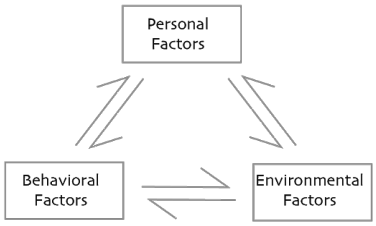


figure 4.1 retrieved from Bandura (1986)

Personal factors include people's thoughts, beliefs, intentions, affect, feelings, which shape and direct behavior. In turn, the natural and extrinsic effects of people's actions resolve their thought and affective reactions (Bandura 1989). The interactions also function between personal characteristics and the environment. Environmental factors can develop and change people's emotional state and cognitive level through modeling, instruction, and social persuasion (Bandura, 1986). For example, social influences can transmit information and stimulate emotional reactions among the public. On the other hand, the social environment is affected by people's physical characteristics such as age, sex, attractiveness, and race, and some other observable identity like social status and roles. The interactional links between behavior and the environment reveal that people are both products and producers of their environment (Bandura,1989). Through their actions, people create, shape, and select environments. After being activated by appropriate behavior, environmental factors such as temptations and social norms portrayed in mass communication, in turn, partly lead and determine what behavior is developed and how the way of behavior is modified.

4.2 SCT and User Groups

Research shows that attainment of a certain level of formal education by young adulthood is positively correlated with lifelong health through various pathways (Hahn & Truman,2015). In some sense, the result

of research could represent the attitudes and behaviors of a certain group of people rather than a universal value. However, SCT roots in the opinion that individuals process their own beliefs and proactively engage in their own development and actions. Environments and social context influence human behavior through psychological mechanisms of the self-system. Therefore, it can be assumed that the eating behaviors of participants of the study were not directly affected by their educational level, social status, economic level, and familial structures. Instead, behaviors are closely relevant to self-efficacy beliefs, personal principles, affective and mental states, and other self-regulatory factors. Thus, even though the educational level of participants seems higher, it would not be a major influential factor in their eating behaviors.

4.3 SCT and Three Focus Areas of The Study

As design instruction mentioned in chapter 1, three areas - guided flexibility, accounting for emotional gains and losses, dynamics of interventions- will be focused as future guidance in the design of adopting health behavior change interventions. Figure 4.2 shows how these three domains are covered in the framework of triadic reciprocal causation.

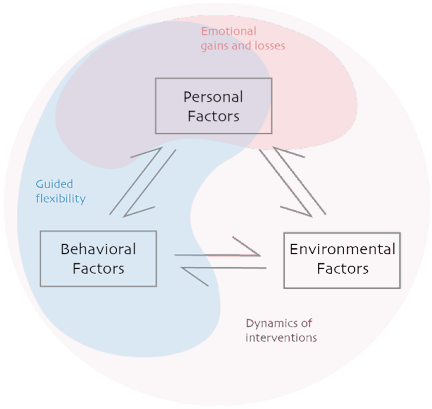


figure 4.2

1) Guided Flexibility & Self-regulate The Behavior

In long-term behavior participation, it is essential to investigate guided flexibility to at least some aspects of the individual or group (Marcus, et al., 2000). Depending on how far people are underway in their behavior change process, the original goal people set for themselves at the beginning will possibly alter always (Bandura,1989). Additional, unexpected factors that disrupt healthy eating plans such as eating out with friends, going for a vacation overseas, and engaging in social reception are difficult to avoid in daily life. If there is a lack of internal standards and self-sanctions, people are very likely to continually shift direction to cope with whatever unpredictable influence occurs to them (Bandura,1989). Self-regulation capabilities in the interaction of self-produced and external sources of influence are necessarily needed when people adjust personal standards to keep them within an attainable extent.

The Self-regulation capability is a distinctive human quality that receives considerable emphasis on SCT. With the capability, people mediate the effects of most external influences and acquire the basis for purposeful action (Bandura,1991). It helps individuals to go through short-term negative outcomes in the process of achieving long-term positive outcomes(Alfred L.et al.,2008). In SCT, it is the specific capabilities of managing oneself rather than a person's "will power" that relates to self-control(Alfred L.et al.,2008). According to Bandura(1997), controlling oneself through self-monitoring, goal-setting, feedback,

self-reward, self- instruction, and enlistment of social support are identified as self-regulatory approaches in SCT. Among them, self-monitoring partly plays a decisive role in a successful self- regulation (Bandura,1991). Self-monitoring orientations vary from individual to individual in the extent to which they guide their actions according to personal standards or social standards of behavior (Snyder, 1987). Thus, flexible guidance for people's behavior will be adopted in the intervention to adapt to individual differences and different stages of the behavioral change process.

2) Emotional Gains and Losses

In the user research, different scenarios are based on eating experiences of self-control dilemma: A conflict between a long-term goal (or personal value) and an immediate desire. These dilemmas always touch upon a balance achieved between two desirable but incompatible features. On the one side, the long-term goal promises them more rewarding and long-lasting gains, such as a good physical state or a beautiful figure than the immediate desire. On the other hand, the benefits of the desire, such as gaining satisfaction from food, releasing stressful emotions and obtaining instant relaxation, can be experienced immediately; while the gratification of the long-term goal is postponed. From an emotional perspective, there is a distinction between hedonic emotions (e.g., satisfaction, excitement, dissatisfaction, frustration, boredom) and self-conscious emotions (e.g., pride, guilt, shame, embarrassment) in self-control dilemmas (Giner-Sorolla, 2001; Ozkaramanli, 2017). When people face two alternative and exclusive choices, the potential losses and gains that involve their personal goals will intimate emotional losses and gains to a great extent.

Since people's emotional bent and feeling as a segment of the personal factor in the model of triadic reciprocal determinism, a dynamic balance between the gratification of both immediate and delayed benefits is required for happiness (Huta & Ryan, 2010). Besides, self-efficacy is an influential factor in an individual's thought patterns and emotional reactions (Pajares, F., 2002).
Self-efficacy not only buffers the negative effects but also plays a crucial role in maintaining and enhancing positive effects(Heuven, et al.,2006).

3) Dynamics of Interventions

Dynamics is an essential concept in user-engagement (O'Brien, 2008). SCT emphasizes that human behavior results from the dynamic interplay of personal, behavioral, and environmental influences. For example, there are powerful influences of the environment on behavior. Incentive motivation, through rewards or punishments, to guide desired or undesired behaviors, is one basic strategy of environmental change. Facilitation, which enables behaviors or makes them easier to perform by changing the accessibility of the resource or convenience, is another way. According to a specific environmental context, there is enough flexibility for the intervention by altering some environmental settings. In SCT, people can change their behavior through learning and experiencing, following guidance in the adjustment of perceptions, and getting support for the development of capacities. (Alfred, L., et al. 2008). And these consistent changes reacting to the environment, beliefs, and previous behaviors play an active role in self-evaluation and even further help an individual to progress through a behavior change process.

4.4 Relating Transtheoretical Model (TTM), Self-efficacy(SE) and SCT

The research of eating behavior is based on the Transtheoretical Model (TTM), which is identified for applying stages of change to integrate processes and principles of change. During the transition from the

contemplation stage to the preparation stage, people experience the process of self-reevaluation, environmental reevaluation, and self-liberation. Cognitive, affective, and evaluative processes are progressed by people, so as to go through the early stages of change (Prochaska, J. O., Redding, C. A. Evers, K. E., 2008). Self-reevaluation, the central process in the contemplation stage, integrates both cognitive and affective evaluations of one's self-image within a healthy or unhealthy behavior. With self-reevaluation, a person gradually realizes that his/her behavior change is an essential component of a person 's identity. SCT also emphasizes such self-consciousness. For Bandura, people understand themselves by looking into their conscious mind. He argued that "a theory that denies that thoughts can regulate actions does not lend itself readily to the explanation of complex human behavior" (Bandura, 1986).

In different stages of change, when people act on a new healthier behavior, various strategies are provided to processes of change to guide the individual. Decisional balance and self-efficacy are important components of the strategy.

Decisional balance means weighing the potential benefits (pros) and costs (cons) associated with a behavior's consequences. The balance between the pros and cons varies depending on which stage of change the individual is in. Evaluating the pros and cons contributes to forming a positive or negative attitude about an issue, which can be categorized as a personal factor of SCT. Research of TTM shows that the cons of changing outweigh the pros in the pre-contemplation stage, but the pros outweigh the cons in the middle stages and the action stage (Hall, K.L. & Rossi, J. S. 2008). Therefore, emphasis on increasing the pros of changing contributes to progressing from pre-contemplation to later stages; the decreasing of cons function more, to progress through contemplation stage; when people shift to the action stage, pros should be more critical than cons (Prochaska, et al. 2008). The relative emphasis on personal strategies will be different depending on the stages and the context. This point will be further discussed in the next section(developing frameworks with the scenarios).

Self-efficiency(SE) is the concept for which SCT is widely known and which has been integrated into other models and theories, for example, TTM. Self-efficacy is understood as people's beliefs about their capabilities to deal with prospective situations. With high self-efficacy, people are more likely to cope with high-risk situations without recommitting their former behaviors. To be more specific, the individual has the confidence that he/she can engage in healthy eating behavior across different challenging situations of temptations that engage in unhealthy eating behavior. Temptation, reflecting a person's desire to engage in unhealthy eating when in weak situations, is a controversial side of self-efficacy. In the user research, three factors reflect the most common types of temptations: negative/positive affect, social situations, and craving for food.

Bandura also pointed out that perceived self-efficacy affects every phase of personal change even though people don't even consider changing their health habits(Bandura 1994). The more people are conscious of self-regulatory efficacy, the more successful they are in getting rid of unhealthy habits and raising health-promoting practices into their lifestyle(Bandura 1994). Indeed, regarding interventions, dietary self-efficacy accounts for over 50 percent of the variance in dietary behavior change (AbuSabha, Achterberg, 1997). Thus, in the following study, self-efficacy will be adopted as part of interventions to improve healthy eating. Self-efficacy theory (SE) summarizes four main sources of influence to develop people's beliefs in

their efficacy, which includes mastery experiences, the successful examples of people who are similar to oneself, social persuasion, and emotional states that indicate individual excellence and weakness. (Bandura, 1994). In this project, considering different scenarios and dilemmas that people face, there will be adaptable sources to help to strengthen people's beliefs in their capabilities to exercise control over their eating behavior.

4.5 Developing Framework with The Scenarios

The user research applies four different scenarios that people may experience in their daily life as a starting point for communication. Combining the scenarios, the participants recalled and shared a similar experience of eating that they face most often. From the result, scenario1 and senario3 will be the focus to discuss. Resulting from the lack of samples, the intervention for scenario2 and senario4 won't be representative enough. Partly resulting from the availability sampling where most participants are university students who don't live with their families currently, the number of the sample is too little. Though similar scenarios won't be the focus of the assignment, how one's eating behavior is shaped and interacts with the closely relevant groups, such as families or roommates, could be a future study.

4.5.1 Scenario 1

Since the scenario is about party and going-out situations where people are not able to initiate power to change the environment. Because the food is prepared and ordered, there are too many limitations to choose healthy food. Therefore, the scenario focuses on behavior and personal factors. As shown in Figure 4.3, the temptations that relate to the environment are being exposed to various foods, a happy and relaxed atmosphere, and social pressure. Following other people's behaviors is a main behavioral factor influencing their behavior.

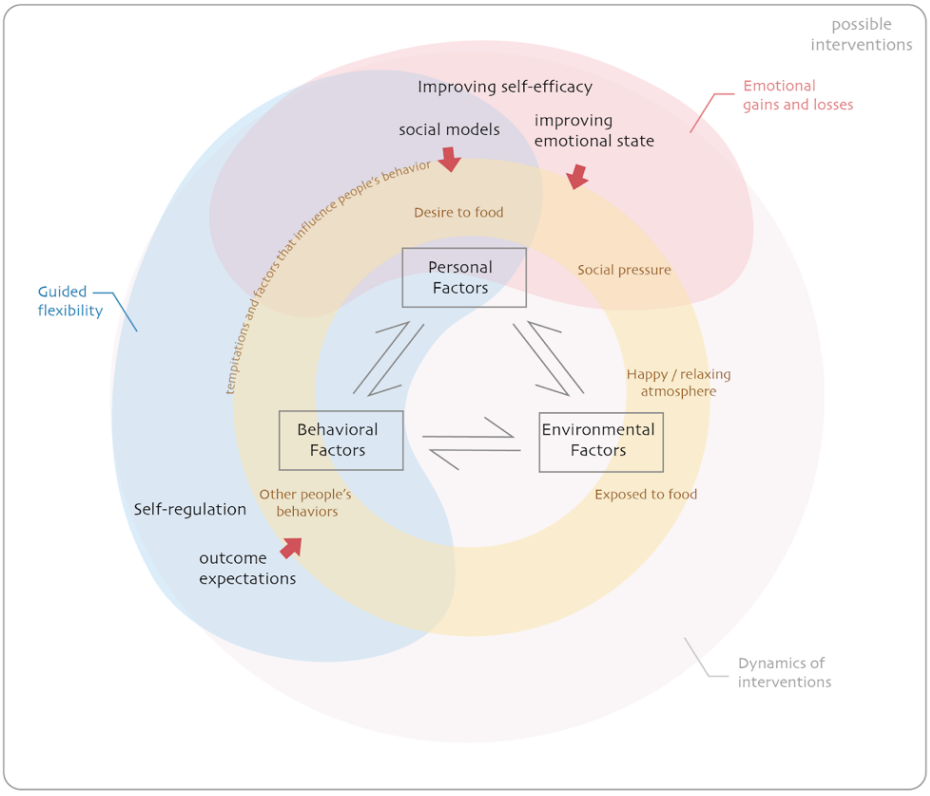


figure 4.3 reproduced from Bandura 1986

The outcome expectancies which is a main determinant in the motivation to change is defined as “beliefs about the likelihood of various outcomes that might result from the behaviors that a person might choose to act, and the perceived value of those outcomes.” (Alfred, L., et al. 2008) How to build links between people’s behavior and succeeding outcomes is necessarily acknowledged. For example, a person at the dinner party may find more good reasons to stop (“if I stop eating when I am full, I will sleep well tonight”)than good reasons to continue (“if I stop eating when I am full, I will miss the food that I love”).

Bandura (1997, 2004) noted that outcome expectations are categorized as physical, social, and self-evaluative outcome expectations. According to SCT, expectations about self-evaluative outcomes can be more powerful than expectations about social and material results for some individuals. (Alfred, L.,et al. 2008) Self-evaluative outcome expectation is produced by individuals, based on how they will feel about themselves if they do or do not perform a particular behavior. It captures beliefs relative to the feelings of satisfaction and self-worth of involvement in healthy activities. The advantage of this category of outcome expectation is helping to resist physical pleasure and social pressures (Alfred, L., et al. 2008).

However, Bandura also mentioned that if one does not believe that he or she is capable of sustaining a behavior consistently, the person is less likely to initiate an active lifestyle (Bandura, 2000). Thus, to some extent, outcome expectations is a necessary but insufficient motivation for action. Perceived self-efficacy that people's beliefs about their capabilities will influence overeating behaviors could be another support from a personal aspect.

SCT identifies four sources of self-efficacy: mastery experience, social modeling, improving physical and emotional states, and verbal persuasion. In the circumstance of social context like the first scenario, social modeling, improving physical and emotional states could be the ways that can be easily accomplished. In the result of user research, most participants could be influenced by others' behavior, and some people would always follow others—the more exposed to negative model, the easier to perform negatively. From the backside, it indicates the lack of a good model. If observers see people similar to themselves succeed by sustained effort, the observers' beliefs that they can also possess the capabilities to master comparable activities successfully will be raised. With the vicarious experiences of social models, self-beliefs of efficacy can be built and strengthened (Bandura,1994).

The emotional state also decides how people estimate their personal efficacy. Positive mood enhances perceived self-efficacy, despondent mood diminishes it (Bandura,1994). The result shows that people can easily reach a positive mood before the meal, which could contribute to improving self-efficacy.

4.5.2 Scenario 3

The third scenario happens at home and is the most common dilemma scenario to people. Different from the above scenarios, it describes an individual context instead of a social context. SCT was based on the principles of learning within the human social context (Bandura, 1977) as an extension of social learning theory (Bandura, 1977) at the beginning. However, the concept developed and changed gradually with the increasing studies of human information processing capabilities and understanding of prejudice in learning resulting from experience, observation, and symbolic communication(Bandura, 1986). Bandura altered the label of his theory from social learning to social "cognitive". It is cognition that plays an essential role in people's capability to construct reality, self-regulation, encode information, and perform behaviors(Pajares, F., 2002). In other words, SCT emphasizes people's potential abilities, which could be both a person's individual and group capacity, to influence and construct environments and in terms of making it appropriate for their own purposes. In addition, even in an individual context, a person is still associated with the social environment by connecting others through the social network, being influenced by information from advertisements or commodities, and getting the news or opinions through various media. Thus, SCT can provide persuasive and supporting interventions to promote healthy eating behavior.

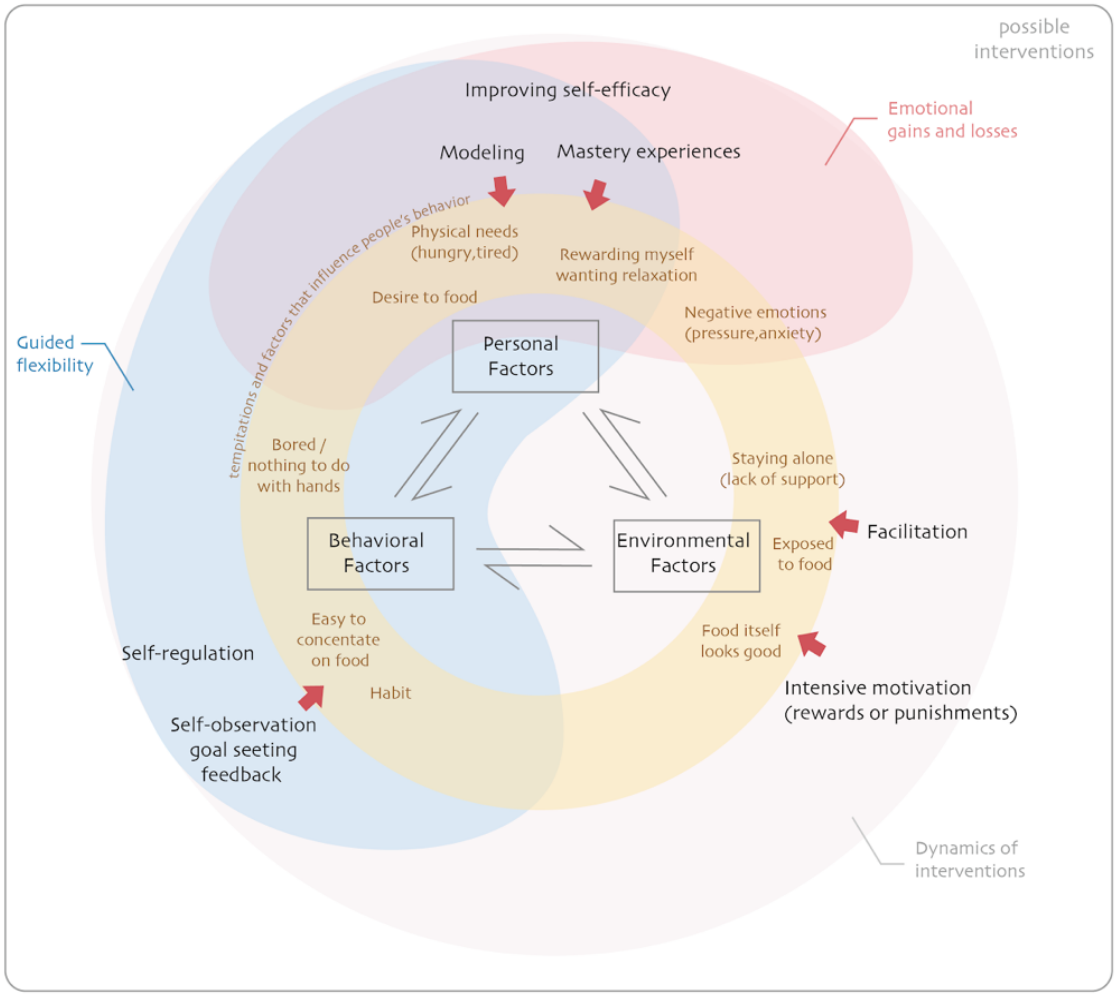


figure 4.4 reproduced from Bandura

figure 4.4 integrates the SCT model into the scenario3 , shows various relevant factors that could motivate people to eat, and presents the interventions that correspond to these factors from environmental, personal, and behavioral aspects.

1) Environmental intervention

SCT includes concepts to describe the environmental influences on behavior and raises two basic environmental determinants to modify behavior. Incentive motivation, one basic form, is leading people to perform desired or undesired behaviors through rewards or punishments. For example, for persons who choose not to purchase unhealthy snacks like potato chips or sweets, it provides a certain reward of some money that could have been spent on snacks for themselves to spend on other things. Alternatively, some entertaining activities and their hobbies could be the resources of rewards.

Facilitation is another essential approach to influencing behavior through environmental change. It means the provision of new structures or resources that enable behaviors or make them easier to perform (Bandura, 1998). Through external control, the intention of controlling behavior will be empowered. For instance, increasing the difficulty of accessibility to snacks could help to prevent people from eating snakes in some way. Some participants said that they tended to eat snacks or cakes that they have at one time, only if they bought some. When people are more readily available to temptations, they are less determined to their original goal. The provision of tools, resources, and training is another way of empowering facilitation that alters behavior. Thus, it is vital to recognize barriers in the environment to health-promoting behavior change and identifying ways in which those barriers can be removed or overcome. Plus, apart from being exposed to food directly and the temptation of the food itself, lacking support from others in a scenario of an individual could be another influential element.

2) Personal intervention

Both self-regulatory and self-observation lie at the very heart of causal processes to mediate the effects of most external influences and provide the very basis for purposeful action.

Self-Regulation is understood as an exercise of influence over one's own motivation, thought processes, emotional states(Bandura, 1994). Before people influence their motivation and behaviors, they should pay enough attention to their own performances. Most people are motivated to eat because of emotions, and a number of them are under pressure and feel anxious. They notice their emotions could be the immediate trigger, no matter bored or stressed, and choose eating as a way to release themselves consciously or unconsciously. But actually, there are other options, such as listening to music, mindfulness and so on. Mood states can affect how one’s performances are self-monitored and cognitively processed (Kuiper, MacDonald, & Derry, 1983). Self-monitoring of behavior that bears on personal competence and self-esteem, in turn, activates affective reactions that can misrepresent self-perceptions when the action happens(Bandura, 1986).

Seeing the consequences of current behavior rather than the distant effects of long term goals enable self-directed change easier to be achieved. Self-observation is able to provide continuing and instant information and influence the behavior in progress. Especially with the help of technology, it can be conveniently realized through smartphones, wearable devices, and other measuring tools. On the other hand, the feedback related to the performance is also needed.

Apart from what mentioned above, personal goal setting is a common and useful way, which can trigger people to achieve some changes in effort. But lofty goals would discourage and sometimes debilitate people's fulfillment. The difficulty in attaining a goal more reflects the match between personal capabilities and goals instead of ability level. It is indeed encouraging to accomplish a goal, while failures can undermine the sense of efficacy. When people make progress, self-observation improves performance more. When there are discouraging failures, self-monitoring can still make positive effects by recognizing possible causes and giving some suggestions. Thus, goal setting, self-observation, and informative feedback of the performance coordinate together in a real case.

3) Behavioral intervention

Improving self-efficacy is an intervention that works on behavior motivation. Mastery experiences are the strongest influence in building up a strong sense of efficacy.

The result of user research shows that a healthy eating experience, which is an essential resource for mastery experiences, brings them positive effects no matter physically or mentally, and they are very willing to perform it if conditions permit. By successful mastery experiences in dilemmas, the belief in one's personal efficacy will be strengthened. However, the failure that discourages self-efficacy will also probably happen, especially in a weak situation of a person. Thus, a resilient sense of efficacy is needed to help them stick out through tough times. It can be acquired through experience in overcoming temptations through continuous effort and make people convinced that their effort in failures and difficulties is still useful. In short, mastering experience enables people not only to succeed within reach but also overcoming barriers of desired behaviors.

Modeling is another optional way to create and enhance self-beliefs of efficacy. Through the vicarious experiences provided by the model which is similar to oneself succeed by sustained effort, the beliefs that the observer is also able to master the capabilities to the similar activities will be raised in the observers' mind. In this circumstance, the perceived similarity between the models and the person is an essential factor to influence perceived self-efficacy. And 2 participants who modified their eating behavior also mentioned that the example of the person who relates to them would be more convincing and encouraging. From the modeling, they foster the acquisition of new competencies, cognitive skills, and behavior patterns.

People's somatic and emotional states affect their judgments of their personal efficacy (Bandura, 1994). Positive affect strengthens perceived self-efficacy while depressed emotions reduce it. The result concludes that emotion is the main motivation that participants indulge themselves in food to relieve themselves or get some comfort. Lowering people's stress reactions and altering their negative emotional tendencies is another way of modifying self-beliefs of efficacy. The critical point is not to constrain or ignore the intensity of emotion and physical reactions but how they are perceived and explained. Also, modeling that mentioned above contributes to altering their emotions, since emotional reactions expressed by models tend to trigger emotional arousal in observers(Bandura, 1994).

4.6 Conclusion

The user research results, theories, and relevant interventions that can be applied are presented in this chapter. Social Cognitive Theory (SCT) and Self-efficacy(SE) developed by Albert Bandura provides various possibilities in motivating people's belief and promoting behavior change of healthy eating through

the intervention from a personal, behavioral and environmental aspect. From the result with four different scenarios in the user research, a number of specific strategies are raised, and the main focus lies in scenario3 in which an individual faces the dilemma of snacking at home. Potential strategies such as modeling and mastery experience from the personal aspect, self-observation, feedback, and goal setting from the behavioral aspect, facilitating and incentive motivation from the environmental aspect are significant basis and indications for idea facilitation about "snacking at home" in the workshop of design phases.

Chapter 5 .

Workshop and Ideation

The goal of the workshop was to generate ideas with the help of the designers and a researcher. The end goal was to come up with ideas that could help people at home, who progress into a healthier eating behavior while they struggle with eating or not eating. The target group focuses on the 18 participants who chose " scenario 3:snacking at home" in the previous research, and similar people among them are grouped together.

5.1 Participants

Five participants from the University of Twente were invited to the workshop, but only three of them came in the end. The participants consist of two master students of industrial design engineering (IDE) and a doctor researcher of mathematics and computer science(EEMCS). The participants were invited to a meeting room that had a whiteboard available.

5.2 Plan of The Workshop

Since the participants of the workshop are unfamiliar with the theories, to create an effective, understandable and friendly communication among participants of different backgrounds, it is essential to "translate" complex definitions into definitions that they can understand the first time they read. Sharing a common language with participants helps to communicate information quickly and clearly, and information is easily scanned and recalled. In this workshop, in order to facilitate the idea generation process, various tools were designed and used. These cover personas, strategy cards, and exploring future use. These served as tools for communication irrespective of participants' knowledge of eating behavior research and are explained in the following lines.

5.2.1 Steps of The Process

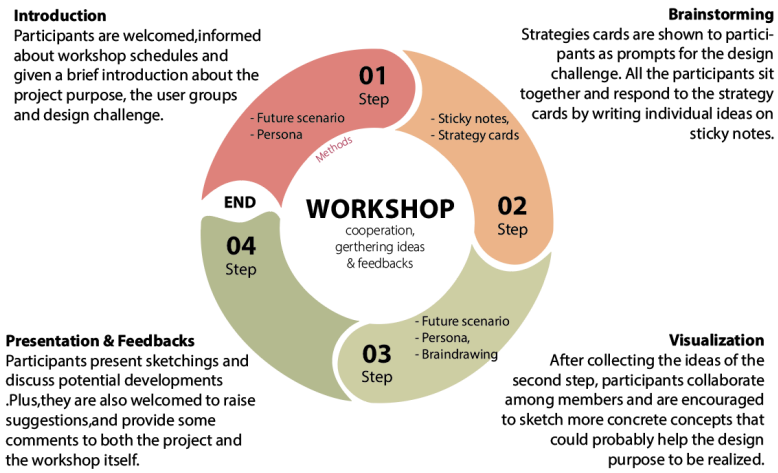


figure 5.1

Step1: Introduction

The workshop begins with a brief introduction so that the participants know about the background, user groups, challenges, and design purposes of the project within a short time. Therefore, communication tools that can effectively convey information from the user research to the participants are needed, in order that both the designer and participants coordinate to act as innovators.

personas

Participants can be familiar with the target user group though personas. They are understood as fictional characters to represent various types of users who share similar characteristics throughout the design process. Based on real data collected from the target group, it is a collection from observations of multiple people (Goltz, 2014). By using a narrative, a picture, and a name, designers can easily get a vivid representation of the person in a persona. As a design methodology, the persona has been widely used in the field of design to help to understand users' needs, experiences, behaviors, and goals. In this way, participants are able to join the discussion from the same understanding of context and needs as experts.

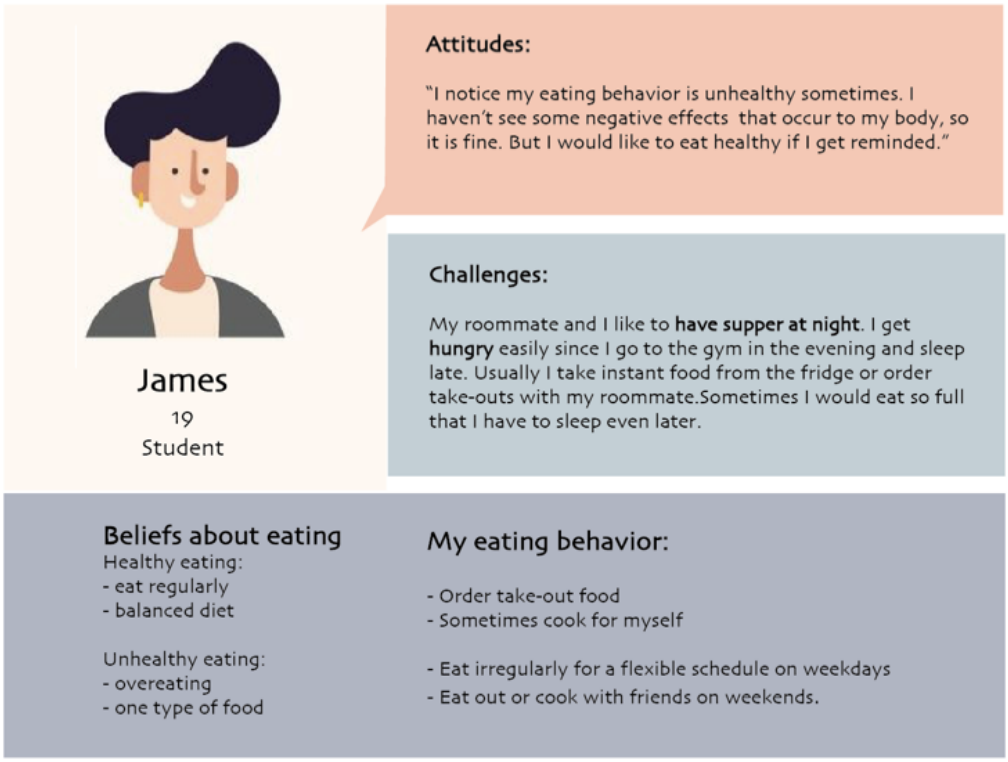


figure 5.2

Figure 5.2 is one persona of three hypothetical archetypical models that build on people's attitudes, feelings, and beliefs towards eating, behaviors of eating, and dilemmas that they usually face in daily life in the user research (Chapter 4). Short paragraphs of the challenges were described to show how the persona behaves in case of experiencing dilemmas. Some fictional details such as name, picture, and occupation help personas to be more concrete and effective for design (Cooper,1996). Since the participants of the user study were aged between 18 and 35, three personas created for the workshop aged 19, 24, 31, and their personas cover the information of similarly aged participants to the largest extent.

Explorative future use scenario

Explorative guidance could be an effective method to reduce participants' uncertainty about outcomes of the workshop and emphasize the links among the inputs (strategies, context, user/actor, goal) and outputs (concepts) in an ideal future scenario (Michailidou, 2017). By describing a possible (near) future use, participants can understand the goal of design is to promote healthy eating behaviors for the person at home. The following paragraph shows the interaction between a user and a new design in the context of the home.

Future scenario

Julian is a young girl who is in the process of conducting healthy eating. Although she noticed some bad sides of her eating behavior and really wanted to change into healthier behaviors, when she ..., she still struggled in the desire to get some snacks to eat. She thought, 'it's time to change my behavior.'

With this new approach, Julian can make healthy decisions more often. She is quite satisfied with her change in performance and gains more confidence in managing her desire and her long-term goal of health.

Julian still sometimes struggles when she is craving for food, but now this won't bring too many negative effects, because she knows how to deal with most of the struggles. This new way….. Therefore, she finds it easier to choose a health decision and concentrates less on unhealthy snacks. In the near future, she hopes she can reach more accomplishments in healthy eating.

In the description, the design is kept as a "black box" and the scenario is deployed to explore use. This exploration is based on the goal of the workshop and the assumptions of the designer. In the workshop, the scenario is used as a communication tool to help participants understand the goal and context of design. During the process of concept generation, the use of 'black box' is gradually developed into a more clear and specified design (Bijl-Brouwer, Voort,2013).

Step2: Brainstorming

The step of brainstorming aims at facilitating participants' imaginations and collecting a list of ideas and solutions that could implement strategies as many as possible. The process is divided into two parts: acknowledging strategy of behavior change and brainstorming them with sticky notes.

Strategy card

Strategies based on SCT and SE to support a behavioral change from behavioral, personal, and environmental aspects of the intervention were used during the workshop.

Intervention	Strategies	Common language with participants
Personal	Modeling	Follow a (modeling)person who is similar with me /I familiar with or approve on, to do the similar activities
	Mastery experience	(successful experience) if I manage it successfully one time, I can manage it more times
		(failure experience +modeling) if she/he can do it, why can't I ?
behavioral	Self-observation	I realize what I eat, how much I eat
	Goal setting	Show the informative, and visualized goal and corresponding feedback
	Feedback	
Environmental	Facilitating	Replace the unhealthy food with healthy food
		Prevent food exposed directly to my eyes
		Prevent eating all food at one time (control amount)
	Incentive motivation (rewards/punishments)	I can get some external rewards (e.g. gaining more entertainment) if I eat less unhealthy food.

table 5.1. The Strategies used in Design Workshop

As explained in Chapter 4, these strategies root in the analysis of 18 samples in the user research and especially work for the “home- case” scenario. To create an effective, understandable and friendly communication among participants of different backgrounds, complex definition each strategy is explained with plain language that can be easily scanned and recalled. Each strategy and its explanation were presented on separate cards to be presented to the participants of the workshop.

figure 5.3 Example of Strategy Card

On the other side of the strategy card, an example with a picture relating to the strategy is given for better understanding. Taking figure 5.3 as an example, “self-observation” refers to observing specific aspects of an individual's behavior consciously (Schunk, D. H. 1998). When it comes to eating behavior, it means a person realizing “what I eat and how much I eat” . An App for tracking behavior is a typical example of self- observation. All of the strategy cards are listed in appendix 4.

Brainstorming with sticky notes

After participants read the strategy and corresponding examples, everybody is given a pad of sticky notes in different colors. They are invited to write down one idea on each note by applying the strategy within a limited time. In case some participants are possibly discouraged by others' judgments, or feeling stressed and distracted (Acunzo, 2014), they should write individually and not worry about the implementation of an idea or whether it is innovative or distinct. The quantity of ideas is more important than the quality in

this exercise (Wilson, Saraiva, 2005). When time is called, each particepant posts his or her notes to the wall and shares ideas with the whole group. Discussion and comments are permitted at this time because people can be inspired by others and raise new ideas.

There are six strategy cards in total, and brainstorming is conducted on each card. To keep it efficient and effective, each round takes 2 minutes. Regarding timekeeping, the organizer gives a 30-second warning before the time is up. If everyone is still busy with writing, the organizer delays the warning accordingly. At the end of six rounds, there are loads of ideas.

Step 3: Visualization

This step focuses more on generating visual design concepts by applying or combining ideas from the first part in a home context. Participants can use the persona and future scenarios to help them formulate concepts.

Braindrawing

Braindrawing is one type of visual brainstorming method that involves sketching ideas quickly and presenting the results with other members in a short time (Wilson, Saraiva, 2005). After explaining the procedure for the session, each participant starts with a blank page to sketch concepts and write down some keywords for an explanation within the time allowed for the round. The participants are encouraged to focus more on drawing concepts down quickly instead of sketching skills. Then they are asked to pass the paper with sketches to the person beside them and use the other's drawings as inspiration for the next rounds. Before starting the subsequent round of drawing, some explanation of the concepts is allowed, in case some rough sketching could be too confusing to understand. Then the next round of braindrawing begins. It takes several rounds until the paper is returned to the original person.

By using this method, everyone can participate and contribute to the one concept of visual elements, which helps to combine ideas from everyone. In addition to the visual design, participants are welcomed to elaborate and refine the ideas that brainstorming of the first part may have missed.

Step 4: presentation & feedback

Evaluation and getting suggestions from participants is the goal of the last step. After the ideas and sketching are gathered, everyone raises the positive and negative points towards them and discusses the potential possibilities of these concepts. Some missing points uncovered in the former steps and the feedback to the workshop itself are also valuable information to the organizer.

5.2.2 Equipment

The workshop is held at a 6-person meeting room equipped with a whiteboard. Strategy cards printed in different colors and sticky notes in corresponding colors are prepared. Duplicate copies for three personas are printed in separate papers. Markers, colored pencils, erasers, and A4 & A3 papers are used for sketching. A phone is used by the organizer for taking the picture and video recording.

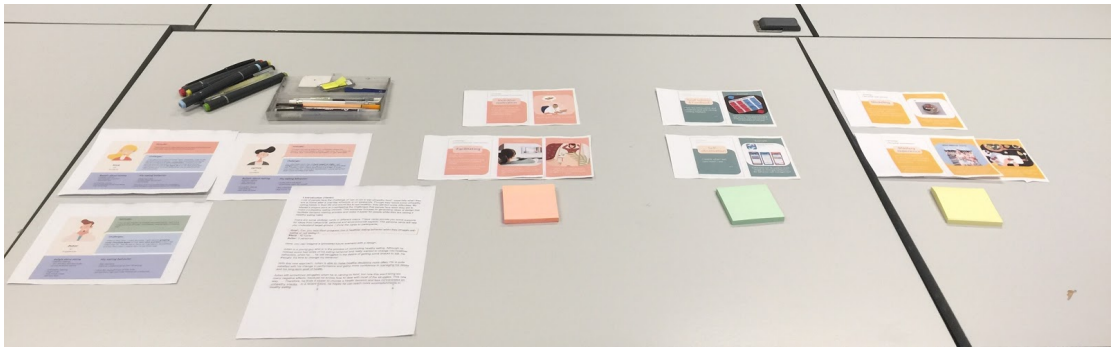


figure 5.4 Equipment

5.3 Outcomes and Reflection of The Workshop

5.3.1 Outcomes from Brainstorming

In the step of ideation, the participants raised 22 innovative ideas into personal, environmental, and behavioral aspects (figure 5.5) and design suggestions in the brainstorming process.

figure 5.5 Outcomes of brainstorming

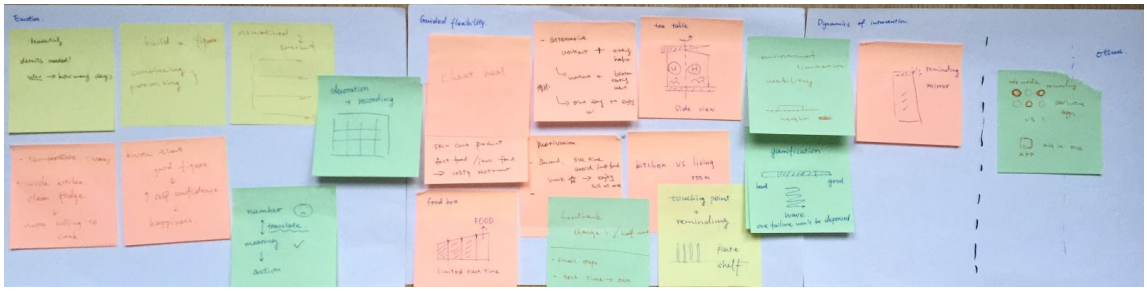


figure 5.5 Arranged sticky notes

To make it clear for idea evaluation and concept generation, ideas are categorized again by referring to the three intervention directions that were initially framed: guided flexibility and dynamics of interventions, and emotional gains and losses.

1) Guided flexibility

The consideration of guided flexibility majorly reflects on shaping people's behavior through functional intervention in usage. Usually, it is difficult for people to get rid of all the unhealthy eating behavior at one time. Reserving some space for them to make unhealthy decisions could be an option. For example, limiting the amount of unhealthy food each time (figure 5.7), or setting gradual sound reminding. As figure 5.8 shows, with the increasing times that a person gets snacks within one day, the reminding sound turns from soft and smooth sounds to unpleasant and eventually jarring sounds, so as to remind people to limit

the frequency of taking food. But reminding could be disturbing sometimes, and people will get bored easily with regular and monotonous reminding or feedback. Thus the interactive should be easily updated and adapted to the shifting of different behavioral stages.

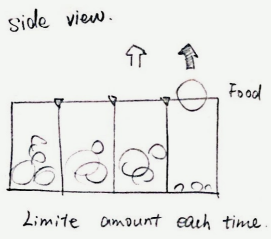


figure 5.7

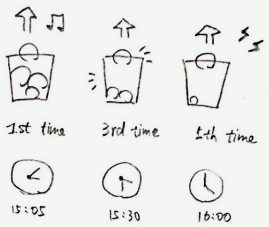


figure 5.8

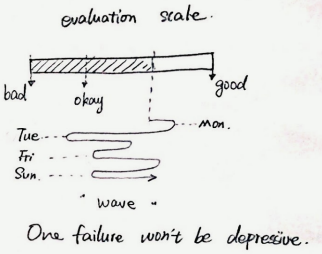


figure 5.9

In addition, visualizing the feedback to each small step enables users to know how far they have gone and how far they would go, which would lead to self-observation. For example (figure 5.9), a scale that can reflect an average evaluation of long-term behavior according to people's healthy/unhealthy decision always waves in a certain range.

2) Dynamics of interventions

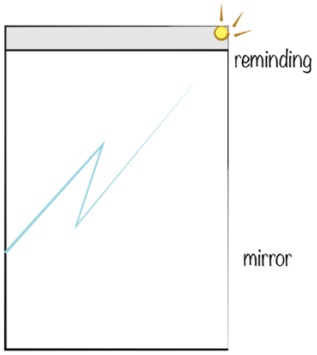


figure 5.10

The beginner user and senior user behave differently, and the beginner will eventually become a senior user. Thus, both how design could adapt to the behavior change happening on the user and how the design covers the diverse users of a different stage of change need to be considered. Concerning the sustainability of design, the usability of the product needs to be reserved, even though people have generalized healthy eating habits or progressed through the stage. For example, an interactive mirror of the whole body (figure 5.10) can encourage people if they become slim. When they go through the stage, it can remind people if they become too fat, to avoid them returning to their old eating habits.

3) Emotional gains and losses

Except for creating aesthetically delighting and functional connections between users and the objects they use, designing for a user's emotional journey contributes to creating a positive experience for the user. For users, understanding the meaning behind the calories is more motivated than the number itself in

changing their behaviors. An appropriate way of showing the meaning behind the data helps to elicit positive emotions.

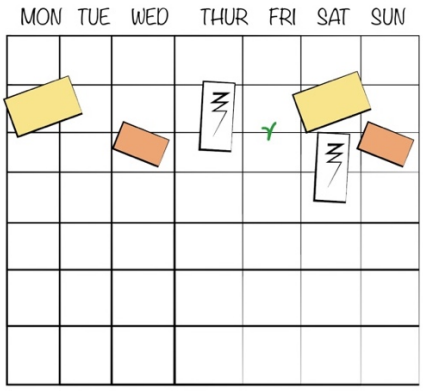


figure 5.11

Additionally, providing guidance in a way of storytelling could be persuasive among the young generation, for example personal vlogs of sharing experience and lifestyle or a picture board (figure 5.11) that people can put relevant photos,recipes,shopping lists on if the healthy decision brings them a sense of achievement.

5.3.2 Outcomes from Visualization

In the session of visualization, participants built up ideas on each other and eventually came up with three concepts, which are “a fridge with mirror”, “snacks box” and “digital decorative painting”. Because they are all rough sketching and incomplete, they are collected and further developed as follow illustrations. Similarly, these three concepts are relevantly categorized again by three directions and refers to various strategies.

Concept 1 Guided flexibility-fridge with mirror

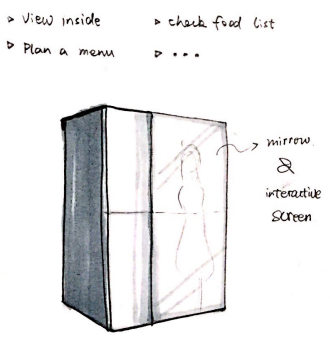


figure 5.12

figure 5.13

The refrigerator that everyone uses for food storage at home is a touchpoint for the daily usage of most people, which creates opportunities for building interactions. The whole-body mirror attached to the fridge is a touchscreen interface that builds connections between food and user and helps users make a personal plan in the long term accordingly. Before the user picks up food from the fridge, it can provide

user recipes suggestions according to the food inside by observing through the internal camera so as to guild the user to make a healthy choice rather than just eating mindlessly. Meanwhile, looking in the mirror is regarded as a way of self-observation.

However, a similar concept has been realized by the latest smart refrigerator (figure 5.13) which is even more superior. Connecting to the internet through Wi-Fi, the smart refrigerator is a functional and fun tool that can keep track of food inside, create shopping lists, play video, post photos, and many additional features. Therefore, the focus of the concept shifts from designing a refrigerator with an interactive mirror to designing interventions applied to an interface.

interventions on interface :modeling, goal setting & feedback

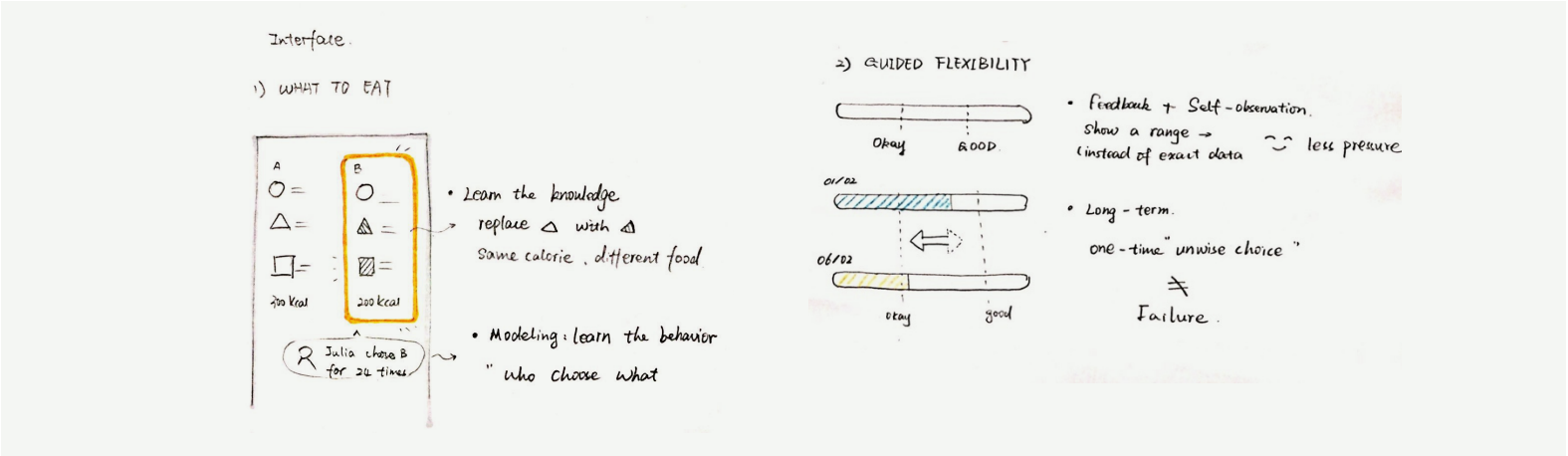


figure 5.14 interface of concept 1

When a user is provided with suggestions of food, the healthier one is highlighted together with the sentence, such as “Julia chooses ‘menu B’ 24 times.” “Julia” here is a model the user approves of and familiar with, ‘menu B’ represents the model's decision of behavior and “24 times” shows the high frequency of healthy eating. The decision that an approved person always makes could be more persuasive to users, especially when they hesitate between two choices. As for the option itself, it could be the menus of the same calories but consists of different ingredients. In the ‘menu B,’ some ingredients in the ‘menu A’ are replaced with healthier ones, which could be subliminally educative to the user.

After the user makes a decision, there is a range bar to show how the user makes a choice in recent days. The system records the user’s choices each time, and the bar reflects a general evaluation. Rather than judging a user's behavior of one-time choice and giving positive/negative feedback directly, this way provides space for the user to perform better and make unwise decisions sometimes. The users will be less likely to give up halfway or totally depressed and stressed because of one-time behavior; instead, they could start to think about their behaviors in the long run. Generally, it could post a positive influence on long-term self-observation.

Evaluation

Interactive and intelligent appliances is a potential region of design for future life, however, considering the high expense of the refrigerator with a built-in interface at the current market, the necessity of its usage

for healthy eating among a wide range of people remains uncertain. An attached and light device with interactive functions is a more possible option welcomed by normal people in daily life.

Concept 2 Guided flexibility-snacks box

A snack box that divides space into two small boxes individually for healthy food and unhealthy food. When the user opens the snack box, the small box for healthy food jumps out and catches more attention of the user, to persuade the user to choose healthy food. This concept is the first output(figure 5.15) from the workshop, and then it is further developed afterward.

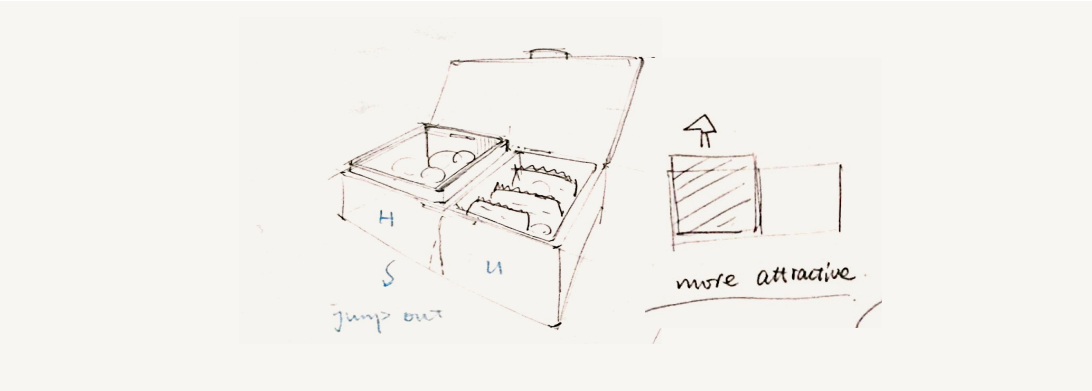


figure 5.15

Intervention on product: facilitating ,Self-observation

Normally, it is difficult for a person to totally change all his/her eating diet immediately even though the person has the intention of adopting a healthier eating habit. In other words, this is long-term self-regulation, proceeding step by step. A big transparent snack box consisting of three kinds of sub-boxes helps users to go through the process.

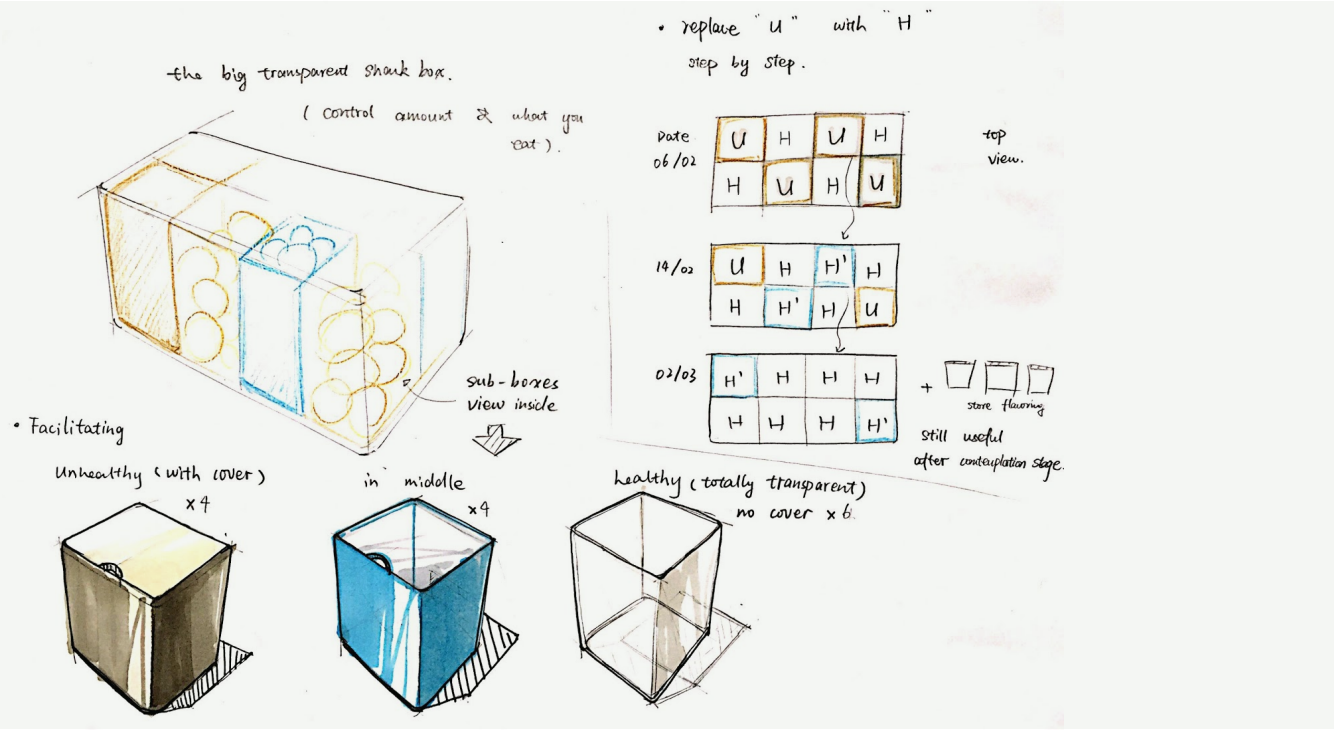


figure 5.16 concept 2

Shown in figure 5.16, an opaque box with cover is for unhealthy food, while the transparent box without cover is for healthy food. Some food that can substitute unhealthy snacks is saved in an opaque box without cover for the transition period. When a user wants to eat snacks and open the big box, healthy snacks come in the user's eyes directly, which means healthy snacks are the most obvious and attractive. If the user still feels struggling, substitute snacks could be a second choice. If the user really wants to and eventually decides to take unhealthy snacks, he/she has to take some efforts to open the cover of the sub-box.

By setting different degrees of accessibility to various snacks, users' behaviors are guided unconsciously. As the days go by, the user can replace a box for unhealthy snacks with a box for transition, and then replace it with the box for healthy snacks, according to their own pace of behavior change. In addition, there is enough freedom for users to define unhealthy/healthy snacks on their own. The unhealthy snacks are not necessarily real unhealthy food; instead, they could be the food that users are addicted to and can't get rid of within the short term. Because healthy eating is not merely about what people eat, but also about how much they eat.

Evaluation

This kind of method actively implicates the user to regulate and evaluate their own behavior and dynamically adapt to changes when they progress through a behavior change process. After the user goes through the contemplation stage and raises a healthy habit, the sub-boxes for unhealthy snacks are still sustainable for use, such as storing flavoring or tea bags. Besides the point of guiding users' behavior, some more elements like educational knowledge of food and emotional caring could be involved.

Concept 3 Emotional gains and loses - digital decorative painting

The third concept is about connection and coordination among a food box for sensing weight, a smartphone for evaluating, and a digital decoration painting for feedback.

figure 5.17 concept3

The painting, smartphone, and food box are connected with Bluetooth and the internet. The food box is divided into a healthy zone and an unhealthy storage zone with a parting slip. With a weight sensor on the bottom of the food box, the decreasing weight of each zone can be tested out when the user takes food out of the box. The content of the digital wall painting changes consistently according to signals from the food box.

Interventions: self-observation, goal & feedback

The painting, smartphone, and food box are connected with Bluetooth and the internet. The food box is divided into a healthy zone and an unhealthy storage zone with a parting slip. With a weight sensor on the bottom of the food box, the decreasing weight of each zone can be tested out when the user takes food out of the box. The content of the digital wall painting changes consistently according to signals from the food box.

Sometimes people eat between-meal food unconsciously because of boredom, relaxation, habit or starving. When they notice their behavior and feel full, they have overeaten. The digital picture plays the role of reminding and helping users to observe their eating behavior. If the box senses the weight decreases rapidly within several hours, which means a large amount of food is consumed in a short time, the painting will change and convey the user an unpleasant feeling, for example, leaves fall down. If the food is consumed within a certain amount, or they chose to eat the food in a healthy zone, the painting still shows a pleasant feeling, for example, flowers bloom. Because the painting is usually a conspicuous eyepoint at home and can hang on any room, people can be quickly conscious of their behavior.

An app on the smartphone can provide more assistant information such as the amount of food consumption, trends of weeks and months, and some personal settings, including the style of the picture, personal goals, and shopping list. If food is consumed in a reasonable amount for several days like goal-setting, users are able to unlock a new series style of painting. This painting can be saved in a local album, set as a table wall on a smartphone, and shown on the digital screen.

Evaluation

The concept focuses on caring for emotional gains and loss by presenting feedback gently and artistically. Introducing ideas of gamification, such as setting goals and unlocking unknown paintings, is to increase the interests of the healthy eating process. However, the coordination among three products and the complexity of understanding the system would bring inconvenience to users in usage, which deviates from the original goal of “promoting healthy eating”. The balance between function and fun needs to be carefully weighed again.

5.5 Conclusion

Various techniques aimed at stimulating innovations and generating ideas were applied in the workshop. For the time control, it takes a longer time(almost 100 minutes) than it planned. In the first session of brainstorming, participants are very willing to share their personal experiences in free discussion after each round. For one thing, the topic of healthy eating could strike a chord among people. Nevertheless, discussions without too many limitations consume lots of time. Some ideas are inspiring and contributing, but too often, a conversation can go unfocused. The organizer needs to strike a balance between freedom and constraints, get participants on the same page, and move the progress forward.

In the session of brain drawing, a group of five to twelve participants is ideal for collecting ideas, but only three participants joined in. In the discussion, everyone agreed that the goal needs to narrow down. Because designing for breakfast, lunch, or dinner and designing for between-meal snacks are quite different in clarifying people's motivation and action, specifying what kind of eating behavior is necessary.

Referring to the result of the user research, the majority of people are more likely to face the dilemma of whether to eat something between meals when they stay at home. Healthy eating is not only about what people eat, but how much they eat. Storing some food, no matter fruit, drinks, biscuits, or junk food at home, is usual for most people. Controlling the frequency of taking an unhealthy diet and the amount of food are pain points in eating behavior. Considering both the diffusion among the potential target group and the feasibility of the concept, the direction of concept 2 seems more promising. In the next step, how to promote people at home to make a healthier choice when they struggle with eating or not eating snacks between meals is the focus to look into and design.

Chapter 6 .

Development of Final Concept and Evaluation

In this chapter, the concept development phase is presented. It starts with a literature review about the study on snacking behavior, then comes to the analysis of existing products on the current market and presents feedback from a prototype test of the initial concept. Built on that, the final concept named “the SnackBox” is further developed and more details of usage are introduced. In the end, an evaluation that tests to which extent the design matching the theoretical framework is illustrated.

6.1 Snacking Behavior

Snacking is usually defined as eating and drinking between meals(Smith & Rogers,2014). A number of researches suggest hunger, food location, social/food culture and environment, distracted eating, and hedonic eating are several common motivations to snack (Hess, J.M., et al.,2016). And the results of user research prove this through factors such as starving, exposure to food, nothing to do with hands, wanting more relaxation, etc. And as mentioned in the results of user research, emotion is the main factor motivating them to intake food. Usually, when people experience negative emotions(i.e. pressures, injuries outside of work) unhealthy snacks like crisps, chocolate, and biscuits are known as common choices for people(Chaplin, K et al. 2011). Even some people depend on chocolate to increase their moods (Schuman, M., et al., 1987). However, the unhealthy snacks that are normally known as what can bring people happiness seem not the best choice. A between-subjects intervention study among 100 university students shows that compared with crisps/chocolate, eating fruit has more positive effects on mental health(Smith & Rogers, 2014). And a daily diary study also mentions that consumption of fruit/vegetables can increase wellbeing(life satisfaction and happiness)and have a better mood (White, B.A., et al.,2013; Blanchflower, D., et al.,2013)

Plus, in regard to healthy snack choices, people’s intentions and behavior are not always consistent. Almost a quarter of people with the intention of choosing healthy snacks can also choose unhealthy snacks in action(Weijzenab.P.L.G. et al.,2007). Therefore, no matter for physical wellbeing or mental health, the consumption of healthy food in snacking has a positive effect on individuals in the long run. The design of intervention is necessarily wanted for the people who merely have intentions at an early stage of behavior change.

6.2 Research of Current Products on Market

The aim of the research of current products is to investigate what kind of products about snacking and healthy eating are popularized and accepted by the user in the current market and tries to find out if there is any blank on market for the design of "SnackBox".

figure 6.1

figure 6.2

The first category (figure 6.1) of product is multifunctional food containers. A big container divided into several sections offers users the freedom to customize their meals and keep your sweets, nuts or biscuits separate. There are various types of containers for various preferences. Some of them are for home or party use, some equipped with clipped lids keep food clean and dry, and some consist of several removable snack containers for portable use.

The second category(figure 6.2) of typical products is designed for a healthy meal. 7 colour-coded containers are used to help people to portion out exactly the right amount of food for each meal. Each container is colored to correspond to an essential food and macronutrient group and sized to deliver appropriate amounts of food. The user doesn't need to count calories but can be still clear about the amount.

In general, in the current market, though there are various types of snack containers to satisfy people's daily use, products with the intervention focusing on snacks remain missing. The intervention of healthy eating lies more in formal meals. The snacks box for healthy eating has the possibility to fill the missing market in the future to some degree. Therefore, in the following lines, the user testing of appropriateness of an initial idea is presented.

6.3 User Testing of the Initial Idea

Before delivering a concrete product design, initial idea testing is employed to inquire into the appropriateness of the possible usage. Through experiencing a full-size prototype, potential users can get a feel of dimensions and have quick explorations of future use practice, so that the designer gathers insights and product improvements during the stage of concept development.

figure 6.3

figure 6.4

Following concept 2 mentioned in chapter5, the intended product provides a gradual and flexible solution for changing the habit of eating unhealthy snacks to healthy snacks. The low-fi prototype (figure 6.3) consists of six approximate 8cm*8cm*12cm containers and a wooden plate that holds the containers. In the beginning, these containers are divided into two containers with an opaque cover for unhealthy snacks like butter cookies, two containers with transparent cover for transition, in which some food can replace really unhealthy snacks, and two totally transparent containers and cover for healthy food, like strawberries. Considering the recyclable usage of material, the original six containers are all transparent. By sticking a paper with various patterns attached to the container, different types of containers are distinguished. The figure 6.4 shows the full process of usage. The containers for the unhealthy snacks are firstly replaced by containers for transmitting and eventually, all containers are for healthy snacks.

In the testing, six students from UT are interviewed randomly about what they think about the concept. From their feedback and suggestion, the discussion lays on two points. The first one is how to ensure the uniqueness of the design and distinguish it from other food containers on the market. Because making a combination of several containers and changing the different types of containers during the behavioral changing process can be easily realized by a user's DIY, which means this product is substitutable. The second point is about convenience in usage. Though each individual container in this system provides users flexibility in a way, the total amount of these containers is too many. Because the system allows

for six containers in usage at the same time, and once a container is replaced by another type of container, the old one will not be used anymore, which is not sustainable enough. Therefore, the number of containers should be cut down.

6.4 Concept Development

Combining the analysis of current products and feedback of the prototype test, some details of the concept are clarified. From the functionality of the design itself, the product should be safe and firm to meet the frequency of daily use. The style and appearance of the design are appropriate to the home context. They are removable and without very sharp edges, so the user can remove the whole set of products easily or hold a single product in hand. From the aspect of the interaction between the user and the product, it should be understandable and communicative. Users can easily understand how to use the product with simple instructions, and the product could provide comprehensible results to respond to the user's actions through audio or visual effects. In the long-run usage, the design would properly fit in the development process of the whole contemplation stage and supply flexibility and scalable space to a certain extent in practice. Based on what mentioned above, a number of sketches contribute to formulating the final concept, which are shown in the appendix 6.

6.5 Final Concept

Based on stage-matched health intervention, the final design (figure 6.5) named “SnackBox” is a set of smart snack containers to promote people to choose to eat more healthy snacks at home. The interventions circle around guided flexibility, emotional gains and loss and dynamic in the process of changing eating behaviors.

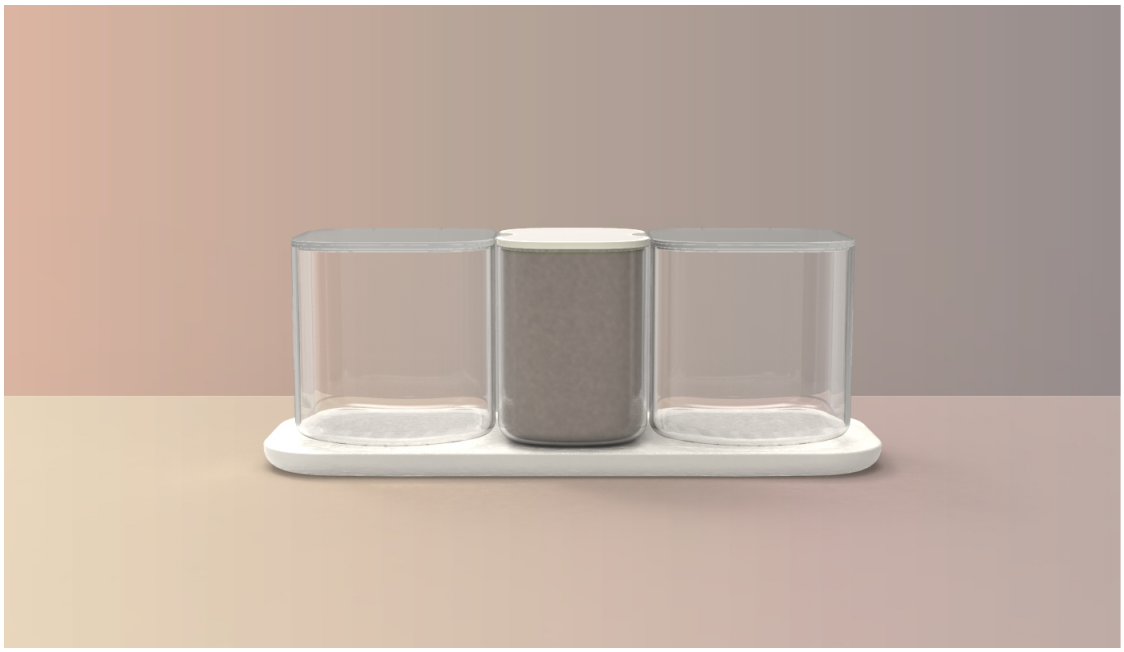


figure 6.5 final concept

6.5.1 Product description

As can be seen in exploded view (figure 6.6) and parts of the containers (figure 6.7), this set of products consist of a pallet holding the containers, two approximate 1000ml transparent containers for storing healthy snacks, one approximate 700ml container with an interactive screen and a division kit for unhealthy snacks; a set of intersections that insert in the kit, and an USB charging wire.

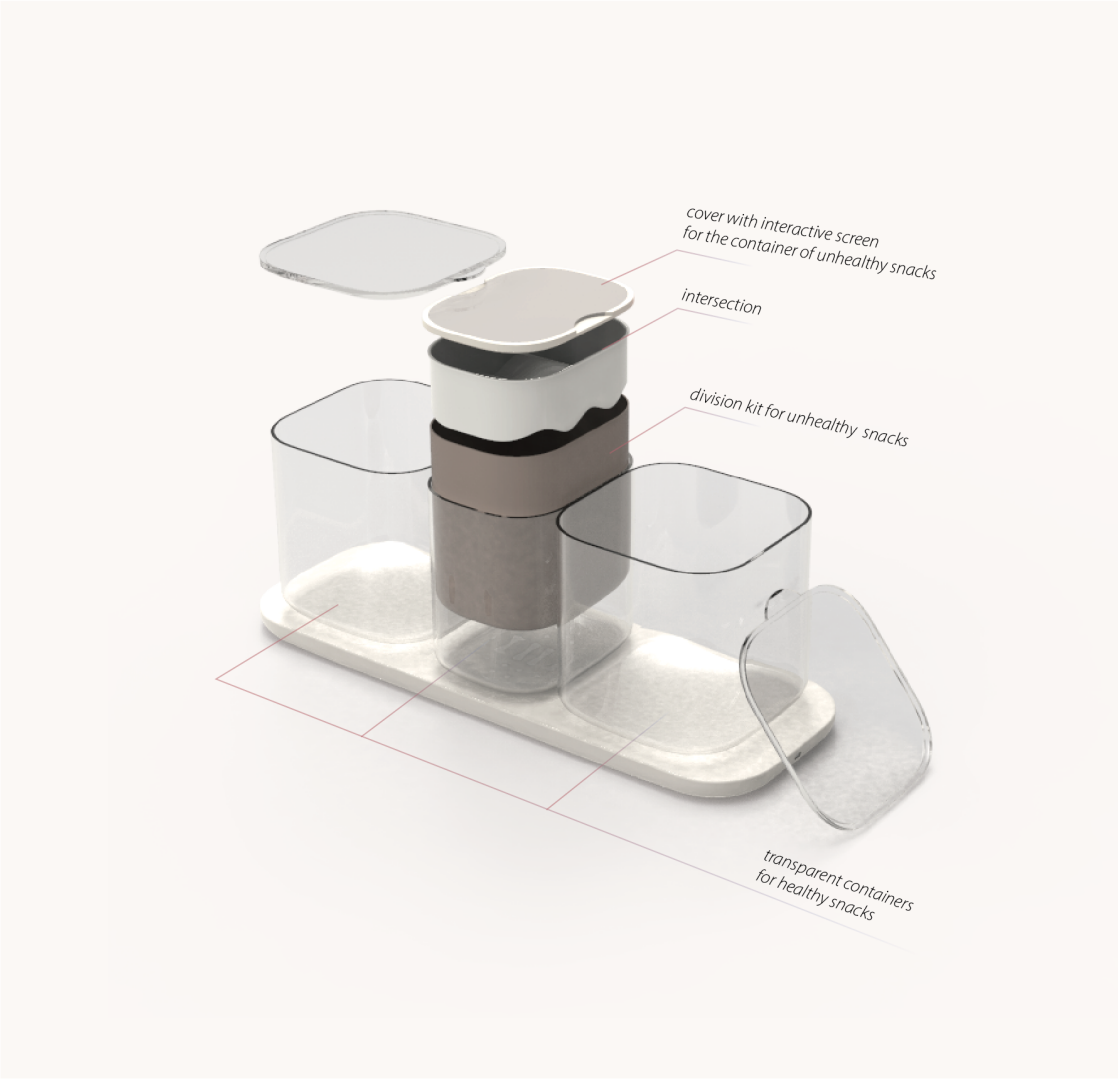


figure 6.6 exploded view

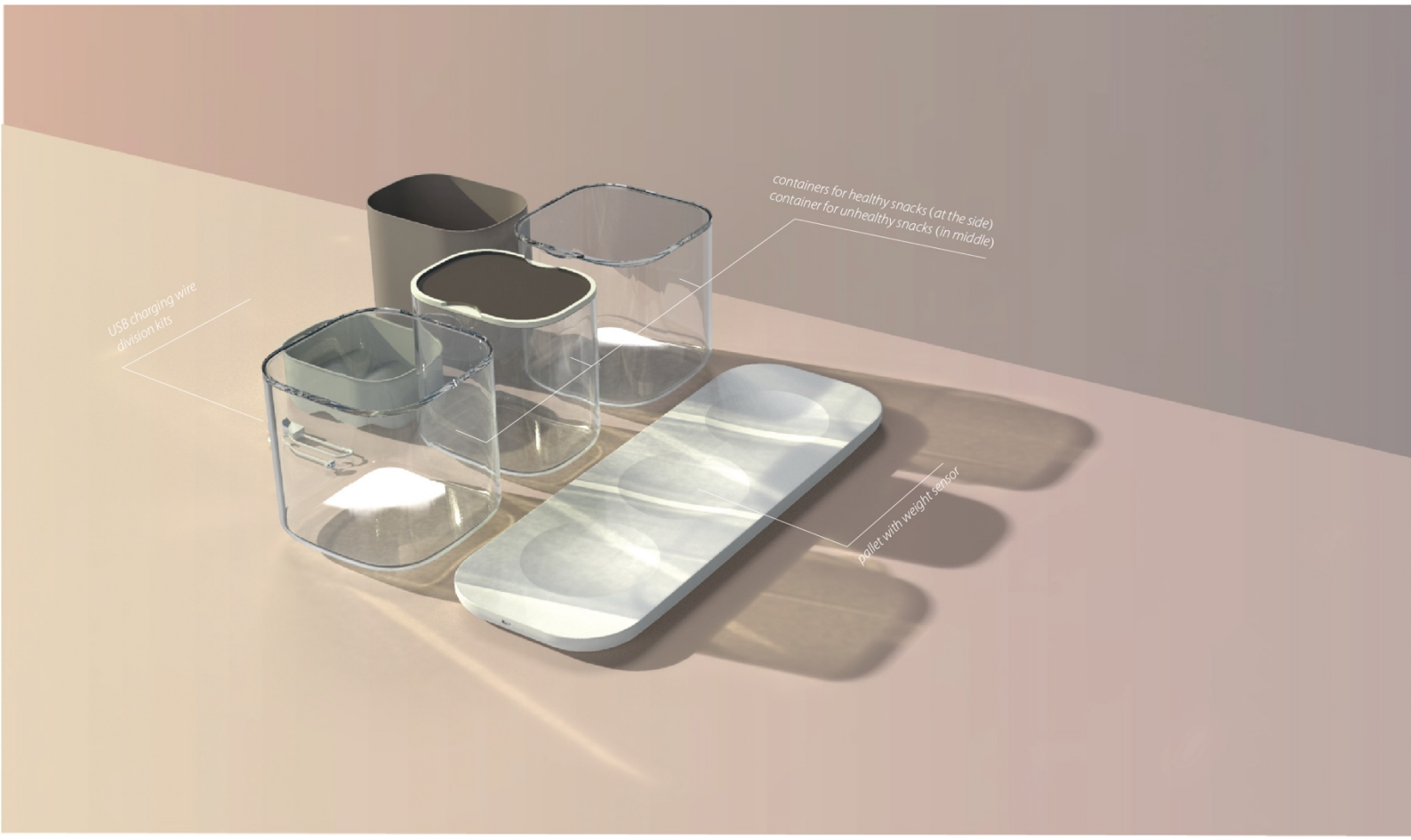


figure 6.7 parts

In the size of 370mm*130mm, the pallet is easy for the user to hold in hand and remove it. The sound holes and power button are on the side (figure 6.8,6.9).

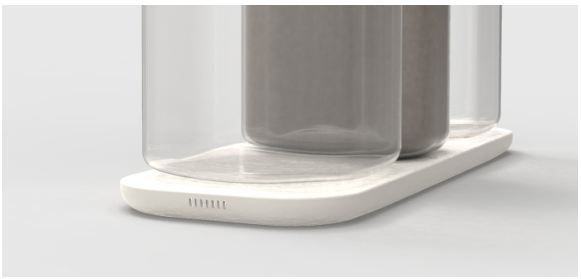


figure 6.8 sound holes

figure 6.9 usb socket & power button

Three containers adopt a very common size of the normal fresh container in daily use. With 120mm height, length and width of each container for healthy food, it can store most fruits such as apple, orange, and snack cucumbers ,individually packaged food like cereal bars, yoghurt, and food on drought like nuts etc., which provides enough freedom for users to define healthy snacks for themselves. The container in between in a smaller size is used for unhealthy snacks that users feel difficult to get rid of, to cut down the amount of consumption of unhealthy food.

The engineering drawings of each component with an accurate size are displayed in the appendix 7.

6.5.2 Materials

The container, kit and intersections are all made of Polypropylene(PP) which is a thermoplastic polymer prized for its resistance to heat and fatigue (constant bending), strength, toughness, and good moisture barrier. It is approved for food contact. Additionally, because of its high melting point within a range(130°C ~171 °C), it is suitable for food packaging, containers that can be easily cleaned in dishwashers and used in microwave ovens. It is naturally translucent and can also be made opaque or a different color when it is manufactured. In regards to food safety in usage, and meeting requirements of the product design including various colors, shaping, clear and sparkling effect on surface, polypropylene is an ideal material.

6.5.3 Product Usage

Figure 6.10 illustrates the visual effect of two types of containers in which healthy food is known as the best choice for users and unhealthy food makes users feel hard to get rid of within a short term. When people would like to eat something but not in the meal time, they can immediately see the fresh and colorful healthy food, while unhealthy snacks are completely stored in an opaque container of a plain color. This visually removes people's focus from unhealthy food to healthy food when they feel tempted by the unhealthy food they like.

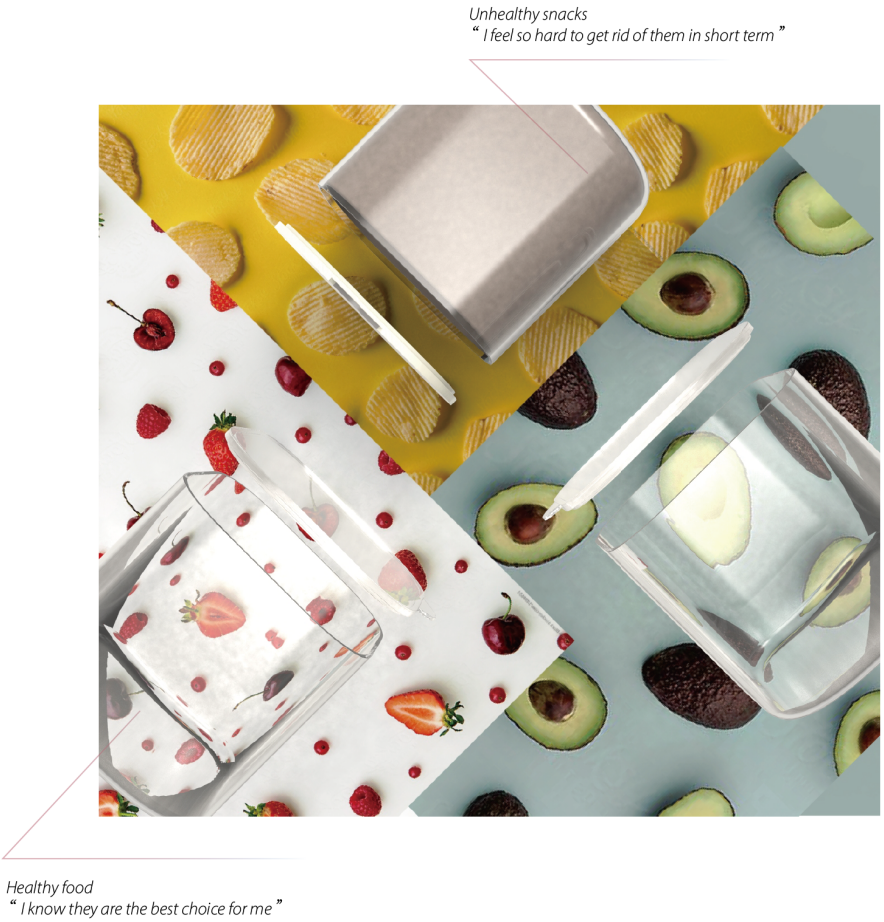


figure 6.10

figure 6.11

If users would still like to get some unhealthy food, they have to take more steps to serve the purpose. Since the covers of both sides are designed to lay on the cover of the middle container, the users have to remove the cover of the container of healthy snacks at the first step (figure 6.11). The more times of opening containers for healthy snacks means the more often triggering the intention to take healthy food. Because removing the cover of the container and seeing healthy food inside already hints a potential choice that getting healthy snacks takes less effort. When sensing the pressure of covers on both sides is removed , the interactive screen shows animative effects of obvious guidance and the pallet produces vibration sound at the same time to remind users.

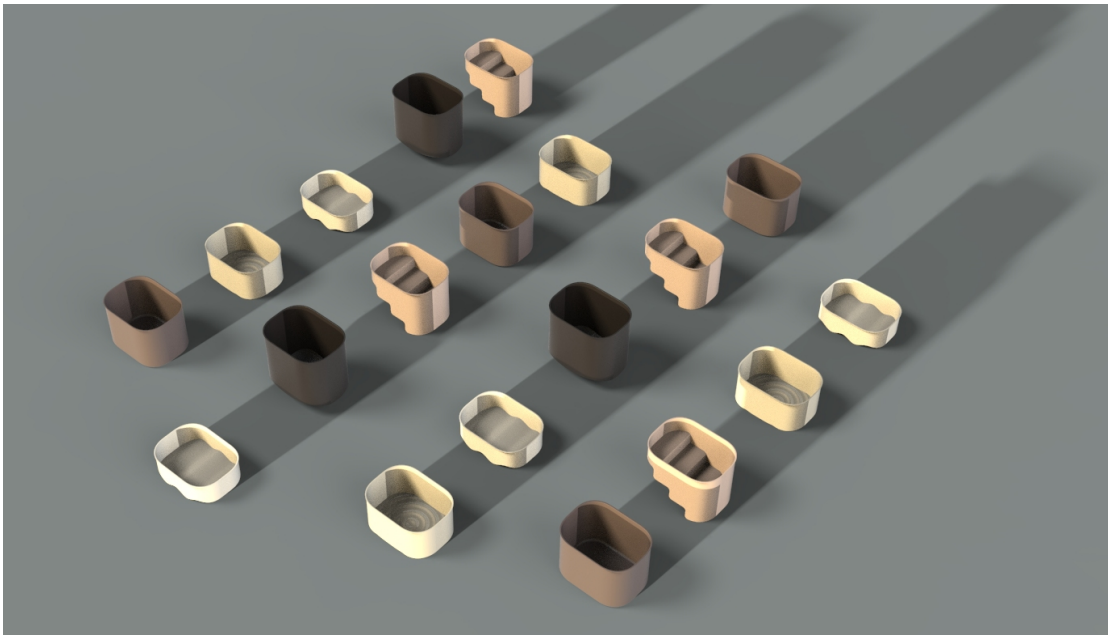


figure 6.12

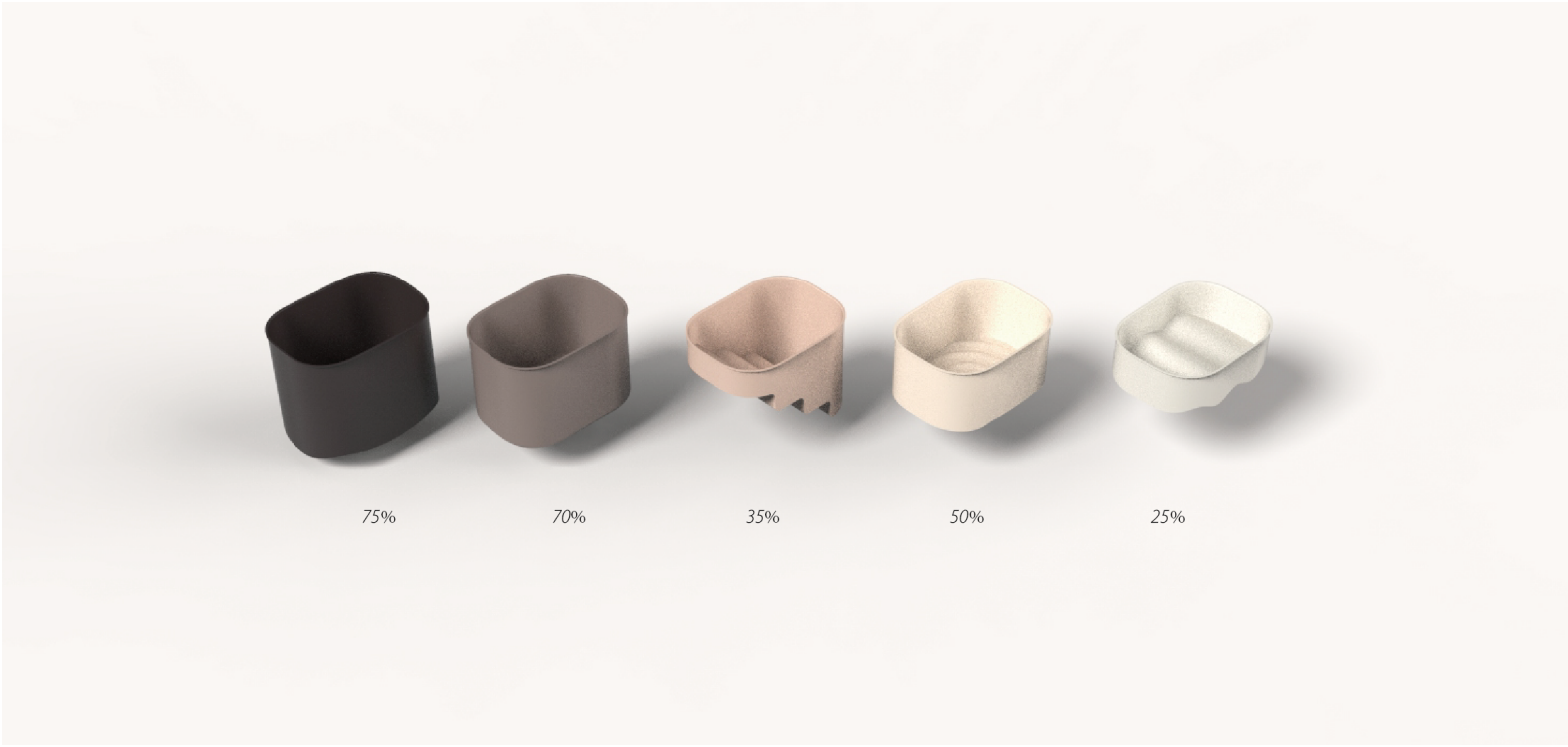


figure 6.13

When people get used to controlling a certain amount of unhealthy snacks, they need to move on to the next step of decreasing the intake on a current basis. A set of intersections(figure 6.12) are designed. The user inserts it in the kit of unhealthy snacks and the container is divided into usable volume above the intersection and hollow space below the intersection. Each intersection(figure 6.13) is various in color and shape, to add more novelty in usage and stimulate users' intention of changing a new intersection. Additionally, evidence shows that based on vision alone, darker objects appear to be of larger weight, while lighter objects are judged to be lighter (Walker,.et.al.2010). Thus the color of the intersection of smaller size is designed to be lighter. In this way, the users can feel the difference between each progress that they make and feel getting closer to the goal of eating less unhealthy food.

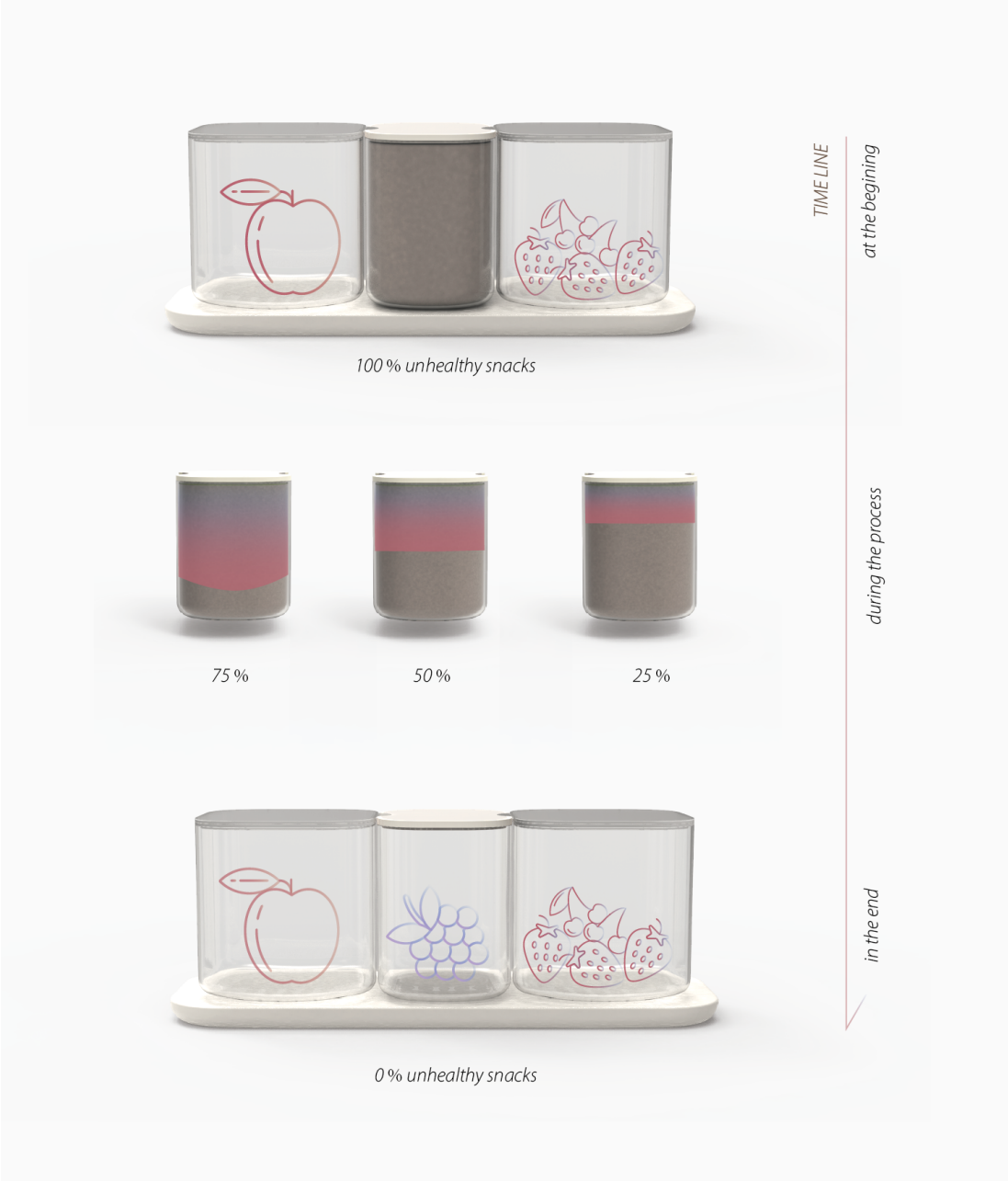


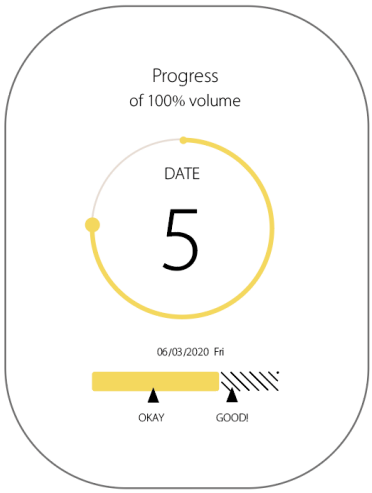
figure 6.14

Figure 6.14 illustrates the whole process. In the beginning, a 100% volume of the container in the middle can be used as storage. When users feel like promoting their changes more, they can insert an intersection to cut down the available volume to 75%,50%, then 25%. And eventually, the kit and interaction are all removed, the container is totally used for healthy snacks.

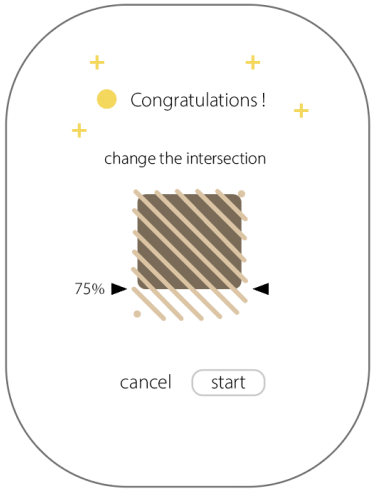
Considering individuals' diversities in the acceptance of changes in volume, two groups of combinations are suggested: cut down ¼ of the original volume(75%-50%-25%) or cut down ⅓ of the original volume (70%-35%) each time. Users are also absolutely free to select any intersections to make the combinations that fit themselves.

6.4.4 Interface

Interactive screen majorly plays a role in reacting to users' behavior ,producing instant feedback and supply guiding in the whole process of behavioral change.



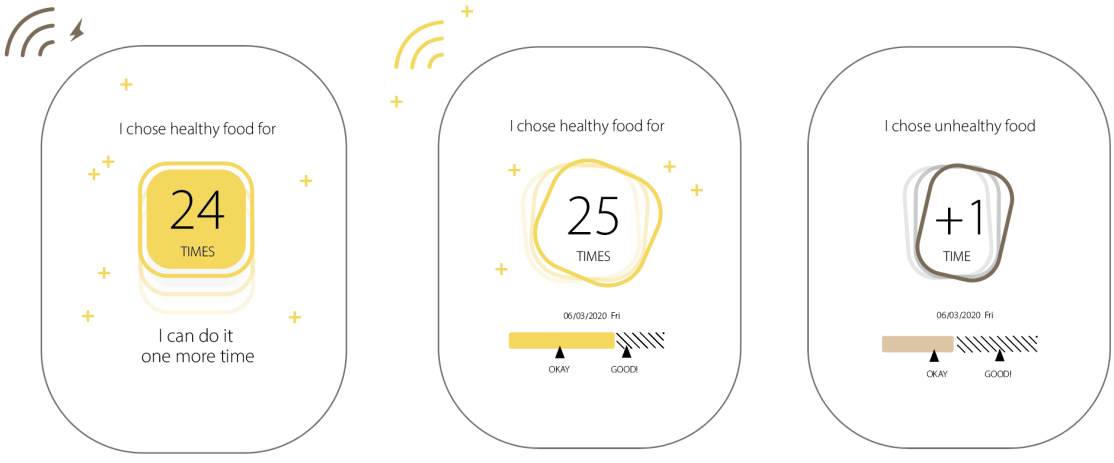
self observation
inculding a long term evaluaton and daily/weekly evaluation



dynamic guiding
go a step further and control more on unhealthy food

Figure 6.15 figure 6.16

Normally the user starts by using the full space of the container . The home page (figure 6.15) usually displays a progress circle based on how users behave on the performance of eating snacks since the user has started to use the product. Only when the user progresses through a whole circle, they can move to the next step. Below the progress circle is a bar reflecting a daily average evaluation of the frequency and amount of food consumption. After the user is accustomed to current eating behavior for some days, the user will be invited to make further efforts on eating less unhealthy food and change an intersection in a smaller volume. In the figure 6.16, the user could decide whether to move on to the next step.



masters experience
by reminding past achievements to improve user's self-efficay

get healthy food

get unhealthy food

feedbacks
every time user takes out food, it provides feedback and evaluation within a day

figure 6.17

As mentioned in the former section and figure 6.17 shown, when the user tries to get unhealthy food, the icon constantly jumps together with sparking and vibration sound, to attract users' attention back to healthy food. The words emphasize the user's past achievement as an intervention of mastery experience. After the user gets some food, the sensor on the pallet feels it, and the screen shows the feedback corresponds to what kind of food the user chooses. The feedback on choosing healthy food is absolutely more positive. The screen shows the accumulated number of times of choosing healthy food, in order to build up some confidence for the user. And the pleasing sound is played to enhance the effect of accomplishment and cover the emotional loss of dissatisfaction owing to missing the snack the user likes. If the user chooses unhealthy food, the counting number is shown as "+1 time" to remind them they make an unwise choice. The accumulated counting of unhealthy choices won't be shown, to prevent users from arising too much negative emotion like disappointment and guilt.

Expanding function

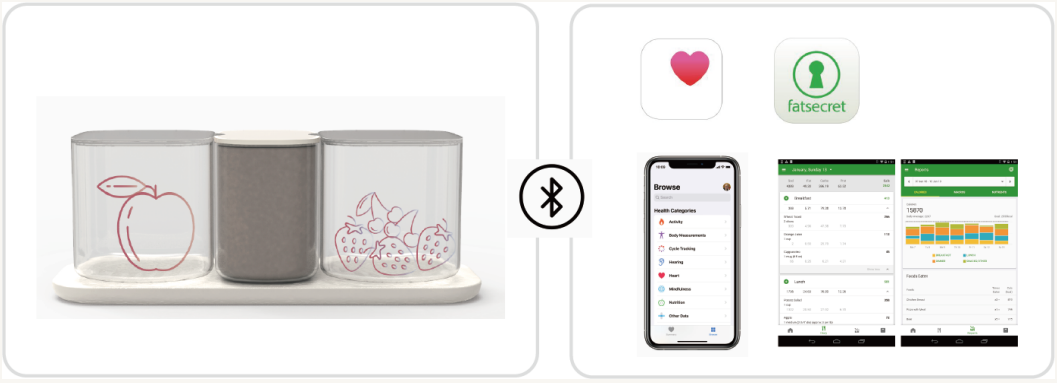


figure 6.18

The product can not only be used alone to react to the user's action but also cooperate with other products to expand its functionality. By way of Bluetooth, it connects to APPs on the smartphone which can track personal diet and provides more data support for APPs that are used for counting calories and providing corresponding eating suggestions and knowledge of healthy eating. In this way, users can store an array of data of diet and sort through it with ease. Through refined self-evaluation and accumulated consciousness of eating behavior, users could gradually get ready for moving to the next stage, the preparation stage.

6.5.5 Target Group

The starting point of the design lies in the people at the contemplation stage and helps them to progress through this stage. After going through the precontemplation stage, people usually have raised some basic consciousness of healthy eating and experienced some negative emotions from unhealthy behavioral risks. They may have tried to change a number of times, but still are not confident about their abilities to change(Prochaska, J. O., et al. 2005). So, these people who are at the contemplation stage are often characterized as having the intention of healthy eating and acknowledging the pros and cons of changing the behavior. Since their determination of taking action is still not strong enough, they can be easily waving between healthy and unhealthy choices, especially when they face the temptations from

environmental factors like exposing themselves to snacks, staying alone and lack of emotional support at home.

Consequently, the design focuses on motivating the target group to make more healthy choices and lessening the possibility of being tempted, so as to ease the situation of behavioral procrastination and hesitating. Though emphasizing the importance of healthy eating and strengthening consciousness are still necessarily required, these can be realized by relating other assistant products as additional functions. It's worth mentioning that the products are not recommended to the persons who either don't have any intentions of healthy eating or have already made a modification in their eating habits. Because in TTM, the efficacy of interventions is functioned and maximized under the condition that specific processes are stressed at specific stages.

6.5.6 Final Scenario

In the previous chapters, scenarios are deployed to explore the use and used as a communication tool. Here, the final scenario(figure 6.19) reflects possible actual future product use.

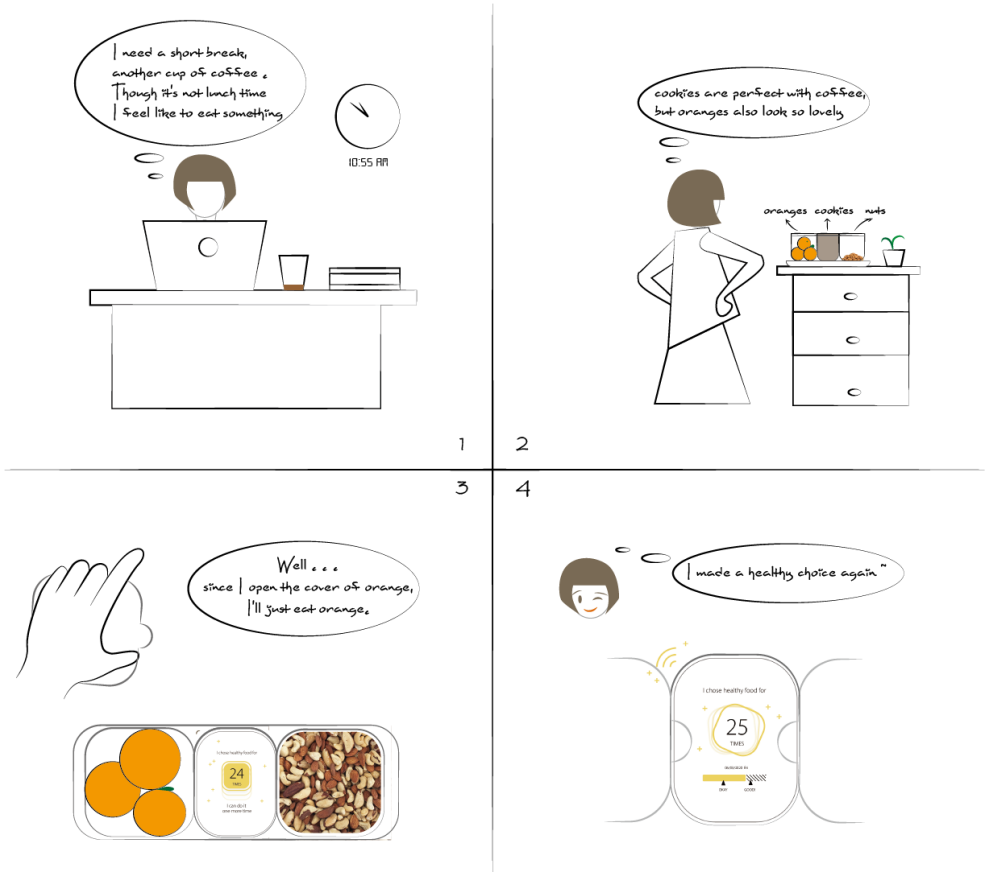


figure 6.19 storyboard of final scenario

Lisa works at home these days. She usually starts to work at 9:00 a.m with a cup of coffee. Feeling a little bit tired at 10:55, she decides to take a short break. She wants to eat something but it is not lunchtime. So she walks to the kitchen to get another cup of coffee and eat some snacks. She has a glimpse of snack containers, the oranges she bought yesterday look fresh and lovely. But she also thinks that coffee goes better with sweet cookies, though cookies could be less healthy.

After she opens the cover of a container, the words " I chose healthy food for 24 times" with sparkling shines come to her eyes and remind her. Since she has already opened the cover for oranges, she just picks up an orange. Then she hears a short pleasant rhythm of sound, " I made a healthy choice one more time" she thinks. She is able to make healthy decisions more often and healthy eating seems not that difficult. She brings her coffee and orange back to the desk and continues to work.

6.6 The Combination with Interventions

The presented final concept implements several interventions in order to gradually decrease the user's consumption of unhealthy snacks in the behavioral changing process. Referring to Bandura's model, there are three aspects - personal, behavioral, and environmental factors- shape people's behavior. Figure 6.20 illustrates how the interventions of theories are integrated into a design.

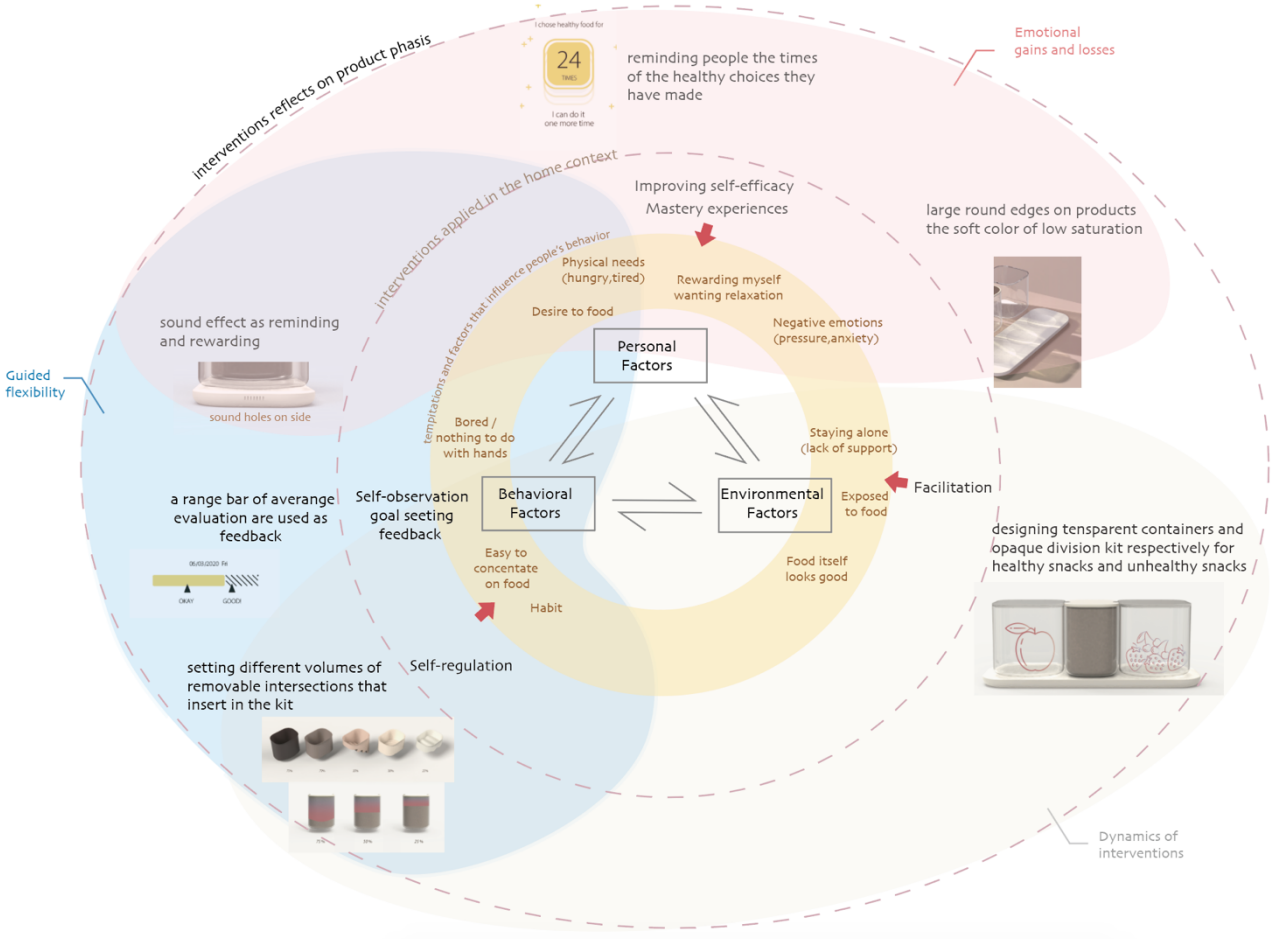


figure 6.20 reproduced from Bandura's model

Facilitation is an influential approach from an environmental aspect. Distinguished from the other two total transparent containers, putting an opaque division kit inside the container is a way of environmental intervention that the provision of new structures facilitates healthy behaviors easier to perform. The intervention that unhealthy snacks in the container are not exposed to people's sight, while the healthy snack comes into people's eyesight directly, is an unconscious form of persuasion. Also, through external

control like increasing additional steps to access unhealthy snacks, the intention of controlling unhealthy behavior is empowered. At the time when covers of both sides are removed, the interactive screen shows the animation indication that directs to healthy snacks, which subtly pushes users into the direction of healthy eating.
Improving self-efficacy is another way of intervention that works on personal factors. When users struggle and remove the cover of the container for unhealthy snacks, the screen shows the reminder words that “I chose healthy food for 24 times”. It emphasizes the memory of a succeeding experience, which is an essential resource for mastery experiences. A healthy choice could always be within users’ reach and positively affect their attitude for a long while.

Maybe, the user eventually would still make a choice of unhealthy snacks, but it is allowed. Because for an intervention, guided flexibility would mean to push the user into making a healthier choice without composedly restricting the option to get unhealthy snacks. Especially in a long-term behavior change process, the intervention aims to affect users’ behavior to the largest extent positively, but people still should always have freedom of choice and the option to opt-out of the intervention by taking unhealthy food. Compulsory instruction, strict controls, and punishment would bring users stress, impatience, and guilt. Then they could even deceive the system or desert it, which is not expected from the original intention of the designer.

Since recurrent choices of unhealthy eating are common in the contemplation stage, a proper intervention that functions as feedback after the actions is critical. Every time within a day, the user takes out food, the weight sensor on the pallet collects the data, and shows an evaluation through a scale bar. The design of the range bar aims to provide a range of space where the unhealthy behavior, though it is not advocated, still allowed, and to which degree the unhealthy behavior is not acceptable. This prevents a one-time unwise choice, totally depressing the user's confidence because the bar shows an average evaluation of all actions within a specified period. The way of self-observation focuses on the long-term effect that brings from the choice of each time. It indicates to users that each attempt will be collected and make a difference so as to encourage them to make efforts for each healthy decision. Plus, if the user picks up healthy snacks, the system produces pleasant sound as a rewarding experience and enhances users’ sense of achievement to balance emotional gains (e.g., a feeling of pride) and losses (e.g., the dissatisfaction of giving up unhealthy food they like) of changing the behavior of unhealthy eating.

Interpreting an intervention that can dynamically adapt to changes in behavior is a remarkable spot of the concept. By setting different volumes of intersections that insert in the kit, users can actively adjust the volume for unhealthy food based on their self-evaluation through the whole behavior change process. Diversity in shapes and series of colors make the process more fun to experience and caring for the individual's personal preference.

Chapter 7 .

Conclusions

This chapter goes through the whole process of the thesis assignment, reflects on the limitations in each significant phase, discusses with future suggestions and implications and explains lessons learned

.

7.1 Summary of Findings

In the beginning, the thesis assignment was defined as “How to motivate people in making more healthy decisions and move through the stage between current and new behavior with strategies and processes of behavior change in healthy eating”. The main goal was to propose an intervention concept that enables users to make healthy decisions at decision-making moments by extending the previous work of three design researchers from the University of Twente. The aim was to apply three proposed strategies - guided flexibility, accounting for emotional gains and losses, dynamics of interventions – in the domain of behavior change in healthy eating.

Throughout the thesis, several sub-questions are answered to address the main question and the goal of the assignment. In Chapter 2, how applying cognitive, affective, and evaluative processes to individuals in the early stage of behavior change are found to be helpful for them to go through stages. It was found that bridging the gap between intention and action could be an entry point of the main research question for further investigation. Following this, in Chapter 3, people’s intentions and actions of various dilemma scenarios in which they make healthy eating decisions are investigated. Among four different scenarios (friends’ party, in office, at home, family meeting), more than half of the participants expressed that snacking at home is the scenario that they mostly experience. The results show the conflicts between long term goals of healthy eating and motivations of emotional factors, carving to food, and starving are the main factors that make people feel challenged to make a decision. In Chapter 4, by combining Bandura’s SCT within the contemplation stage of TTM, the strategies of self-efficacy, self-regulation, and facilitation are put forward which correspond to personal, behavioral, and environmental influences in a decision-making moment. Finally, through a design workshop and finalization, the design of interactive SnackBox integrated the framework by interacting with users (i.e. Emphasis achievements of past experience, providing visual and audio feedback to the actions) and implicitly relying on the construct of the products (i.e, way of usage, setting different volumes of intersections, using various materials) to promote people making healthy snacking decisions.

The results show that combining and referring relevant theories of behavior change could be an accessible way to bridge the gap between intentions and action, to promote desired change. The theoretical framework of interventions adds to a growing body of understanding people’s intentions and decision making on health behavior. The whole process of designing SnackBox illustrates how a theory-driven

design from an applied perspective may help individuals who may struggle with achieving long-term goals for healthy eating behavior, and implicates a design approach in understanding eating behavior.

7.2 Suggestions for Future Research

Possible (limitations and) suggestions can be illustrated about three important components of the assignment: the user research, the framework, and the design of SnackBox.

1) User Research

The generalizability of the user research is limited mainly due to the fact that only volunteer university students and staff participated in the research. Resulting from this, the focus group is passively centered around young adults. Since young adulthood is a life stage special for increased independence and the ability of decision making, health behavior patterns established during this period may have enduring consequences in adulthood (Nelson, M.C., et al. 2008). Other outcomes from the user research, yet they are not the focus in this assignment, are still meaningful and worth discussion in further study. For example, “eating in a social context (i.e. Friends’ party, BBQ)” is a second common dilemma scenario that is mentioned by participants. More than half of the people who experienced similar scenarios express that their peers more or less influence them. Eating behaviors of college students could always be affected by social and psychological factors (Ganasegeran, K., et al. 2012).] So, how to promote healthy eating in a social context, in which individuals’ eating behaviors can be easily influenced by people around, could be a future study. the opposite side of that, just as scenario4 presents an individual cook and eat with their family and how his/her decisions influence others and are influenced by the group. How one person who adopts healthy eating habits affects people around to make more healthy decisions could also be an interesting topic to look into. In essence, it is about whether a person realizes the impacts of unhealthy eating behavior on one’s close social circle and physical environment. In a social context and facing others' invitations, improving self- efficacy could still be a suggestion, to help them resist the temptation of unhealthy food. How to resist pressure of interpersonal relations in eating needs more understanding.

Additionally, possible diversities of eating choices in different gender, cultural backgrounds, and living conditions have not been taken into consideration. From the result, the general cognition and beliefs about healthy eating almost converge.

In the user research, there was a small group of people who, even though acknowledge or have experienced the risk of unhealthy eating and know well about healthy eating, still insist on their current eating habits as their statements that “Eat the food I like, live a short but happy life”. In TTM, these people could be categorized as the middle or late pre-contemplation stage in which they are aware of problems in their behaviors but have no intention to overcome them. Normal traditional health promotion programs do not work for and match the needs of such individuals who are characterized as unmotivated groups or not ready for health promotion changes (Prochaska, J. O. et al., 2008). However, when it comes to health behavior risks, for example, diet, no more than 10 percent of the individuals adequately prepare to act on two or more behaviors (Prochaska & Velicer, 1997). How to apply more innovative and effective interventions and input more theoretical and empirical insights into the interventions could be part of the challenge from a TTM perspective.

2) Framework

Integrative different approaches of the theory are promising within TTM (Prochaska, J.O. et al., 2008). One strategy of the approach in this thesis assignment is to do the right thing at the right stage. Bandura's SCT and SE play a significant role in the contemplation stage of snacking behavior at home. Instead of fighting against low self-control and weak determination in a dilemma, the framework exploits environmental, personal, and behavioral conditions under the scenario in which most food choices are made. Chances for healthy decisions would be improved when users feel confident about themselves in healthy choices rather than challenged and fought. Between pre-contemplation and contemplation stage, emphasis on advantages of change is more critical than disadvantages for people; from contemplation to action, attention on the disadvantages of changing should decrease (Prochaska, J. O., et al. 1994). The framework presented in Chapter 3 emphasizes the positive side of their health decisions to increase their motivations, while after people move through the contemplation stage, how to prevent people from returning to their old unhealthy behaviors in the following stage has been mentioned yet.

The strategies described in the framework not only function in the contemplation stage of snacking behavior but also may have a positive influence on their general eating habits.
At the late contemplation stage, individuals would have cognitive and affective assessments of their self-image with a healthy/unhealthy behavior and gradually realize that the behavior change could be a part of identity as a person (Prochaska, J.O., et al. 2008). Because people tend to behave compatibly with the identity they approve for themselves (Cast & Burke, 2002). Conscious about healthy-eater identity contributes a lot to predicting healthy eating behavior (Strachan & Brawley, 2009). Except for a healthy-eater identity, self-efficacy plays a consistent role in the long run. It improves the possibility of an individual's healthy eating in the future, such as more fruit and vegetable consumption and intake of low energy-density food (Strachan & Brawley, 2009), which means it motivates people to eat healthier from more sides.

3) Design of the SnackBox

The design of the SnackBox is goal-directed, driven by the theoretical framework of interventions, and shares the assumption that people at the contemplation stage of TTM are target users. However, in real practice, the users won't entirely behave the same as what the designer assumes. They may deceive the system, like putting unhealthy snacks into the container for healthy snacks and gain the reward by cheating. Unfortunately, the underlining cognitive assets of this behavior can't be completely prevented within this SnackBox system. The current design does not forbid deceiving or force users to behave in a certain way.

With the consideration that interventions that give instructions to people do's, and don'ts could cause reactance (Demmer, J., 2017), implicit cues and flexible guiding are more suitable ways. Rather than a compulsory design, the SnackBox works for reducing the possibility of cheating behaviors in usage as much as possible. For example, the system provides enough self-flexibility in the process of changing a smaller container, lessens the emotional disturbance because of one-time unwise choices, and provides positive feedback when they choose healthy food. Healthy eating should not become a burden to people that they have to deceive the system. Implicit cues and guided flexibility could provide users with the feeling that their freedom won't be threatened. This will ensure less stress about the behavior of healthy eating. Yet, to which extent the design could lead to healthy snacking behavior remains unknown due to the lack of evaluating the concept in real-life use case scenarios.

7.3 Lessons Learned

In today's food-rich environment, healthy eating is more readily seen as a lifestyle and even a part of personal identity. A future intervention design would allow users who have cognition on their eating behaviors and acknowledge healthy eating to define their own meanings of eating. Users would not be placed in a rational cage where people have to follow the standard eating plans, accept the right instructions in every situation, are under the control of all the tracking measurements, and behave appropriately. Many participants expressed, “Eating is the resource of happiness.” How people feel about the way they eat and how much room is made for people’s own experience of food are not less significant than the numerical values of calories and nutrition. Designers should keep in mind that whether substituting users to make a seemingly right decision for them would remove the agency from the individual (Purpura, S., et al. 2008). Users should be encouraged to reflect on their feelings (i.e., sense of confidence, sense of control) and then decide whether to move on by themselves, more than directly and mindlessly relying on a data source of measurement. In this situation, whether the interventions can dynamically match users' changes across each state would possibly determine the life-time of a product.

In conclusion, guided flexibility, emotional experiences, dynamics of interventions could still be the guidelines in future studies of other (healthy eating) behaviors. There is an obvious limitation of a design to help all users to achieve an ideal state, while revelations that users acquire in the process of using the product have prolonged indications in other eating behaviors.

7.4 Reflection

As the designer of the SnackBox and the framework, I tried a theory-guided approach. Most often, I focus on a moment: start with a problem/event/action and make the most effort in finding an innovative solution to them, but seldom jump out of the moment, and regard it as one part of a long-term process of a larger goal. In this assignment, with the approach, the relationship between actions and internal factors (i.e., beliefs, motivations) of the potential users could be better understood, rather than stay on the surface of a problem. The biggest challenge lies in how to integrate the strategies in the function and appearance of a product. Using specific examples in daily life to explain the procedures bridges the gap between theory and product and helps all the participants in the workshop to raise ideas from the industrial design aspect, which eventually contributes to the final design.

The SnackBox could be regarded as an attempt to regulate healthy eating. With the quick development of technology, these years witnessed a boom in wearable devices and interactive products, especially in the domain of health. With these advantages, we can anticipate more innovative designs embodied in individuals and embedded in social contexts.

Reference /

figure 5.13 https://www.samsung.com/us/explore/family-hub-refrigerator/overview/

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Appendix 1 The format of questions in user research

The main question of the user research :
How does a person deal with his/her challenges in eating?

Thank you for accepting to be a participant of my research project. Before we start, I would like to give you some information about my research project. Recent years, we see that people sometimes face the challenge of “eat or not to eat unhealthy food”, especially when they notice some unhealthy eating habits in their life and would like to eat healthily. My Master’s project aims at investigating the challenges that people face when they are to make (un)healthy eating choices. My end goal is to design a product that facilitates the decision making process and make it easier for people while they are raising a healthy eating habit.

Therefore, I would like to ask you some questions about your experience, beliefs, and feelings about healthy eating and food. Please answer the questions according to your life experiences. The whole process will be divided into 2 parts and it will take about 30 minutes. In the first part, I will ask you some general questions about your eating habits. The second part will be…

If you agree, I would like to start.

Date:
Name:
Gender: female / male
Age:
Work status: (do you work / study)

>>

Part 1 (10 minutes)

The first question is; what do you think a “healthy eating behavior” is? And what “unhealthy eating behavior”?	
How do you define your eating habits? What kind of diet do you have? Could you tell a bit more about it? How do you feel about it?	
Do you have different eating habits during the weekdays and weekends? How does it change? What about vacations? How does your eating behavior change by then?	
What kind of benefits do you experience with keeping your eating habits?	
What other factors influence your eating behavior? How do you feel about it?	

To what extent these effects will change/help you to keep your eating behaviors?	
What do you like the most about healthy eating? What do you dislike the most about unhealthy eating?	
Or do you have any example of suffering from the unhealthy decisions you sometimes make?	
Have you ever taken some significant steps toward healthy eating behavior (such as having a diet plan, consulting a counselor, talking to your physician, buying a self-help book)?	

Part 2 (20 minutes) --
The below graphics represent scenarios where people face the challenge of making decisions to eat or not to eat “unhealthy” food.
Please recall your scenarios of eating and answer the questions.

1. Which scenario do you experience the most often ?

1 Mary is keeping a diet to lose some weight.

Mary got a message from her friends and plan to go to the party.

Mary dressed and made up herself. She looked good, the diet and exercises made some efforts (or probably not, she was still fat, not confident about herself).

Eat or not to eat ?

The food was delicious but she did not know whether she should continue to eat more.

2 Lucy is a newbie in the company and needs to build good relationships with her colleagues. She starts to eat a less sugary diet these days.

One afternoon at office Lucy’s colleague brought a home-baked cake and share with others

She wants to join them, but she does not want to break the rules of her diet and change her well-prepared plan for dinner

Eat or not to eat ?

The colleague comes to invite her

3

7:00 PM
After finishing whole day study loads at the library, Jackson came back to his apartment.

9:05 PM
Alone at home
Watch a movie to kill time

Eat or not to eat ?

He wants to take some snacks, but he will go sleeping after one hour .

4 Julia visits their grandmother and having a family dinner monthly.

All the family members ate lots of sweets during the afternoon tea.

Cook or not to cook ?

For health, she planes to make a chicken broccoli stir fry ,but she wants everyone to enjoy the dinner.

1 Mary is keeping a diet to lose some weight.

Mary got a message from her friends and plan to go to a party.

If I were her, I would feel…
Can you draw a face expression, or write down how do you feel ? Why **?**

Eat or not to eat ?

The food looks delicious, but she did not know whether she should continue to eat more.

What kind of food is there in your plate?
How do you feel? What is your decision?

On the way back to your home, how do you feel about your food decisions? **?** Why ?

Questions

1.Can you help to finish the story? (write down/ draw)

2.Do you think your decision is healthy or unhealthy ?

3.Why do you make such a decision / what factor motivate you?

4.Some days later, you will join a party again, what will you do?

5.Do you experience similar situations?
What do you do? Why do you do?

6.How do you feel in that situation? How do you feel afterwards? How do you adjust your feeling ?

7.What temptations do you face during this process? What help you to overcome these barriers during the process ?

8.How will the behavior of others influence your decision?

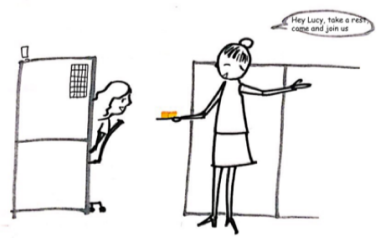
9.If you make a healthy decision, will you reward yourself afterwards? How? Why? If not, what will you do?

10.Do you know what will you do when similar situation happens next time?

2 Lucy is a newbie in the company and needs to build good relationships with her colleagues. She starts to eat a less sugary diet these days.

One afternoon at office
Lucy's colleague brought a home-baked cake and share with others

She wants to join them, but she does not want to break the rules of her diet and change her well-prepared plan for dinner



Eat or not to eat ?
The colleague comes to invite her

What is your decision?
How do you feel at the moment?

After that, what happens ?
Why ? How do you feel?

Questions

1. Can you help to finish the story? (write down/ draw)
2. Do you think your decision is healthy or unhealthy?
3. Why do you make such a decision / what factor motivates you?
4. What will you do after work? Why will you do it?
5. If you enjoy your less sugary diet, what happened during this time?

6. Do you experience similar situations?
What do you do? Why do you do it?

7. How do you feel in that situation? How do you feel afterward? How do you adjust your feeling?

8. If you start a healthy eating plan, how certain are you that you can keep it? Will you enjoy it? Why?

9. What temptations do you face during this process? What things make it easy/hard for you to promote healthy eating?

10. Will you reward yourself afterwards? How? Why?

11. Do you know what will you do when a similar situation happens next time?

3

7:00 PM
After finishing whole day study loads at the library, Jackson came back to his apartment.

After that, what happens ?
Why ? How do you feel?

Eat or not to eat ?

He wants to take some snacks, but he will go sleeping after one hour .

What kind of food is there on the table?
What is your decision? Why ?
How do you feel at the moment?

When you are lying on the bed, how do you feel?
What are you thinking ?

Questions

1. Can you help to finish the story? (write down/ draw)
2. Do you think your decision is healthy or unhealthy?
3. Why do you make such a decision / what factor motivates you?
4. If a similar scenario happens again, what would you do? Why?
5. Some days later, what possible changes will happen to you?

6. Do you experience similar situations? How often does it happen? How do you feel in that situation? How do you feel afterward? How do you adjust yourself afterward?

7. Staying alone or staying with others, at which context, you are more likely to face temptations? What are you doing at the moment?

8. What temptations do you face during this process? What things make it easy/hard for you to promote healthy eating?

9. Do you know what will you do when a similar situation happens next time?

10. Can you share a healthy eating experience(alone) that you enjoy most? Why do you enjoy it?

4 Julia visits their grandmother and having a family dinner monthly.

All the family members ate lots of sweets during the afternoon tea.

Cook or not to cook ?

For health, she planes to make a chicken broccoli stir fry ,but she wants everyone to enjoy the dinner.

What is your decision? Why ?
How do you feel at the moment?

Everyone sits together and start to eat. What dishes are on table?
Will they enjoy the dinner?
What will you do? Why ? how do you feel ?

Questions

1. Can you help to finish the story? (write down/ draw)
2. Do you think your decision is healthy or unhealthy?
3. Why do you make such a decision / what factor motivates you?
4. If a similar scenario happens again, what would you do? Why?

6. Do you experience similar situations? How do you feel in that situation? How do you feel afterward? How do you adjust yourself afterwards?

7. Does you know your eating behavior influences others? How do other people's behavior/suggestions influence you?

8. What temptations do you face during this process? What things make it easy/hard for you to promote healthy eating?

9. Do you know what will you do when a similar situation happens next time?

10. Can you share a healthy eating experience (with other people) that you enjoy most? Why do you enjoy it?

Are there any other situations that you can share ,in which you think that you make unhealthy decisions?

- How do you feel about your decisions?

- What temptations do you face during this process?

Are there any times that you make healthy decisions in the same situation?

- What do you do? How do you feel? Do you reward yourself?

Appendix 2 The results of user research

1.Explanation of abbreviate words in the from
F:Female
M:Male

B:Breakfast
L:Lunch
D:Dinner

Q:Question

2.Explanation of colored table in the from

	Vegetarian
	Person in the process of diet
	Person successfully lose weight
	Experience negative emotion
	Experience no obvious emotional change
	Experience positive emotion

				Q1	Q1	Q2	Q2	Q3		Q3	Q4	Q5	Q6	Q7	Q7	Q8	Q9	notes
	F-6 M-3			**what do you think a "healthy eating behavior" is?**	**And what "unhealthy eating behavior"?**	**How do you define your eating habits? What kind of diet do you have? Could you tell a bit more about it?**	**How do you feel about it?**	**Do you have different eating habits during the weekdays and weekends? How does it change?**		**What about vacations? How does your eating behavior change by then?**	**What kind of benefits do you experience with keeping your eating habits?**	**What other factors influence your eating behavior? How do you feel about it?**	**To what extent these effects will change/help you to keep your eating behaviors?**	**What do you like the most about healthy eating?**	**What do you dislike the most about unhealthy eating?**	**Or do you have any example of suffering from the unhealthy decisions you sometimes make?**	**Have you ever taken some significant steps toward the healthy eating behavior (such as having a diet plan, consulting a counselor, talking to your physician, buying a self-help book)?**	
31	F	master	Joy	eat regularly, 3 times a day balanced	irregular not at meal time unbalanced not enough nutrition	very regular 3 meals a day balanced (meat and vegetables)	I like it and feel satisfied. Feel happy at meal time.	regular	irregular, always over sleep	irregular, just like weekends feel lazy order takeout	light taste, fruits slim,clean less inflammation feel happy	dine together (less options in restaurant more fat) pressure (loss of appetite-want more salty food,eat more to release pressure)	not so often certain period ,such as near deadline	good physical state good figure	bad physical state face acne	summer vocation eat too much put on weight take lots of effort to lose weight	No only when feel uncomfortable ,I will search some information to balance	
25	F	phd	Fangzhou	eat regularly, 3 times a day	eat when feel starving	regular 9am,12-13,6-7pm	just so-so	regular	brunch sometimes	having a substantial breakfast	regular original ingredient low oil	relates to daily schedule	sometimes	good physical state	stomachache	eat fried chicken at night	No	
54	M	Work - medicine	Ron	bio food, on time, regular,(you can eat unhealthy food but in control)	irregular, junk food	regular, bio food	healthy ,satisfied	easy,fast irregular sometimes	cook myself substantial meals	regular, cook myself substantial meals	good physical state	taste of food	If the food tastes good, I will keep eating it	good physical state	bad physical state,feel uncomfortable	eat unfresh food	chatting with others	
25	F	Work - master	Chuqing	balanced	one type of food skip breakfast	B-bread milk L-fast,easy D-fruit/skip dinner snacks,chocolate	just so-so want to be better	regular	irregular eating as a way to release too much fruits	eat with family	no backside till now (still worry about my health)	location (you are only accessible to some type of food)	not so often	that is our life should be	increase the risk of disease	keep a strict diet, unhappy	push myself to buy some food for breakfast	
50	F	work	Yulian	light taste	high carb salty	regular, balanced	healthy happy,satisfied	regular	cook myself substantial meals	local food	slim,enjoy	-eat outside, have to eat food with high fat	sometimes	good physical state peaceful emotional state	spicy food- uncomfortable	spicy food- stomach ache	internet book	
23	M	master	Hao	low fat sugar	snacks,junk food,sweets	lots of vegetable, balanced, not too full	healthy ,satisfied	easy,regular	cook with friends,healthy & substantial meals	eat with family fish,fresh food	slim	no	healthy eating is my habit	good physical state	weight increase	eat too much because I don't want to waste food	internet audio/information exercises,and recipes	
26	M	master	Arvind	enough vitamins, different types of food,fresh vegetables and fruits	fried food ,junk food,sugar	depends on mood stress-junk food, sugar,chocolate normal-rice, vegetables	mixed	depends on mood,cheese, butters and i put some weight	cook myself , sup	with family- super healthy	not benefits, I always get stressed,then get fat	emotions, friends habits(e.g. fried chicken, feel good when I eat, feel bad afterwards	sometimes	good for mental, good figure	weight increase, looks dull,feel bad afterwards	Eat too much ice-cream in summer, because i feel it's time to eat. At the end of summer, I become fat	always make plans ,but never follow	
23	F	master	Eliana	nutrition aware of what you eat	over eating junk food	cook my food,and try to eat healthy	go out- unhealthy cook myself-healthy	satisfied, cook myself	go out with my friends,	half-half,eat with families, typical recipes	energetic, awake,work better but sometimes control too much ,which could be stress, feel bad	social media, go out with friends	often	good for mental and body	feel heavy, not energetic	book about recipes, easy and quick to cook	not want to punish myself too much, which is good for you psychologically	

32	F	Work - assistant professo r(phd)	Armağan	balanced	high carb ,fat ,sugar, one type of ingredients	balanced, not really count calories, less sugar,fat, salt snack sometimes	balanced, happy basically sometimes cheat (after exercises -) disappoint when gaining weight sometimes go out with friends	3 meals, structured (running) sometimes stupid food	grains-run-brunch healthy dinner	local food cultural recipes (hometown)	good physical state(blood pressure) running – feed my body	workday,tired and hungry, chips, instant food stress influences dinner	sometimes cheating meals doesn't influence so much	good physical state,life long goal	body reacts badly (instant reaction)	stress(after work) tired(after running) - thoughts of unhealthy eating happens all of a sudden,I don't like it happen, want to have the pressure to eat some food	sometimes follow special diet, consulting physician	treat the body as machine
	F-1 M-2																	
24	M	master	Chen	balanced,less meat,low fat regular,on time	high fat,salt	different types of food balanced, less oil	just so-so	3 meals	almost same as weekdays sometimes substantial meals	healthy and less processed food	healthy, good figure, confident	special context, surrounding people mood,sometimes just want to eat something, but in control	sometimes	get knowledge about health, improve cooking skill, raise self-awareness,	the taste is too light	feel starving on the streets,when you smell something good with nice looking,eat and regardless of health	website; APP reminds me incontrol and reflection when I eat more calories than what I planned	
21	F	bachelor	Jin	balanced,meat vegetables regular,on time	overeating, irregular	eat only when feel hungry	just so-so,maybe unhealthy	regular	get up late, brunch	at home,regular	I can choose the food I like	eat outside with friends	sometimes	feel happy, healthy, satisfied,sense of achievement	bad physical state,feel uncomfortable	eat too much snacks,feel too full	APP count calories	
23	M	master	Jiacheng	balanced	junk food,much meat, vegetarian	Chinese dishes, fast food, vegetables	healthy,good taste, i will balance consciously	cook myself, simple	substantial meals	local food, balanced	good taste is more important than balanced meal for me	don't have a formal breakfast (sleep too late) sick	depends	good physical state	put on weight, lack of flexibility in exercises	skip breakfast, stomach uncomfortable	no	
	F-10 M-8																	
41	F	work pharmac ist	Yufang	eat regularly, 3 times a day balanced & enough nutrition not over eating no eating in 2 hours before sleeping	over eating skip breakfast	very regular B-bread, milk L-easy food A-fruits D-cook myself, 2 different dishes and soup,some coarse cereals	healthy satisfied	simple	more complex and better dishes, more time to cook	regular do exercises	clear mind feel energy good body's metabolism	dine together good smell of food on street alluring, hard to resist	not so often eat less and light next meal	good physical state	bad physical state spend money on hospital	spicy food toilet affairs get treated	Yes with friends	
23	M	master	Philipps	support body function low sugar,fat	over eating	flexible -eat out side no dinner -some yogurt,for sleeping	good	flexible	brunch + dinner social activities	local context	flexible (fit the schedule)	physical state	depends	taste better	smell	eat to late,stomach uncomfortable	not a strict plan	affordable, easy to cook,tasty, repeat

25	M	master	Emil	regular low fat ,sugar	irregular not enough nutrition	skip breakfast irregular	unsatisfied	skip breakfast	brunch + dinner	healthy regular travel-depends	figure clear mind eel weak(if not enough) physical state (stomach)	sitting bored	often	good physical state		fast food,not fresh > stomach	own schedule video,youtube	fast,way to cook
36	M	mster	Viriega	eat when feel hungry stop when full	over eating	love eating balanced-mixed food vegetable	just so-so	normal	well-prepared substantial meal	eat more (walk more)	feel energy	atmosphere (light)	sometimes	clear mind	unhealthy but tasty	high oil,deep fried> toilet activities	APP (work out,many options)	
26	F	mater	Kristin	balanced	unbalance high fat, carbs spicy	eat until feel full low calories food	unsatisfied carbs-concentrate	canteen,regular	cook self-more complex and better dishes, eat out	eat more local food unhealthy	less carb,more meat-clear mind vegetables-better skin	time/busy-easy,eat more emotion sleep well-eat more	often	health,skin, figure	toilet activity, stomach	high oil,spicy> toilet activities	APP(Count) social media	what you eat>how you cook
26	F	master	Yaqian	not too full	irregular high fat	regular eat outside sometimes	just so-so	regular	order take-out food	at home regular,easy	good physical state, enough nutrition	emoticon-unhappy-sweets eat outside-cope with others-unsatisfied	have the conscious this is not good always	good physical state	stomach	feel upset>eat too much >stomach ache	find some recipes	
26	M	work-UX designer master	Shuhan	3 meals/day low fat ,salt,carbs	over eating skip breakfast	easy,no control regular	satisfied	regular	cook self-more complex and better dishes, cannot eat them all	skip breakfast 11:00 brunch 15-16:00 snacks 20-21 dinner	not fat	work affairs business trip	sometimes	good physical state	stomach, disgusting heavy	BBQ,hot pot,dink >uncomfortable	keep own diet + exercise (eat less)	
32	M	Work - assistant professor	Florian	balanced, not too much sweet	unbalance one type of food	regular too much sweet	fine/well (no bad effect till now,not fat	regular	no change	christmas -eat with family(fine)more meat	not fat,good for environment	local food/sick/pressure (more often)	depends	healthy, powerful, energy,longer life	too much sweet/sugar-no bad consequence till now	too much sweet/sugar,enven 1-2 package	try to eat less meat- moral issue	
26	M	phd	Xingyu	regular,on time rich breakfast balanced low fat ,sugar	over eating eat too fast irregular	skip breakfast irregular (sandwich)	unhealthy (sleep late, cannot get up, habit cannot change)	2 meals a day (2 bread on the train , 10am lecture, no lunch)	skip breakfast fast food(fried fish,each week) easy, fast,tasty	skip breakfast local food	convenient, easy,fast	follow others' behavior positive effect(when other people cooking themselves,I will cook. My habits is super unhealthy)	depends on schedule	health enough energy	irregular bad physical state	skip breakfast	try to drink a bottle of water after get up	
26	M	master	Bili	balanced enough nutrition eat less but often	unbalance one type of food	enough vegetable protein,fish meat pizza-one times a month (with colleague)	healthy satisfied good for environment	regular,basic	more complex and better dishes, various categories	with family and more eat	good for environment, arise the awareness of other people ,personal value	cook with friends who are vegetarian, interesting to try new dishes and communicate	total change my beating habits	health enough energy	bad skin, stomachache	eat more sweet,ice cream even in winter	to be a vegetarian	I prepare food one time for two day.
24	F	mster	Yumeng	balanced enough nutrition ,suitable portion, low fat salt,sugar	junk food,fast food, snacks	B-protein,grains L-protein,grains D-fruit,yogurt not enough choices	generally healthy	eat much in breakfast, lunch	eat much in brunch	less choice, local food	good physical state, clear mind	pressure- eat to release place- you don't have so many choices	sometimes	healthy, smooth skin, figure	bad skin,	hot pot- toilet affairs, don't want to eat anything the second day	learn others recipes and combine my own tastes step by step	
25	F	work - master	Xinyu	balanced, regular, on time	high fat,sugar	B-bread,milk L1 meat,2 vegetables skip dinner/ little	satisfied	regular	skip breakfast big lunch & dinner	brunch, more choices,local food	regular scheduled give me a sense of safety	new restaurants, curiosity	always	healthy	put on weight	want to eat something even though it is late 10pm, super full	look for recipes, control consciously	happiness > healthy eating behavior

28	F	master	Reilin	balanced,low fat , low salt not to keep sitting after meal	high fat,sugar, salt unbalanced	related to pressure stress- eat to release no pressure-health	should be improved	fast,high efficiency,easy	cook myself, more choices	eat with friends,mood> health	unhealthy, but I cannot find other way	emotion,pressure	often	clear mind feel slim	bad physical state	high pressure- too much black chocolate- toilet affairs	youtube	eat alone,fast,easy to try
23	F	mater	Yujia	on time, balanced, avoid bedtime snacks	snacks,fried food,high fat	skip breakfast, irregular,1 meal a day	unhealthy	irregular, schedule is flexible because of group discussion	regular, pizza,take-out sometimes	eat with family, healthy, balanced,less salt	flexible (fit the schedule) eat the food I like-happy	schedule	often	less stomach ache, control weight	stomachache, put on weight	group meeting in the early morning, skip breakfast, rush to another group meeting,skip lunch, over starving- don't want to eat anything at dinner time	App	balanced,fast, recipes
25	F	master	Ziyun	regular, balanced,	over eating or eat little high carbs,fat	3 meals,but irregular, sometimes overeating	unhealthy	depends on mood	depends on mood	eat with family, healthy, balanced,less salt	makes me happy	pressure,emotion	always	good physical state,better figure	stomachache, put on weight	because of group discussion don't eat anything for the whole day.and eat too much on the second day- stomach ache	diet plan(never follow)	
23	F	bachelor	Airan	on time, vegetables, low fat salt	fried,high fat, meat	Japanese style, fish, boiled vegetable	healthy	salad	soup,various food	eat little	healthy	depends on mood	sometimes	feel confident	less concentrate	eat instant noodles and feel headache	App recipes	
25	F	work-UX designer master	Sibra	regular, balanced,	overeating,high fat	eat at workplace	try to eat healthy, it's a long process	regular	cook myself, more choices, eat outside	eat with family	lose weight and the fat rate of body decreased	emotion, exercises- reward	often	slim,health, confident	bad physical state	after exercises, I eat really unhealthy food	talking to my physician, I got a serious sick a year ago, I have to face the reality	the number change on the weight scale could excite me, but I am still in anxiety
31	M	Work - assistant professor(phd)	Katos	low fat	fats,fried food	avoid fats,fried food,	nice, it's hard at beginning, after a few weeks, it works well	healthy eating	no difference allow myself a cheat meal every 10 or 15 days	environment change,not available to the food I eat ,but I try to keep it as much as possible	health benefits sleep better an organized schedule helps your body work better	when live with other people,we eat together, sometimes you break your habits,I am looking for other healthy food choices and try to manage	sometimes	you can see the change-fat decreases, pleasing,better body function	feel lazy, it doesn't give you a chance to be better, to let you to go psychologically down	static effect ,some level in blood test is higher than the limite	App,count calories, exercise together with diet very helpful,time consuming, it should include more products	
26	M	master	Zhongcheng	enough nutrition	one type of food	no plan,eat when I want to eat,buy the ingredients on discount, sometimes overeating (depends on my living environment)	unhealthy	easy food,eat better at dinner	no plan, depends on the situation and mood	local food	flexible (fit the schedule),less effort and convenient	supermarket seasonal ingredients,cookers, cooking conditions, order take-away	always	good physical state	feel happy when you eat, feel guilty after eating	weight scale, combine eating diet with exercises plan, control carbs intake	vlogger	
24	M	master	Xinchang	enough nutrition, balanced, not too full	not eat over eating one type of food high energy	exercises 4 eggs a day,low carbs,balanced diet	healthy	less processed food	same	eat with family, but carbs in control	confident,sense of control,good figure,learn knowledge about nutrition,	emotion, schedule, supermarket closed	sometimes	good physical state	feel guilty	no time to cook, eat in simple way,eg. bread & vegetables	vlogger, blogger, social media,count calories	eating is for survival currently,I don't enjoy the food

	Can you help to finish the story?			Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10		notes
Which scenario do you experience the most often	**how do you feel before the party?**	**What kind of food is there in your plate?** **How do you feel? What is your decision?**	**On the way back to your home, how do you feel about your food decisions? ? Why ?**	**Do you think your decision is healthy or unhealthy ?**	**Why do you make such a decision / what factor motivate you?**	**Some days later, you will join a party again, what will you do?**	**Do you experience similar situations? What do you do? Why do you do?**	**How do you feel in that situation? How do you feel afterwards? How do you adjust your feeling ?**	**What temptations do you face during this process? What help you to overcome these barriers during the process ?**	**How will the behavior of others influence your decision?**	**If you make a healthy decision, will you reward yourself afterwards? How? Why? If not, what will you do?**	**Do you know what will you do when similar situation happens next time?**		
1	happy	BBQ all kinds of meat you have no choices just have a taste, control myself (nobody will cares how much you eat)	a little bit guilty	unhealthy not so often not too bad to my health	environment	Same	Yes eat in control, feel comfortable with my body	happy happy & guilty sleep and forget	atmosphere, everyone feel good and enjoy have no choices		have a big meal not so often (I don't have a rigid diet. I want to eat, simply because my body need	control remind in head		
	worried-care about my figure excited-want to be attractive	have a small taste of pizza ,dessert happy,enjoy	depends on the time afternoon party-eat less at dinner evening party - worried	unhealthy not so often not too bad to my health	the taste of food,I like eating	in control		enjoy eat in control	If I see other people try some food , I would like to try.	for the most of time, I will eat if I want	I don't have a diet, I always eat the food I like	eat, depends on mood, eating is not a burden for me		
	happy enjoy food communication	happy eat delicious food taste unhealthy food(in control)	full,satisfied take a walk	healthy	I enjoy eating	same			taste in control	no influence	It has been a part of my life	same		
	under pressure you have to face the social issue	limited choice eat more vegetables	eat some fruits	just so-so , you have no choice	social pressure	same			social pressure, find come excuse to leave	often	feel tired, some delicious food	I try to improve my influence power, - I have more choices and freedom	food decision relate to social issue (external factor)	
	happy like delicious food	eat,enjoy	take a walk/ do more exercises	unhealthy not so often not too bad to my health	atmosphere, more choices of food	same			taste in control	no influence,just taste	no, that is our life should be	same		
	eat little during the day	eat in control i hope it can finish as soon as possible	lose weight-guilty normal – no worry,drink yogurt	unhealthy but I will suggest other people to eat healthy food	taste	in control		i hope it can finish as soon as possible	no, I don't like the noisy environment	unless other people strongly ask me to eat something	no, eating wastes time	same		
	excited, I will enjoy the party with friends	eat chicken and croissants,don't care,I am excited to eat and decide to eat.	content, because I am full	unhealthy	looks good and taste delicious I like food	same			I like food and always decide to eat	always	always think about change but never change	same	I will reflect myself until the weight increase or get sick consulting a counselor could help if I am really unhappy with my body and myself. But now,I am happy	
	accept ,you can't live without society	depends,fish, vegetables,side dish continue to eat, but not too much	a little bit guilty	unhealthy ,but you have no choice	social pressure	depends on how often it happens, twice a week - manage to reject every two weeks- fine			social pressure i control myself well if I am alone	always	not too often, once a week,or there is no meaning to keep the habit	same		

	a bit stress ,there will be tempting food	mixed plate (cupcake, cheese, chips,salad)	mixed different attitudes to different types of food	happy with my decision	cupcake - tempting food environment, people	keep cheese, salad, may try dessert with less sugar	treat visitors with a good table try to eat responsibly	compensate what I eat with more exercise	cheat meals(eat out with friends)	always	cheat meals	more running		
	mixed	in balance as possible as I can, a little annoyed about myself, because I break the plan	no feeling, I made a decision and you can't change it anymore	just so-so , you have no choice	want to keep the plan	same, in balance								
	Eat or not to eat? How do you feel?	**What will you do after work? Why will you do it?**		**Do you think your decision is healthy or unhealthy?**	**Why do you make such a decision / what factor motivates you?**	**If you enjoy your less sugary diet, what happened during this time?(your own strategy)**	Do you experience similar situations? What do you do? Why do you do?	How do you feel in that situation? How do you feel afterward? How do you adjust your feeling?	**If you start a healthy eating plan, how certain are you that you can keep it? Will you enjoy it? Why?**	**What temptations do you face during this process? What things make it easy/hard for you to promote healthy eating?**	**Will you reward yourself afterwards? How? Why?**	**Do you know what will you do when a similar situation happens next time?**		
2	eat, it is impolite to reject others kindness	nothing		unhealthy	don't want to hurt others' feeling;cannot resist temptation	in control consciously,do exercises	visiting friends, families eat, hard to reject, cannot resist temptation	a little regret	25% I won't enjoy it, food is not tasty, unsatisfied	bonus food at the supermarket; new taste	not, there should be cheat day	self-reflection, compose myself in control, limit times 1/2 weeks	diet is an assisting factor for exercises	
	just a small bite happy	nothing		just so-so	greedy to food, but it depends on the relationship with the person	feel satisfied the second day when i get up	roommates share food even at 11pm	happy and enjoy	not sure, i like salads	eat outside with friends, but I won't eat too much, because for the most time you are talking	some snacks	same	I will eat all the snacks at one time if I buy some snacks. feel happy,but too full. cooking with others to prepare healthy meals is a happy process that I would enjoy	
	accept, but I won't eat, depends on the relationship with the person	no care		healthy	I have to deal with the social issue	balanced			i won't have a plan	lack of flexibility,I won't keep it	no reward,only after serious sick,I would have a big meal	same	good taste and health are not conflict, cooking skills are important	
	After that, what happens ? Why ? How do you feel?	**What kind of food is there on the table? What is your decision? Why ? How do you feel at the moment?**	**When you are lying on the bed, how do you feel? What are you thinking ?**	**Do you think your decision is healthy or unhealthy ?**	**Why do you make such a decision / what factor motivate you?**	**Some days later, what possible changes will happen to you?**	Do you experience similar situations? What do you do? Why do you do?	How do you feel in that situation? How do you feel afterwards? How do you adjust your feeling ?	**What temptations do you face during this process? What help you to overcome these barriers during the process ?**	**Staying alone or staying with others, at which context, you are more likely to face temptations? What are you doing at the moment?**	**Do you know what will you do when a similar situation happens next time?**	**Can you share a healthy eating experience(alone) that you enjoy most? Why do you enjoy it?**	**If you make a healthy decision, will you reward yourself afterwards? How? Why? If not, what will you do?**	
3	feel bored nothing to do	nuts, fruits, cookies eat only when I am hungry,but in control	satisfied	healthy	eat only when I am hungry,but in control feel comfortable	no change	afternoon tea, nothing to do	bored and hungry satisfied	eat only when I am hungry	staying with others eating & chatting good atmosphere sharing food I well prepared	yse same	healthy eating is a long term habit instead of one experience or one attemption my diet is healthy	have a big meal with friends try something new feel happy not so often	
	tired,unhappy nothing to do	unhealthy food-sweets, chips unhealthy time for food (vegetables)	full less tired bad certain-cognitive dissonance	uncertain,the reason behind is more important	emotions	Never think about food Still think about food,but I control myself and be proud of myself			weak situation have a way to release	alone if i want certain kind of food,I will always think about it until I find a reason to eat	mostly same	If I try a new product and it tastes better than I expect ,I would be happy	no-that's my life	sometimes you want to eat sth, your body really need

	tired,hungry	eat some left over a day before or sandwich dink a cup of tea if not too late ,I don't mind cooking	satisfied sometimes I am too full to fall asleep,	depends on how much I eat 70% healthy	combination of how tired and how much I have	depends, sometimes try			combination of how tired and how much I have, I will do somethings else	depends on mood, with others- sometimes may cook or just order online, but more likely to eat healthy alone- you are more likely to cook fast ,do cleaning,preparing alone,amount of tasks you have to do		depends on what kind of food I eat	no, healthy eating is a reward, it is not a punishment	
	tired (shower) fresh	instant noodles, oren,tea, chips tea>chips>noodles satisfied,happy	full sleep late (45mins) satisfied,happy	happy is more important	I don't mind health	no change	70%		food itself	alone concentrate on food,if I am with people, I have to talk	yes eat	start to eat when you feel hungry, stop when i am full.but potato chips always make me want to eat more,relaxed	don't think about it	
	doing homework watch video	cake,chips (if I buy them,eat) 1/a week	no regret, feel better	just so-so (weight myself every day, control)	pressure (deadline, you have to write sth,but you can't, you want to keep you hand busy)	no change			greedy	alone-pressure social-familiar friend-encouraged/follow new friend-polite	yes eat	not busy - eat balance - comfortable	cheat meal greedy	
	bored, watch video	chips,milk happy,satisfied, enjoy the sound and process of chewing,released	unhappy,guilty, regard	unhealthy	bored	no change			deal with negative emotion	both (if I want to eat - eat)	yes eat	lose weight- cheat day	cheat day - greedy	
	greedy, relaxed	order take-out food(fried chicken, depends) no care	don't care,more relaxed	unhealthy	greedy	no change coz not always			greedy, atmosphere-more relaxed	with others (raise your interests, happy, no choices)	if I want to eat, eat	cook myself a sense of achievement, eat the food I like	no, It is a decision	alone how much I should cook, hard to calculate
	(most)feel well sometimes-stressful days 1/2 weeks	chocolate eat happy-because I like the taste of chocolate	happy-chocolate is not an issue	not so often it's not a issue	I like the taste of chocolate,to be happy	no change			taste	with others(girlfriend) she also likes sweets, when we are together we eat more sweets	yes eat, it happens every two weeks instead of everyday,so it's okay	fruits in the morning ,I like the fresh fruits. less meat,do something good for the environment. I like the healthy food	no,I like the healthy food	
	watch audio, relaxed	chips,beer happy,satisfied	satisfied	unhealthy I don't care	taste,crispy sound ,make me less stressful	no change I need to pu on weight, junk food is not a burden to me		don't adjust, no reflection, satisfied	greedy, multisensory stimulation by chips-good experience	alone, (when with others, I don't focus on eating	yes eat	during the graduation assignment process, eat sandwich everyday regular,balanced. Under huge pressure, I don't want to eat,but I push myself to eat	order chinese take-out food (more expensive)	
	relaxed,watch audio	chips,sweet (if I buy them,I want to eat them all until I am totally full.like addiction) happy	uncomfortable ,always too full, but I go gym regularly, it's not a matter.	compensation. Reward to me because I do exercises	release and reward myself	If I feel really uncomfortable , I will try to control next time		no reflection	release the negative emotion (depression) , sweet makes me happy especially winter	alone,- will not think too much about how my behavior influence others (when with others, I don't focus on eating, and restrain myself)	yes eat	cook with friend (try some new recipes)	sweets	
	tired	water>fruit if I am hungry,I will eat	full,good	healthy, My body need it	My body need it	no change I am in control, and it happens 1/2 weeks(not often)			go out with friends, follow others	with others	depends the situation,who I am with	I do exercises 10000 steps everyday to release my pressure, instead of eating		
	watch TV,play smart phone happy and want to be happier	fruits,chips happy	fruit- happy chips-guilty if I eat too late and too full,I would feel uncomfortable physically	unhealthy	emotional need- food brings me happiness	no change		some reflection, try to eat less	emotions	with others happiness are doubled	depends on mood	when I am a student, there are not so much pressure, I cook myself and carefully prepare food,and lose lots of weight	cheat meal	the result brings me more happiness than the process

	tired,helpless,lose control,uncertain (close to deadline)	chocolate (eat crispy things to release myself)	clam a little bit with short regret	unhealthy	pressure	I try do some exercises		I want to change,find other way to deal with emotional issue	wanting to release pressure	alone(all relate to pressure)	try to clean the room,do some exercise	A blogger who I know well successfully lose weight and I followed his recipes and feel better with my body. the example of the person who relates to me will be convincing	i want to buy SWITCH(combine exercise with games, less boring, challenging	
	bored, watch audio,want to relax myself	nuts,sweets,chips relaxed	happy together with worry (to be fat)	unhealthy	habits	no change,I will comfort myself afterwards		mixed	when I am with friends,I will eat more because I don't notice how much I eat while we are chatting	with friends,more fun and happiness,good atmosphere	eat	not busy 3 meals cook myself, alone sense of self-control	never think about	
	pressure, tired, lose control	cakes milk,coffee happy .the sense of control makes me lose control	happy,but I will blame myself	unhealthy	pressure	I try to change or I will put on too much weight		always	greedy,emotion	alone, every decision is relating to my emotions	eat	vacastion,no pressure, I eat regular and feel everything in control	a big meal	
	tired, want to reward myself	chocolate,need happiness,happy	guilty	unhealthy	needs for happy	if I tired of one taste,I will try new taste		sometimes	reminds me of the feeling of happiness	alone, I want to find one reason to escape from the reality,and release my emotion	eat	eat boiled vegetables(now eating habits ,good taste, healthy	no	
	tired, anxious	sweets, instant noodles release the pressure,feel happy,satisfied	guilty,blame myself	unhealthy	I do understand I am not starving, but I want to deal with the current (emotional) issue.50% control myself 50%	try to change and manage	compensate exercises with food	often	emotion cheat myself - one meal won't make me fat	alone escape from the reality food makes me relaxed	maybe eat, but I am conscious about that	after work, all the colleagues went to eat KFC, I went to a vegetarian restaurant, feel proud of myself	cheat meal , especially after exercises	I tried several apps, but I prefer to be encouraged and interact with a real person.
	tired & entitled to a reward-snacks	unusually some yogurt with fruits at first, try to reject chocolate and chips	hungry (try ro replace healthy snacks with unhealthy one), now my snack is more healthy	mixed most of time - healthy	health actively thinking about what I eat and why I eat	go for the healthy choice			the original (unhealthy) habit	with others, when you see other people try something, it is difficult to remain your original decision.	go for the healthy choice	try ro replace healthy snacks with unhealthy one	cheat meal every 10 or 15 days	
	cook or not to cook? why?how do you feel?	**Will they enjoy the dinner?Why ? how do you feel ?**		**Do you think your decision is healthy or unhealthy?**	**Why do you make such a decision / what factor motivates you?**	**If a similar scenario happens again, what would you do? Why?**			**Does you know your eating behavior influences others? How do other people's behavior/suggestions influence you?**	**What temptations do you face during this process? What things make it easy/hard for you to promote healthy eating?**	**Do you know what will you do when a similar situation happens next time?**	**Can you share a healthy eating experience (with other people) that you enjoy most? Why do you enjoy it?**		
4	prepare two dishes,because it fried chicken will make everyone happy,if there more choices for people,they can balance themselves	enjoy,because there are food they like		healthy	care people's feeling and provide various choices	same, it is a good decision			it happens, only when I eat with other. yes,I will follow some suggestions from nutritionist,or blog of real example	emotion get tired of the taste, difficulties to change a habit because your body gets used to it the goal is important, I need positive trigger in visual	same	a diet plan: no carbs, only meat and vegetables loss some weight,but it is hard to keep because you body need carbs	if I fail to keep a diet at one meal,I will restart	
NON														

Appendix 3 Personas for workshop

Peter

31

Freelancer

Attitudes:

"I try to eat healthy and balanced consciously , but it is a long and slow process. Sometimes I would lack of motivation."

Challenges:

Most of the time, I work at home. I get used to **grasping some chocolate beans** on the table **now and then** when I am watching TV, feel bored or have no inspiration. Sometimes, it is too late when I notice how much food I eat.

Beliefs about eating

Healthy eating:
- low fat,less salt,less sugar,
- avoid bedtime snacks

Unhealthy eating:
- high carbs
- too much meat
- eat too fast

My eating behavior:

- Eat regularly
- Have an undemanding plan of eating.

- Cook for myself most of the time.
- Sometimes I eat out with friends on weekends.

Kiza

24

Student

Attitudes:

"Balanced diet is important for me to keep a good physical state. But I would lose control sometimes."

Challenges:

I can get anxious and stressed easily, especially close to the deadline or presentation. Crispy chips and sweets bring me lots of comforts and **calm myself down**. I would even eat several bars of chocolate or a bowl of chips at one time. Though it is unwise to **eat them all** and I do feel guilty and regret afterward, it is too difficult for me to deal with the weak situations.

Beliefs about eating

Healthy eating:
- get enough nutrition
- balanced diet

Unhealthy eating:
- junk food,fast food,fried food
- skip breakfast

My eating behavior:

- Keeping a diet
- Always cook for myself
- Like sweets

- Eat easy and convenient food on weekdays
- Cook complex and better dishes on weekends

James

19

Student

Attitudes:

"I notice my eating behavior is unhealthy sometimes. I haven't see some negative effects that occur to my body, so it is fine. But I would like to eat healthy if I get reminded."

Challenges:

My roommate and I like to **have supper at night**. I get **hungry** easily since I go to the gym in the evening and sleep late. Usually I take instant food from the fridge or order take-outs with my roommate.Sometimes I would eat so full that I have to sleep even later.

Beliefs about eating

Healthy eating:
- eat regularly
- balanced diet

Unhealthy eating:
- overeating
- one type of food

My eating behavior:

- Order take-out food
- Sometimes cook for myself

- Eat irregularly for a flexible schedule on weekdays
- Eat out or cook with friends on weekends.

Appendix 4 Strategy cards for workshop

/ Strategy
/ Environmental intervention

Facilitating

Replace the unhealthy food with healthy food

Prevent unhealthy snack easily accessed or directly exposed visually

Control the amount of food that can be consumed each time

>>

- Example -

"real world primes," such as ads for healthy foods can help people regulate food intake later in the day.

/ Strategy
/ Environmental intervention

Incentive motivation

rewards/punishments
I can get some external rewards, if I eat less unhealthy food.

>>

- Example -

If I don't eat cakes for a month, I can use the money that spends on cakes to buy myself a beautiful dress.

/ Strategy
/ Behavioral intervention

Self-observation

I realize what I eat, how much I eat

>>

- Example -

Some tool can be used to track single or multiple behaviors, for behavior self management

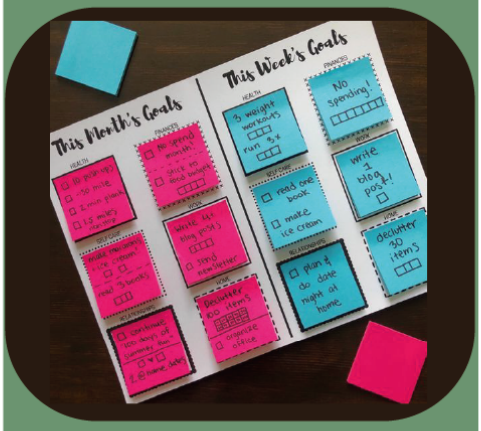
/ Strategy
/ Behavioral intervention

Goal setting & Feedback

Show the informative, and visualized goal and corresp -onding feedback

>>

- Example -



Realizing a realistic and challenging goal gives an individual a feeling of pride and triumph, and sets him up for attainment of next goal.

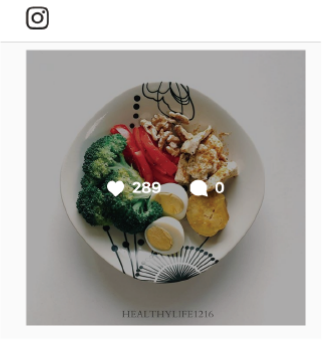
/ Strategy
/ Personal intervention

Modeling

Follow a (modeling)person who is similar with me ,
I familiar with or approve on, to do the similar activities

>>

- Example -



Individual starts to try a similar diet of a user he/she likes on Instergram.

/ Strategy
/ Personal intervention

Mastery experience

(successful experience)
If I manage it successfully one time, I can manage it more times

(failure experience)
If she/he can do it, why can't I ?

>>

- Example -

A friend who is known for being a couch potato treat us delious meal. I start to believe that I can become a cook too.

Appendix 5 workflow for workshop

The whole process takes around 90 minutes.

1).Introduction (10min)

Duration 10min	Instruction
6min	Welcome the participants and introduce background information including goal, design context, actors, dilemma,future scenario.
4min	The organizer Introduce peronas that help participants to understand target groups. Please read the personal cards.

2).Ideation

Part 1:Brainstorming with sticky notes

Duration 36min(6min*6)	Instruction
2min	(Show the 6 strategy cards to participants) The organizer introduce one strategy card. Please read strategy and the examples on the back side.
Brainstorming 2min	There are sticky notes in various colors. The color corresponds to the strategy cards. List some related ideas on the sticky notes to the strategy(as many as possible)
2min	Share the ideas on sticky notes

Part 2:Braindrawing

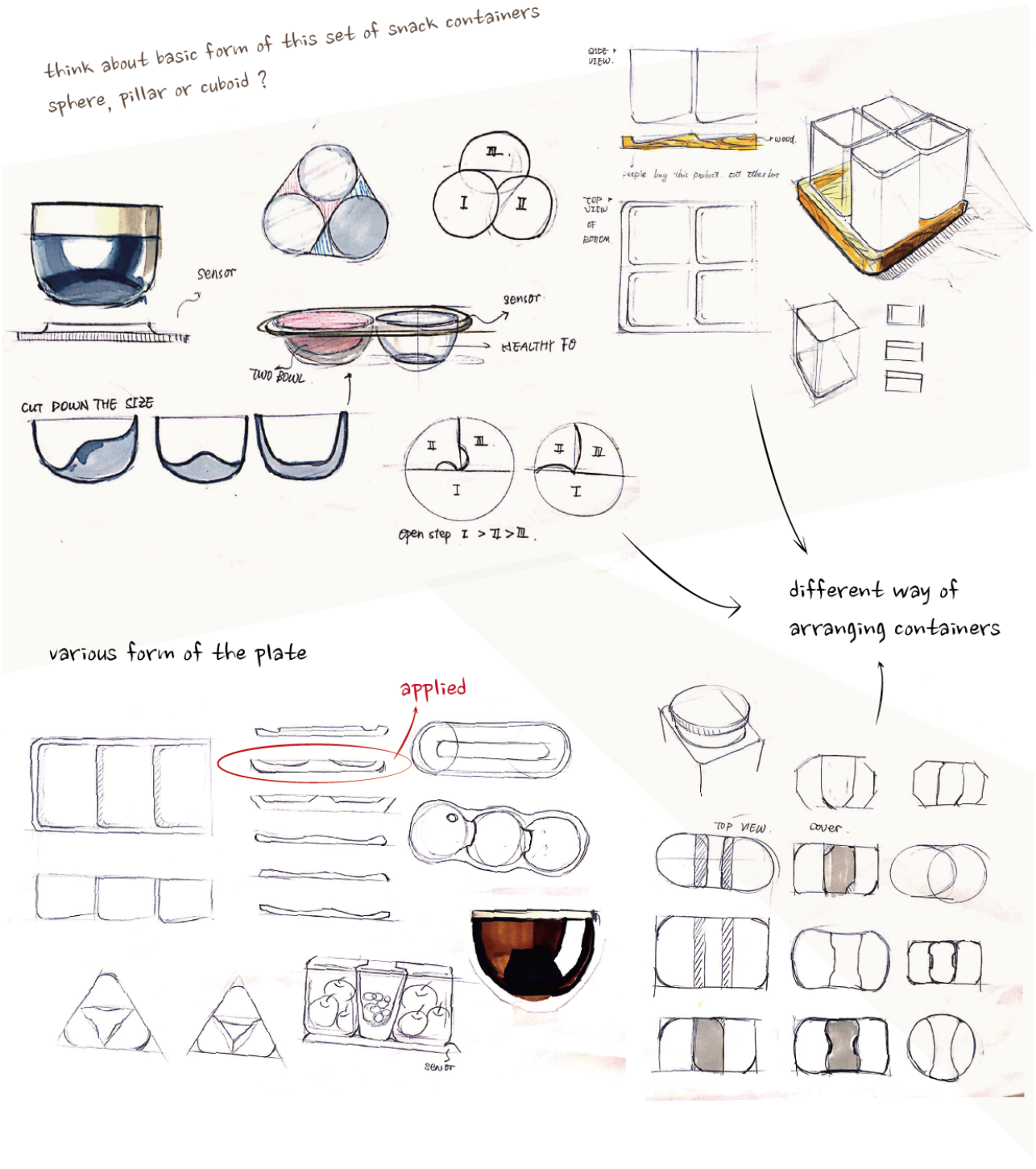
Duration 40min (10min*3 +10min)	Instruction
Braindrawing 6min	Put all sticky notes of ideas and strategy cards together on the wall. Please think about which idea could be developed into a design. Pick up ideas and further develop them. (individually) Sketch it on the paper or write down some keywords.
3min	Share your concepts. (Either description or show your sketching) What do you think about the concept? What strategy does it apply in the concept?

	Please think about how it could be better developed?
1min	Please pass the paper with sketches to the person next to you and develop the concept based on other's drawings.
Discussion after rounds 10min	What do you think about these concepts and why do you think so? Can you provide positive and negative points to these concepts? What ideas of strategy are combined to use in the concept? Why does this combination make sense? Is it necessary? Do you think whether the user will use them in the long term?

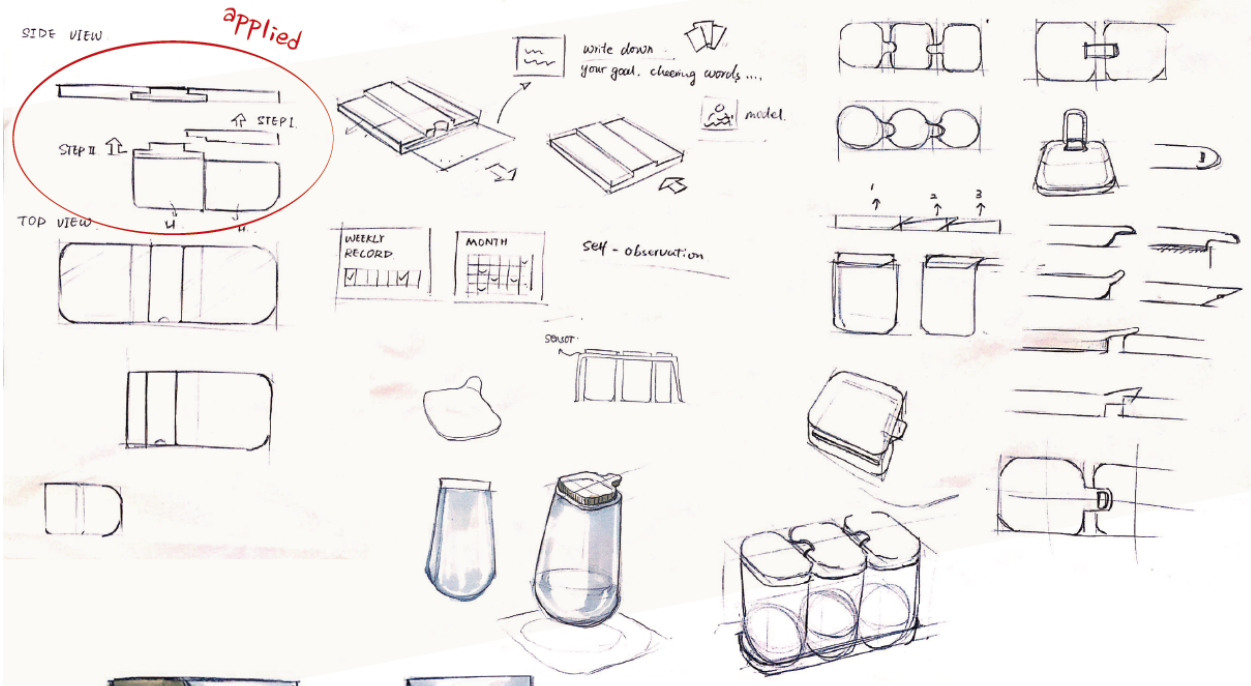
Feedback (5-10 min)

To this project, do you have some comments and suggestions?
(positive and negative points, missing points, suggestions in the design process)
How do you feel about this workshop?
Do you have any other suggestions for the workshop?

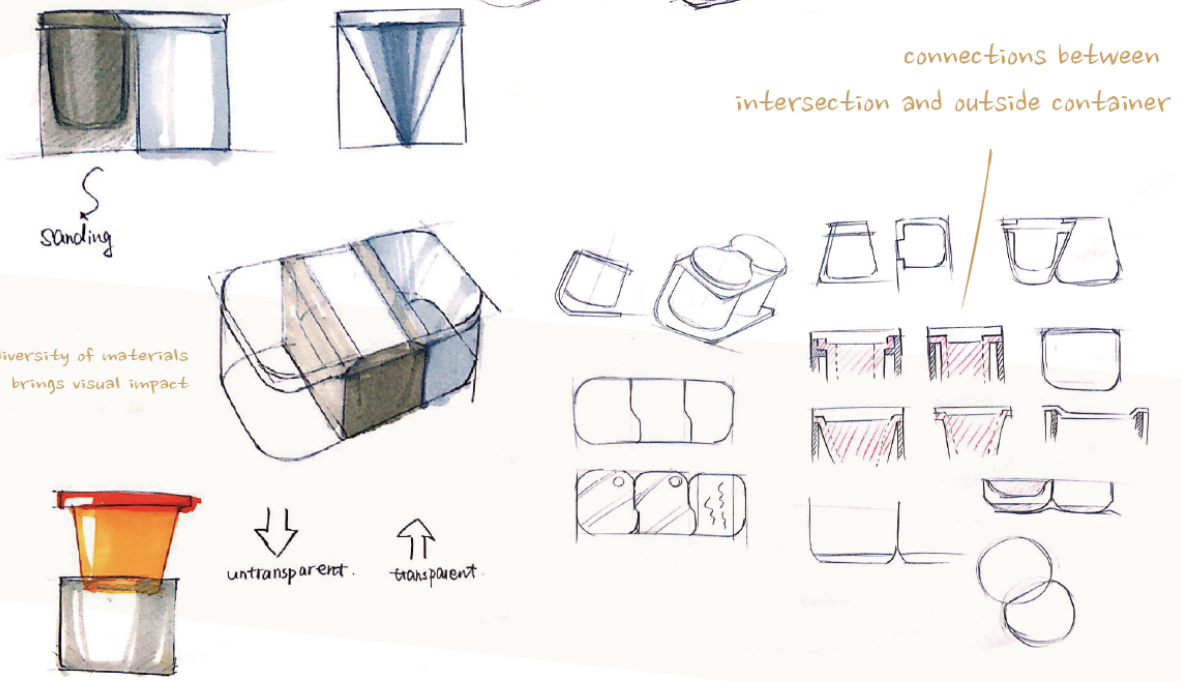
Appendix 6 Sketching of concept development



connection of the covers



connections between
intersection and outside container

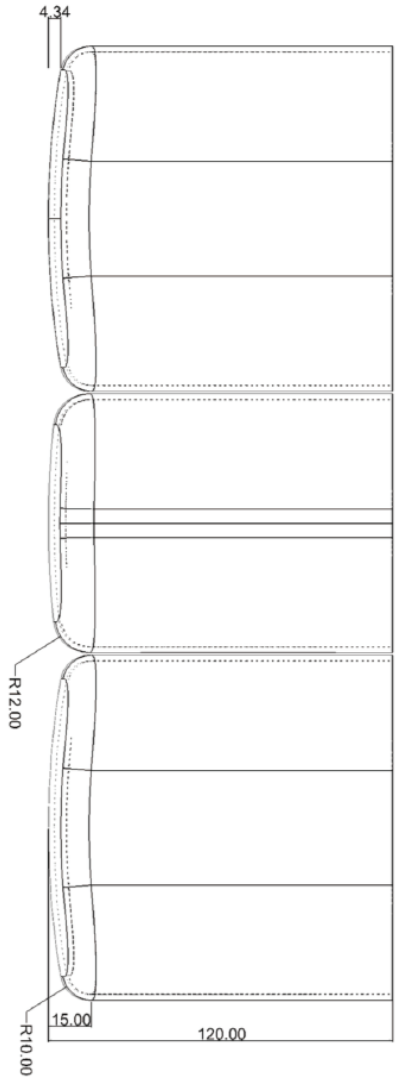


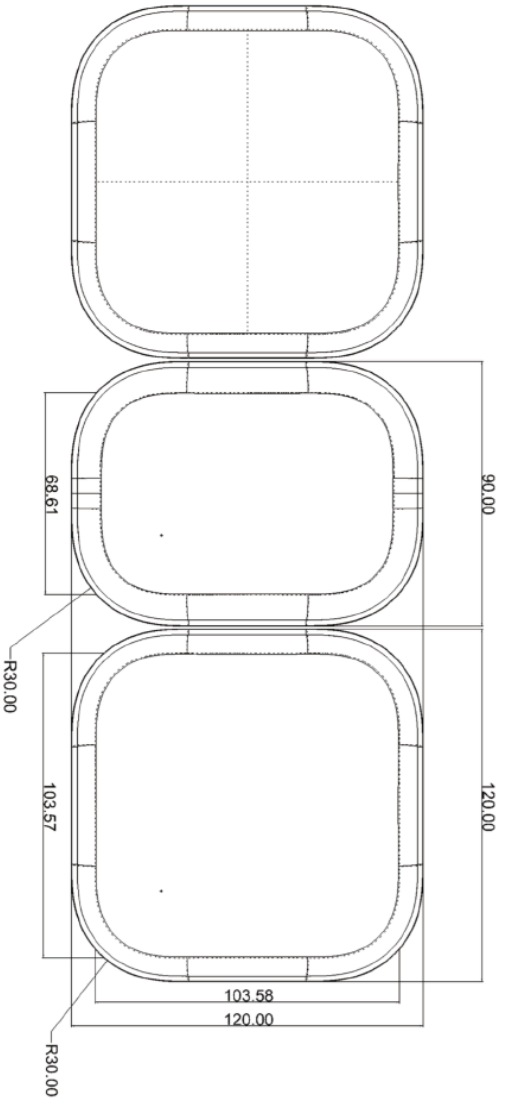
diversity of materials
brings visual impact

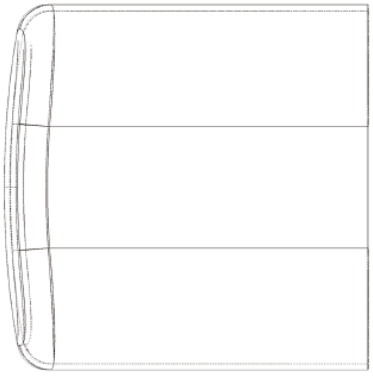
Appendix 7 Three-views picture of parts

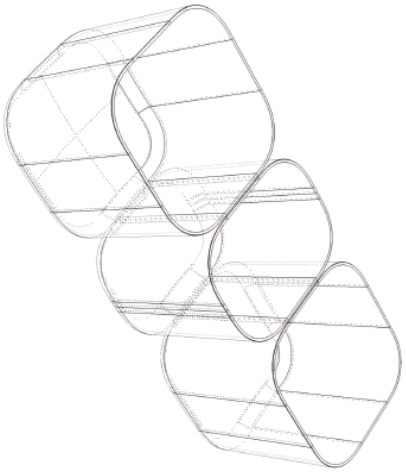
Part 1 : transparent container

Unit : mm



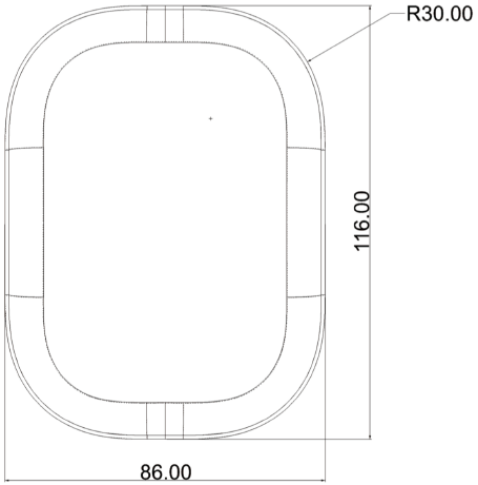


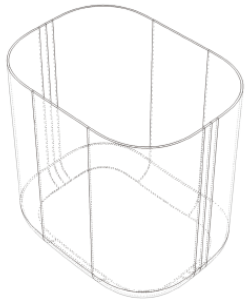


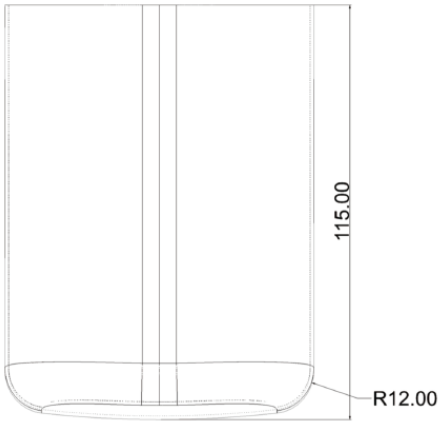


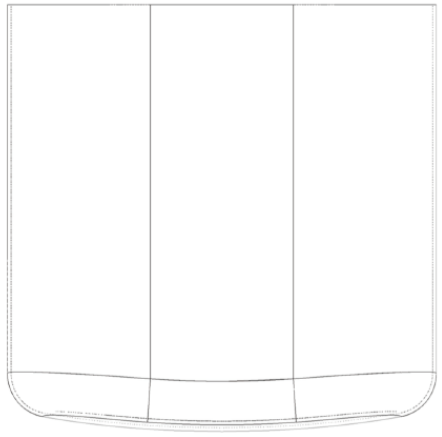
Part 2 : Kit

Unit : mm



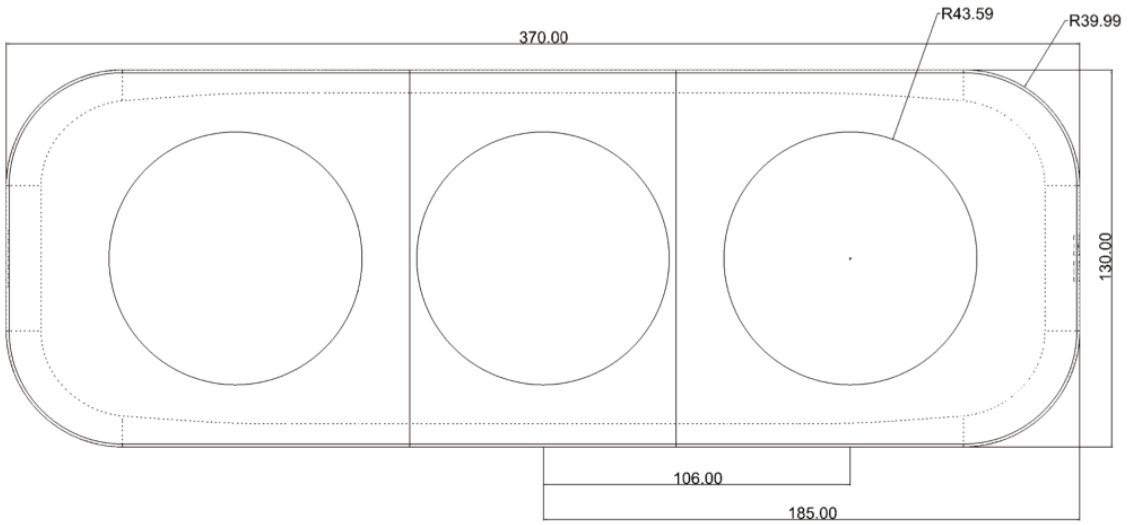


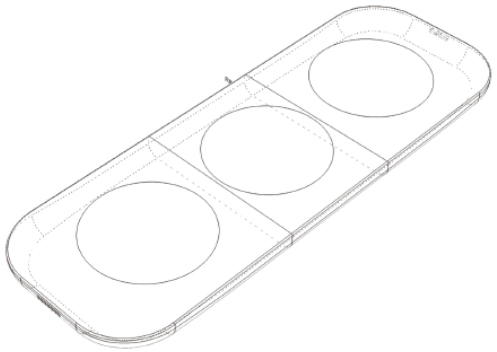




Part 3 : plate

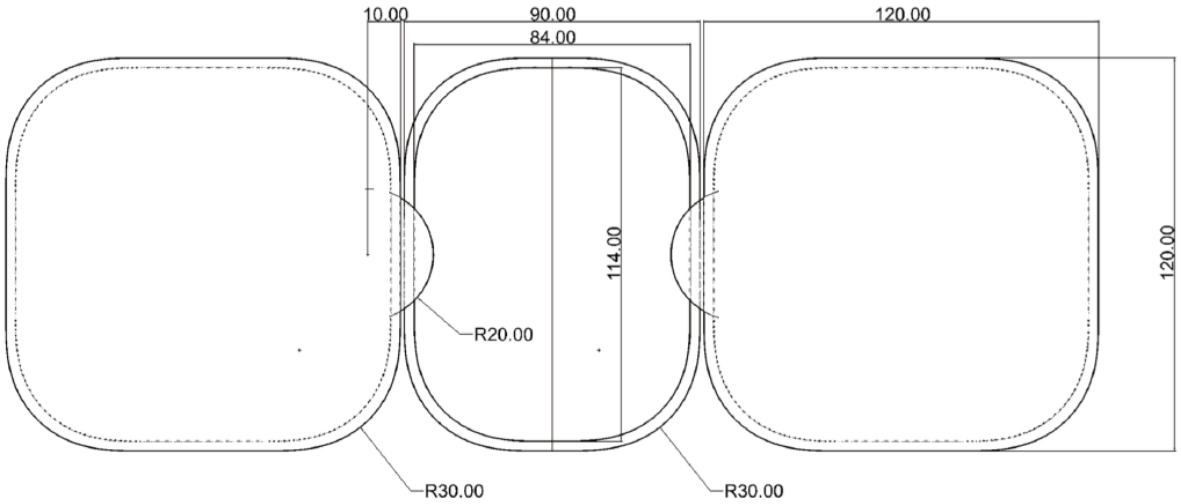
Unit : mm

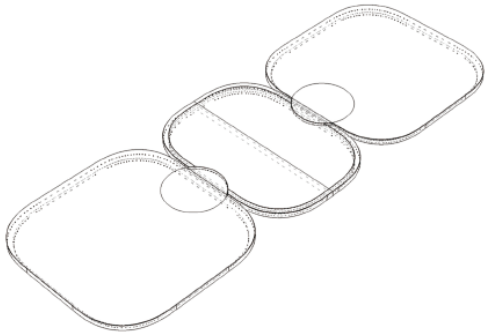




Part 4 : Covers

Unit : mm

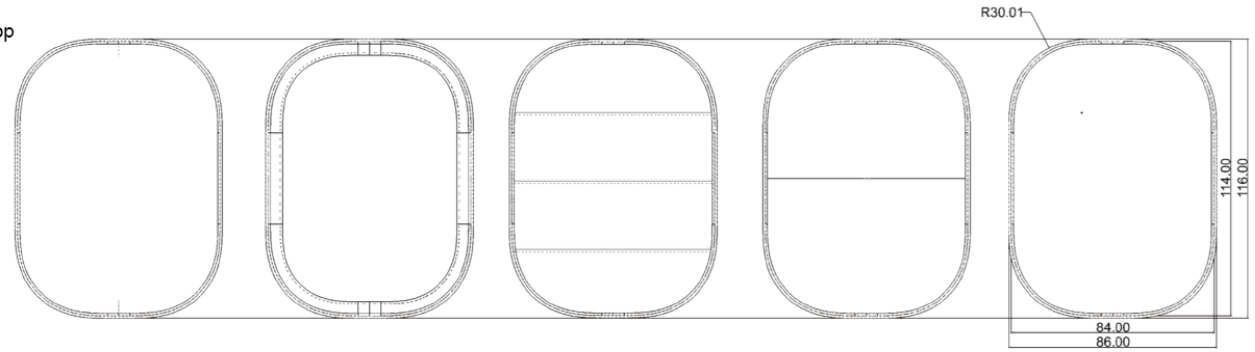


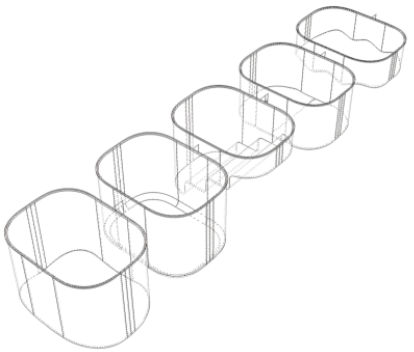


Part 5 : Intersctions

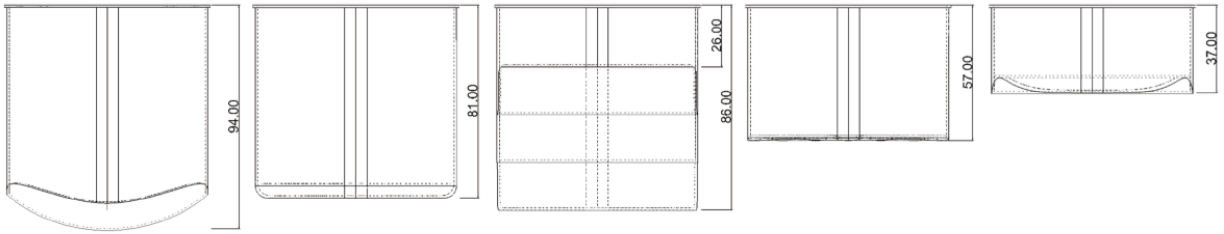
Unit : mm

Top





Front



Right