

Redesigning Our Personal Environments and Behaviors:

A Systems Approach to Wellness

A thesis submitted to the
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for the degree of Master of Design in Interaction Design
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Abstract

Health behaviors are triggered and reinforced by a system of environmental cues that only dimly impact conscious awareness. When people try to change their eating habits, they often struggle to break out of the self-defeating scripts that keep them entrenched in undesirable behavioral patterns and fail to take into account the environmental cues that undermine their efforts. By redesigning their personal environments, people can facilitate their own behavior change to promote wellness.

This thesis explores the ways in which individuals can redesign their everyday personal environments, from kitchens to desks to cars, to disrupt unhealthy patterns and create positive cues to support their desired behavioral transformation. Research conducted through literature review, surveys, interviews, journals, and generative modeling reveals needs for personalized wellness education, design inspiration, guidance that promotes self-efficacy, and long-term support for prioritizing and managing environmental and behavioral redesign.

A proposed web-based tool called Seeds of Health provides an adaptive framework for personal wellness transformation in an iterative, four-phase process: (1) exploration and assessment, (2) planning and preparation, (3) practice and tracking, and (4) reflection and adjustment. The tool is intended to serve as a personal wellness guide, planning tool, and evolving record of an individual's behavioral and environment changes.

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I dedicate this thesis to my family,
in gratitude for all their love and support.

Chapter 1:

Introduction

The Development of Obesogenic Environments

A recent National Health and Nutrition Examination Survey found that between 2007-2008, about one-third of adults in the U.S. were obese and more than two-thirds were either obese or overweight (Flegal et al. 2010). Obesity has risen dramatically in the U.S. over the past twenty years and, according to The Centers for Disease Control and Prevention, is a major risk factor for the leading causes of death in the nation, including cardiovascular disease, type 2 diabetes, and certain cancers. Early medical models attributed obesity to individual behaviors such as habitual overeating (Chang and Christakis 2002), and past approaches to reducing obesity have accordingly relied on individuals taking personal responsibility for changing their behavior. A growing body of evidence, however, suggests that obesity is a symptom of a systemic problem. The rise has been attributed in part to the development of “obesogenic environments,” a term describing the external influences that promote overeating, unhealthy foods, and physical inactivity (Swinburn, Egger, and Raza 1999). An ecological systems approach, emphasizing the connections between people and environment, may therefore prove more effective than a purely behavioral approach in addressing the obesity epidemic.

Addressing a Systemic Problem

An ecological systems approach recognizes that behavior and environment not only influence each other, but that they do so at multiple levels of interaction ranging from macroscale to microscale (Swinburn, Egger, and Raza 1999; Story et al. 2008). Macroscale environmental factors refer to the upstream influences that impact behavior on a population level, such as regional and global transportation networks, advertising campaigns, agricultural and food policies, and food distribution outlets. Microscale environmental factors refer to influences within the individual’s immediate settings, such as package and portion size, plate shape, room layout, lighting,

and dining companions (Rolls 2003; Wansink 2004; Sobal and Wansink 2007; Wells et al. 2007).

Interventions at multiple levels, collectively spanning physical, sociocultural, economic, and political dimensions, are likely needed to transform obesogenic environments into health-promoting ones. While policy makers wrangle with the food industry over proposed upstream changes like soda taxes and bans on trans fat, relatively few interventions have been attempted at the microscale level in which individuals live and interact on a daily basis (Story et al. 2008). Yet these microscale settings in which we spend most of our daily life are filled with physical, social, and information cues that reinforce our existing habits without impacting our conscious awareness. Simple changes at home, like serving dinner on salad plates instead of dinner plates, minimizing distractions like television, and serving vegetables family-style while keeping the other serving dishes out of sight at mealtime, could significantly reduce the number of calories consumed without adding to our cognitive load (Wansink 2004).

Design Goals, Approach, and Scope

Thesis statement

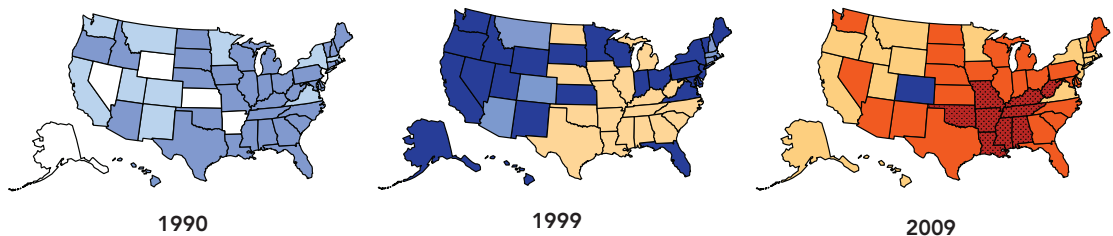
While others have targeted macroscale environmental factors such as food policy, or personal factors such as nutrition knowledge or intrinsic motivation, this thesis explores the premise that by redesigning their personal environments, people can facilitate their own behavior change to promote wellness.

Figure 1. Obesity in the U.S. has risen dramatically over the past twenty years

Obesity Trends Among U.S. Adults

OBESITY RATES

- No Data
- < 10%
- 10% - 14%
- 15% - 19%
- 20% - 24%
- 25% - 29%
- ≥ 30%



Obesity is defined as a Body Mass Index (BMI) ≥ 30 , or about 30 lbs. overweight for a 5'4" person.

Source: Behavioral Risk Factor Surveillance System, CDC

Terminology

Personal environments refer collectively to factors at the microscale level – specifically, aspects of the physical, social, and information environments – that influence everyday behaviors.

Goals

By examining how people make decisions about what and how much to eat, how aware they are of the microscale environmental influences on those decisions, and how the confluence of factors within a system shapes behavior, it seeks to support – rather than undermine – their desire to live healthfully. The work's ultimate goal is to empower individuals to redesign their personal environments to shape their own behavior and promote wellness.

Approach and Scope

This document begins with a review of underlying ecological systems theory and related frameworks for health behavior change. Next, it discusses the microscale environmental factors that influence eating behaviors along with related design interventions. Since the ultimate goal is to design for behavior change, it highlights key psychological principles used to influence and persuade on conscious and unconscious levels, with a note on the ethics of designing to influence on an unconscious level. To test the hypothesis that individuals can redesign their personal environments to change their own eating behaviors, it leverages this theoretical foundation in the design of a tool that individuals can use to plan and manage their own personal environment redesign. It concludes by reflecting on the success of the final design solution and proposing avenues for further inquiry.

Chapter 2:

Related Research

Based on a review of the current state of related work in the fields of human-computer interaction, design, behavioral economics, marketing, medicine, nutrition science, psychology, and public health, three primary areas of research have informed this inquiry:

1. ecological frameworks for health behavior interventions
2. the microscale environment design space
3. behavior change theories and persuasive design

First, an overview is given of ecological systems theory and frameworks for understanding person-environment dynamics in the context of health behavior change. Second, work in the microscale environment design space is reviewed for lessons that can be applied to health behavior change interventions. Third, the topic of persuasion is explored, specifically how a combination of traditional psychology, behavioral economics and technology can be leveraged to change behavior on both conscious and unconscious levels. Lastly, connections are drawn between these three domains that highlight opportunities for persuasive environmental design to effect health behavior change.

A Systems Approach to Health Behavior

Since 1927, the medical view of obesity has gradually shifted from being a consequence of individual behavior to being a consequence of experience, shaped by both personal and environmental factors (Chang et al., 2002). Accordingly, human ecology – the study of the interaction between people and environment – has played an increasingly large role in health promotion research in recent decades (Stokols, 1996; Sallis et al., 2002).

Ecological systems theory defines environment as everything external to the individual (Bronfenbrenner 1981). In contrast, personal factors refer to influences that are specific to the individual, including genetics, demographics, knowledge, attitudes, skills, and behaviors. Because

environment and person are considered interdependent parts of a larger whole, they can be analyzed within a system context, at multiple levels of scale and across multiple dimensions.

Environmental levels describe a gradation of influence on a person's behavior ranging from immediate to distant. Based on his own fieldwork observing people over long periods in situ, Bronfenbrenner (1981) divided the ecological environment into four nested levels called the micro-, meso-, exo-, and macrosystems. The innermost is the microsystem, describing influences experienced within an individual's immediate setting where face-to-face interaction takes place. Home, work, school, supermarkets, and restaurants are microsystem settings, where individuals inhabit specific roles and engage in specific patterns of activity at specific times. The next level is the mesosystem, or the system of microsystems, comprising the relationships between an individual's microsystem settings. For example, a mesosystem could represent the interrelations between the individual's home and work settings. The exosystem refers to settings that indirectly affect, or are affected by, what happens in the individual's microsystem settings. These could include peers' homes, local government offices, or the corporate headquarters of a company with a presence in the individual's home town. The highest level is the macrosystem, encompassing cultural values and belief systems that affect the micro-, meso-, and exosystems. For instance, certain foods become more prominent in American supermarkets the week before Thanksgiving, and more readily available in the home the week after.

Based on Bronfenbrenner's ecological model of behavior, McLeroy et al. (1988) proposed a variant model focusing on health promotion that features five levels of behavioral influence: personal factors, social networks and social support systems, social organizations, relationships among organizations, and public policy. The authors based their model on their understanding of the determinants of behavior. However, they acknowledged that different levels of analysis could be used.

Ecological models consider different types or dimensions of environment. These, too, vary across the literature, with researchers typically selecting a subset of physical, social, information, cultural, economic, and political dimensions (Stokols 1996; J. F. Sallis and Owen 2002; Wells et al. 2007). Multiple frameworks based on ecological principles and models have been proposed to analyze the environmental supports and barriers to healthy eating, although none has achieved widespread adoption.

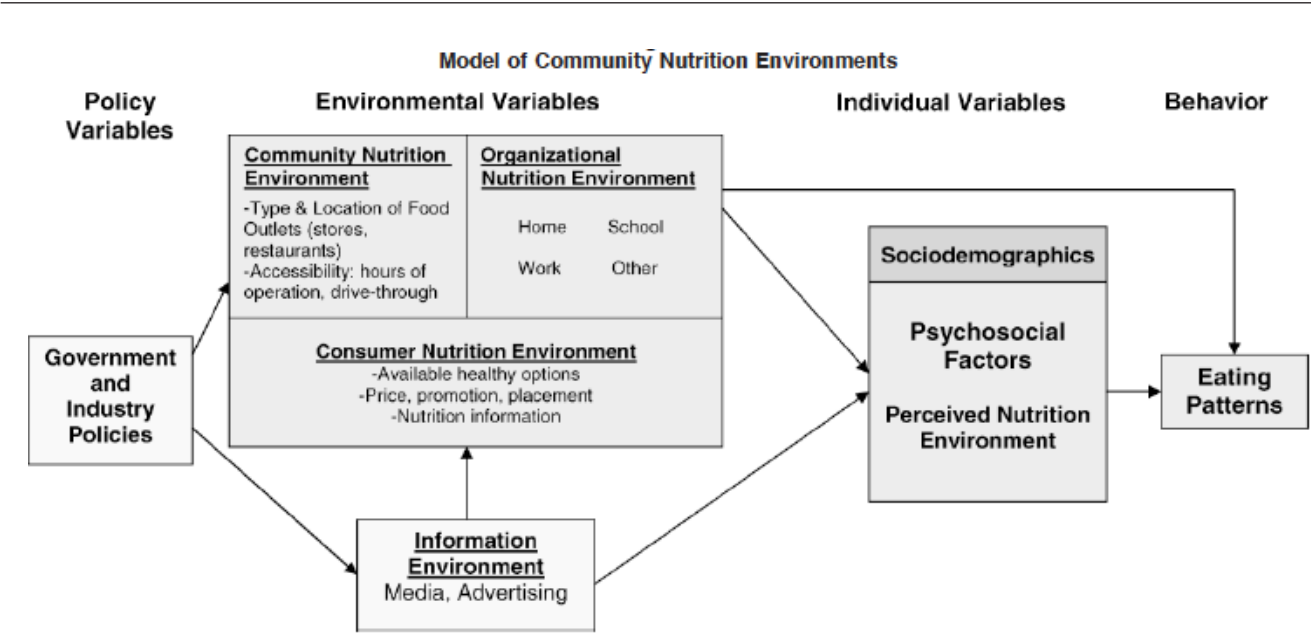
Ecological Frameworks for Health Interventions

Drawing upon research in the fields of public health, psychology, and urban planning, Glanz et al. (2005) identified four types of nutrition environments, shown in **Figure 2**, that influence eating patterns: the community nutrition environment, the organizational nutrition environment, the consumer nutrition environment, and the information environment.

The community nutrition environment describes stores and restaurants available to the general population. Organizational nutrition environments, in contrast, are limited to places that have specific meaning to the individual (such as home, work, and school) and social groups such as family, colleagues, and classmates. The consumer nutrition environment refers to factors such as nutritional quality, price, placement, range of food choices, freshness, and nutritional information. The information environment includes media and advertising that influence attitudes and the appeal of certain foods and food sources.

Story et al. (2008) proposed a more detailed ecological framework, shown in **Figure 3**, in which social, physical and macrolevel environmental factors combine with personal factors to influence eating behavior. The social environments include interactions with other people, exerting

Figure 2. A model of community nutrition environments



Source: Glanz, Karen, James F Sallis, Brian E Saelens, and Lawrence D Frank. 2005. "Healthy nutrition environments: concepts and measures." *American Journal of Health Promotion: AJHP* 19 (5) (June): 331.

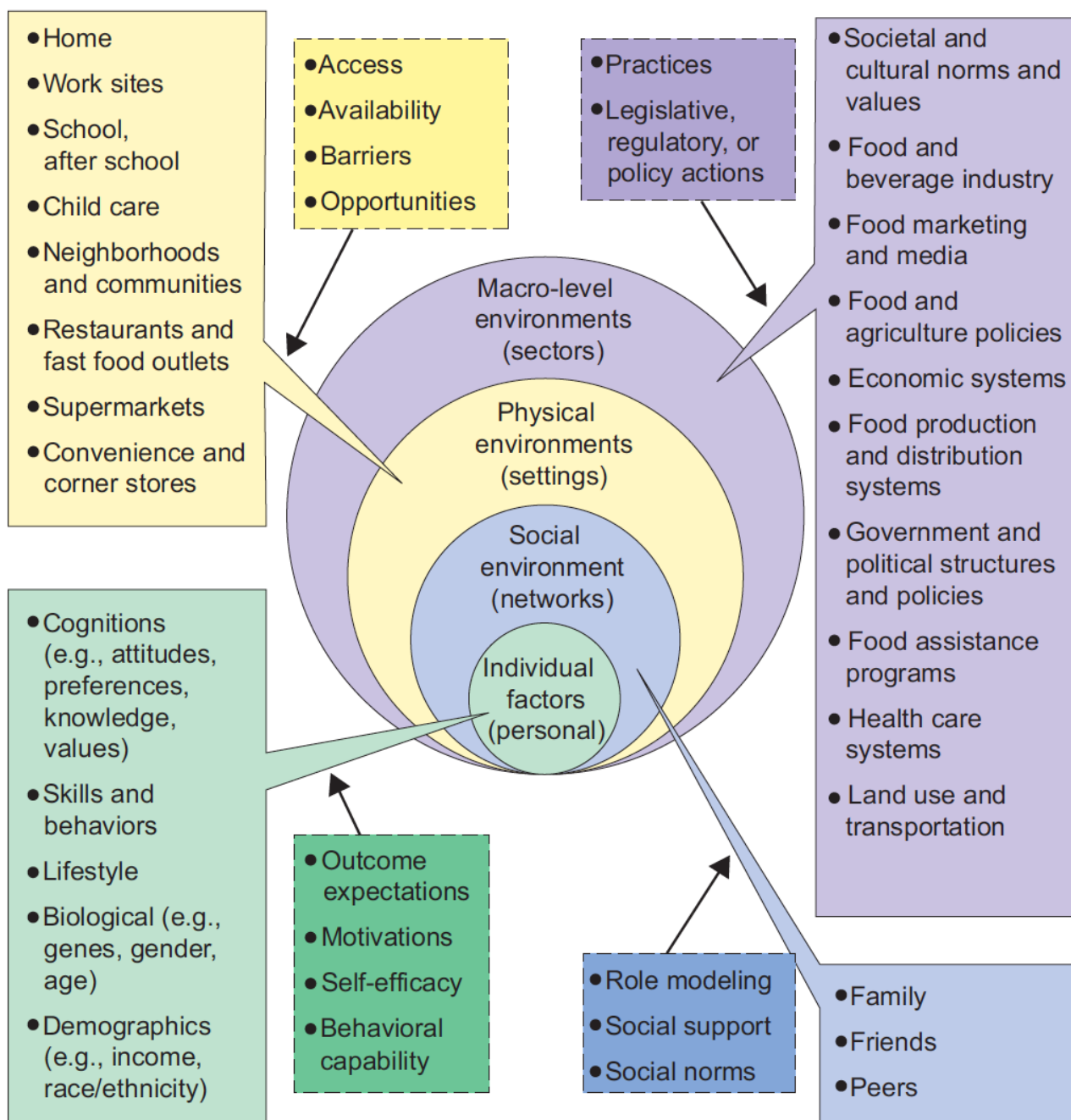


Figure 3. An ecological framework depicting the influences on eating behavior

Source: Story, Mary, Karen M. Kaphingst, Ramona Robinson-O'Brien, and Karen Glanz. 2008. "Creating Healthy Food and Eating Environments: Policy and Environmental Approaches." *Annual Review of Public Health* 29 (1) (April): C-1.

influence through role modeling, social norms and social support. The physical environments include natural and built settings in which people obtain, prepare, and consume food. The macrolevel environments include a wide range of features that impact the population at large, from food and agriculture policies to school lunch programs to food marketing to cultural norms.

In any ecological framework, there are a number of interdependencies among environmental variables, individual variables, and behavior. The challenge lies in choosing meaningful measurements among them. Ball et al. (2006) cautioned that easily measured environmental factors are not necessarily the most significant influences on behavior, and that effects arising from a combination of factors may be discounted or missed altogether. For instance, measuring the type, number, and location of grocery stores within a given neighborhood is a straightforward task and may influence food choices at home. However, socioeconomic factors such as income and access to transportation options may limit or expand the area that should be considered and may affect the frequency of grocery shopping. Researchers can measure the number of food advertisements individuals are exposed to over a given period, but media and advertisements that target the primary food shopper and preparer in a family may have more influence than those targeted at other family members. The main difficulty in using ecological frameworks is thus knowing which factors to include to achieve a comprehensive yet feasible intervention strategy. Furthermore, although data has clearly shown ties between environment and eating behavior, researchers still do not know how much environmental change is needed to change behavior or how long an environmental change needs to remain in place before behavior change occurs (King 2010). Quantitative measurements need to be cross-checked with qualitative findings.

The Microscale Environment Design Space

Murray's (1938) concept of "press" describes the power of an external object to affect the well-being of an individual. While individual factors such as desire and skill level also play roles in determining behavior (Lawton 1988), environmental press has been shown to have a powerful influence regarding what and how much people eat (Horowitz et al. 2004; Austin et al. 2005; Brownell et al. 2010). This section presents a list of factors in the individual's personal environments that impact eating behavior, along with related design interventions. Designers may choose to target a specific factor or, since factors are often interdependent, envision intervention strategies that exploit or influence relationships among multiple factors.



Figure 4. An external cue that may trigger food-related thoughts:
Caress Whipped Soufflé body wash in blackberry cream

Source: <http://www.caressskin.com/>

Clothing and wearable technologies

Although clothing may be the most immediate, external, physical environment, it has been studied more for its influence on physical activity than on eating behavior. However, the increased physical demands of heavy clothing (Duggan 1988) and multilayered clothing (Teitlebaum and Goldman 1972) as worn in the Arctic and Antarctic, do seem to stimulate appetite (LeBlanc 1957). Clothing can also inhibit or provide longer-term feedback about eating behavior; loose clothing makes changes in body shape less noticeable, whereas people tend to notice weight gain when they no longer fit into specific articles of clothing like jeans. Keeping “signal clothing” as a reminder of weight goals or achievements can motivate some individuals to sustain healthful eating habits.

Smart clothing equipped with biomedical sensors (Axisa et al. 2005) and wearable technologies like Nike+ (Nike, Inc. 2011) and the BodyMedia FIT (BodyMedia, Inc. 2011) monitor physiological state and, in conjunction with some kind of communication mechanism, provide feedback about the number of calories the wearer burns. When equipped with GPS or other context-sensing technology, wearables can also deliver persuasive information to influence behavior in real time (Chatterjee and Price 2009).

Food environment

Wansink (2004) described the food environment as the set of factors that relate to the way food is provided or presented. Four of the factors he mentions that influence how much people eat are salience, structure, package and portion size, and serving containers.

Salient food can trigger impulse eating. Salience may be externally cued by a visible candy dish (Wansink, JE Painter, and Lee 2006) or appetizing aroma (Jansen and van den Hout 1991) serving as continual temptation. A less obvious example of salience is related to the stockpiling of food. When purchased in bulk from wholesalers like Costco, food comes in large containers that may be more difficult to store than small containers. When such food is stored in visually prominent places in the home, it is eaten twice as quickly as non-stockpiled food (Wansink 2004). Thinking about a food, even without an external cue, can also increase its salience; in one study, people who wrote a detailed description of the last time they ate soup proceeded to eat 2.4 times as much soup over the next two weeks as the control group (Wansink 2004). Salience may also be internally cued by a food craving or strong negative emotion such as boredom, depression, or loneliness (Wansink 1994).

The structure of an assortment of food can also influence how much people eat. People believe they will enjoy a food more if it appears to have a high level of variety, and increasing the perceived variety of food can increase

the amount of food consumed. For example, Kahn and Wansink (2004) found that people ate 43% more M&M candies from a bowl containing candies in ten colors than seven colors. The researchers also found that organization has an effect; when offered an assortment of six flavors of jelly beans either sorted by color or unsorted, people ate 69% more jelly beans from the disorganized assortment.

The size of food packaging and portions suggest consumption norms. Unfortunately, the supersizing trend of recent decades has shifted these norms into obesogenic territory, increasing everything from restaurant portions to amounts listed in recipes. Research shows that when presented with larger portions, people eat more (Rolls 2003). They even eat more out of a large container that is only partially-filled compared to a small container containing the same volume of food (Wansink 1996). In fact, package size can be as influential a factor as taste when it comes to how much someone will eat. Wansink and Kim (2005) found that, given either medium or large buckets of stale 14-day-old popcorn, moviegoers consumed 33.6% more popcorn from the large buckets.

The size and shape of serving containers also create illusions that influence how much people consume. People judge volume of a drinking glass by its height, not its width (Wansink and van Ittersum 2003). Thus, a volume of liquid in a tall, narrow glass appears greater than the same volume in a short, wide glass. Such illusions matter because the size, or perceived size, of a serving container suggests an appropriate amount to consume. People tend to serve themselves more food and eat more of it when using larger bowls, and they tend to pour more cough medicine into larger spoons (Wansink, Vanittersum, and J Painter 2006).

Wansink (2004) provided a set of specific suggestions for individuals to alter their personal food environments in ways that help them control how much they eat. These include keeping tempting, unhealthy foods out of sight, making healthy foods more easily accessible, always transferring food from a package to a plate or bowl before eating, and using smaller serving dishes and spoons. By taking advantage of human psychology, he suggested that people can counteract the influences that lead to overeating without relying solely on willpower.

Eating environment

In contrast to the food environment, Wansink (2004) described the eating environment as the ambient factors associated with eating, including atmospherics, eating effort, the presence or absence of other people, and eating distractions.

Atmospherics refer to the ambient characteristics of the physical environment, including temperature, lighting, sound, smell, and color. Studies on atmospherics' influence on eating behavior have been somewhat



Figure 5. Colors in a food display direct attention and stimulate appetite

*Photo by Mo Riza.
<http://www.flickr.com/photos/moriza/421707969/>*

contradictory. People drink more when the ambient temperature is high (Casa 1999). Anecdotally, people eat more in cold environments and less in hot environments. However, Westerterp-Plantenga (1999) found no difference in how much people ate after exposing them to extreme short-term temperature changes, and studies of soldiers' calorie intake in hot environments have failed to produce consistent results (Stroebele and De Castro 2004). Increasing lighting and noise levels in restaurants and bars has been reported to reduce the amount of time spent there, whereas dim lighting and soundproofing through the use of carpeting, drapes, and padded ceilings encourage patrons to linger and thus consume more (Sommer 1969). Table lighting that create a comfortable and intimate eating atmosphere while contrasting with darker surroundings (Alexander, Ishikawa, and Silverstein 1977) can prolong the duration of the meal, which has been shown to increase consumption (Bell and Pliner 2003). Patrons also spend more time and money in restaurants with pleasant and familiar music, (Caldwell and Hibbert 2002), but loud, unpleasant music has also been found to increase consumption (Stroebele and De Castro 2004). Ambient smells can either enhance or blunt the taste of food (Stevenson, Prescott, and Boakes 1999), thereby influencing the enjoyment of a meal. The smell of food may increase its salience and prompt people to begin eating (Stroebele and De Castro 2004). Environmental color has been shown to unconsciously influence mood, sensation, appetite, food choice, hunger, and palatability by stimulating physiological changes, producing emotional responses, directing attention, and shaping people's expectations (Stroebele and De Castro 2004). On a physiological level, bright and warm colors tend to arouse and stimulate, while dark and cool colors promote relaxation; warm reds (coral, flamingo, and vermillion), oranges (peach, pumpkin), warm yellows, light yellows, and clear greens have been shown to stimulate appetite, while purple-violet, purplish red, orange-yellow, yellow-green, mustard, grayed tones, and gray have the opposite effect (Mahnke 1996). Color can also be used in food display areas to direct attention and make items stand out or minimize their visual impact (see **Figure 5**). On the individual level, memories associated with specific colors can affect mood (Mahnke 1996). Additionally, people's expectations of food colors influence their judgment of food's freshness and palatability. Supermarkets use light with a spectrum closer to red in their meat display counters to enhance the appearance of cuts that shoppers expect should be red, and food manufacturers add dyes to processed foods to shift the product's color closer to consumer expectations (Mahnke 1996).

Effort associated with eating also influences what and how much a person will consume. Meal-replacement programs that conveniently provide nutritious food in predetermined portion sizes have been shown as a more effective weight loss strategy than dietary counseling (Wing, 2001). People also tend to drink more milk when the milk dispenser is nearby

(Lieux et al., 1992) and more water when the water pitcher is placed on their table than when it is further away (Engell et al., 1996). Obese people are especially likely to eat more when food is easy to access and less when it is difficult to access (Schacter, 1971). The eating behavior of nonobese people, however, is also influenced by the effort required. When a candy dish was placed on their desk, secretaries ate more candies than when they had to stand and walk two meters for them (Wansink, JE Painter, and Lee 2006). The difference in physical effort in cases like this is small, suggesting a psychological effort associated with eating may also play a role. Wansink (2004) suggested making tempting foods less convenient by storing them in hard-to-reach places and keeping serving dishes out of the dining area.

Social factors affecting how much people eat include group size, social motivation, and consumption norms. The larger the group, the longer a meal lasts (Sommer et al., 1997), particularly when people dine in comfort with familiar companions (Bell and Pliner 2003). De Castro (1992) found a linear relationship between the number of people at a meal and both the meal duration and rate of eating. Wansink (2004) hypothesized that people eat more in relaxed group settings because they are less aware of how much they are eating and suggested, to compensate, that individuals model their own eating behavior on the companion who appears to be eating the least or slowest. It is important to note that both group size and social motivation interact to influence eating behavior. Pliner et al. (1990) found that people actually eat less than usual when dining with unfamiliar companions in situations that heighten self-consciousness, such as first dates. People also use social cues to gauge what and how much to eat. Watching their companions eat, they will actually eat more or less to reduce the amount of variance between themselves and the observed consumption norm (Polivy et al. 1979; Herman, Roth, and Polivy 2003).

People eat longer meals when they are distracted. Time spent watching television is positively correlated with obesity (Stroebele and De Castro 2004), and even listening to a story on tape while eating results in significantly higher calorie intake than eating in silence (Bellisle and Dalix 2001). Researchers speculate that people eat more when distracted because their self-awareness decreases, reducing their ability to monitor food intake, and because distractions can extend the duration of a meal (Wansink 2004).

Several technology-based interventions have been designed to increase people's awareness of calories and other nutritional information in domestic settings. However, they focus primarily on the food preparation and cooking as opposed to eating environments. Chi et al. (2008) embedded sensors in a kitchen to track calories in food ingredients and provide real-time feedback to users during food preparation and cooking. Krantz et al. (2007) designed an intelligent cutting board that acts as a food scale, recognizes the food being prepared on it, and gives cooking guidance. The MIT CounterIntelligence project sought to augment residential kitchens by

collecting data from the physical environment and projecting task-specific interfaces onto the refrigerator, cabinets, countertop, and food (Bonanni et al., 2005). Chang et al. (2006) did target the eating environment in creating a dining table that tracks what and how much people eat on it; however, the work focused on the technical challenges of measurement rather than influencing eating behavior.

Behavior Change and Persuasive Design

Facilitating behavior change to promote wellness has been an area of active inquiry across multiple research domains, from public health to psychology to human-computer interaction. The Behavior Change Consortium (BCC), a collective of 15 behavior-change projects funded by the National Institutes of Health, focuses on the reduction of tobacco dependence and improvement of physical activity, nutrition, and other health behaviors. In the domain of nutrition, at least 12 theoretical models have been used in BCC studies (Ory, Jordan, and Bazzarre 2002), the 5 most common being Social Ecological Theory (Bronfenbrenner 1981), Self-Determination Theory (Ryan and Deci 2000), Social Cognitive/Learning Theory, the Transtheoretical Model (Prochaska and Diclemente 1994), and Motivational Interviewing (Rollnick et al. 2010). Social ecological theory was described earlier and provided the systems framework for this work. The other theories, having also informed the design process, are reviewed here.

Self-Determination Theory

Self-determination theory (SDT) identifies three innate psychological needs – the needs for competence, relatedness, and autonomy – that underlie motivation and are necessary for personal well-being. Research guided by SDT also examines environmental factors to the extent that they interfere with these needs. SDT hinges on understanding motivation as multifaceted concept. According to Ryan and Deci (2000), there are three types of motivation: intrinsic motivation, extrinsic motivation, and amotivation.

Intrinsic motivation refers to engaging in a behavior for the inherent satisfaction in doing so. For example, a person who enjoys cooking may choose to create a gourmet meal for the sheer enjoyment of the experience. Designers can tap intrinsic motivation by framing desired behaviors as positive experiences in and of themselves. Psychologist Mihaly Csikszentmihalyi (2008) found that optimal experience involves a challenge that calls fully upon a person's abilities without overtaxing them (Csikszentmihalyi 2008). There must be a balance in which tasks are not so easy that they trigger boredom, yet not so difficult that they produce frustration and anxiety. Video game designers have embraced this requirement by striving to dynamically match the difficulty curve of their

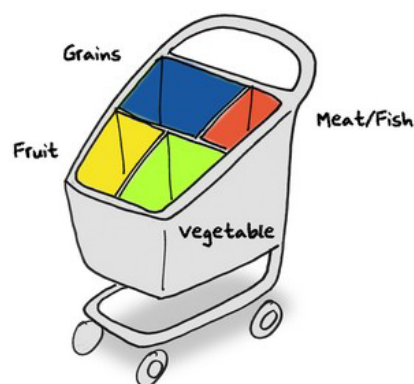


Figure 6. Winning concept from the Open IDEO challenge, "How can we raise kids' awareness of the benefits of fresh food so they can make better choices?" – based on the experiment at New Mexico State University

<http://openideo.com/open/how-might-we-give-children-the-knowledge-to-eat-better/winner-announced/shopping-cart-provokes-healthier-purchases/>

games with the learning curve of players.

Extrinsic motivation refers to acting in response to external pressures or incentives to attain an outcome separate from the task at hand. A person offered money to create a gourmet meal may choose to do so for the financial reward, regardless of the enjoyment derived from the act of cooking itself. Designers should exercise caution in using extrinsic motivations such as money or points, which have been shown to be counterproductive in situations when people are performing anything more complex than rote tasks (Ariely et al. 2009). Internalizing extrinsic motivations, however, has been associated with greater success in maintaining weight loss among morbidly obese patients, improving glucose control among diabetics, and enhancing subjective wellbeing (Ryan and Deci 2000). The desire to meet the three innate needs for relatedness, competence, and autonomy can drive people to internalize extrinsic motivations. To support their desire for relatedness, they may adopt certain behaviors in order to fit in with peers. To support their desire for competence, they may repeatedly perform tasks because they feel they are good at them. Those who have a sense of autonomy over their decisions are more likely to internalize values than those who feel that the values have been imposed upon them.

Amotivation refers to a state in which motivation for a specific task is absent. Amotivation may seem unproductive in terms of facilitating behavior change, but in fact, people need neither intrinsic nor extrinsic motivation to engage in healthy behaviors. Deterding (2009) describes this productive form of amotivation as "tangential motivation," as it does not stem from the conscious desire to meet a behavioral goal but may still result in a desired behavior being performed. For example, researchers at New Mexico State University were able to produce a 102% increase in fruit and vegetable purchases by visually compartmentalizing shopping carts with a line of yellow duct tape across the width of the carts and adding a sign that directed shoppers to place fruit and vegetables in front of the tape line and other groceries behind the line (Bannister 2010). Although the new shopping carts did not directly motivate shoppers to make healthier food choices in the grocery store, they suggested norms for purchase quantities of different food categories that subsequently influenced shopping behavior. Tangential motivation can play a key role in the design of personal environments, increasing the odds of success at moments when neither intrinsic nor extrinsic motivation for performing desired health behaviors is high.

Social Cognitive/Learning Theory

Social cognitive theory, also known as social learning theory, posits that people learn by observing and imitating what others do. Behavior change is thus determined by environmental, behavioral, and personal factors that reciprocally influence each other. In the context of self-regulation, people

monitoring their own behavior on a consistent basis can gather valuable information for self-diagnosis, motivate themselves through progressive goal-setting, and reflect on their own performance. Research has shown that attending to successes during self-monitoring increases desired behavior, while focusing exclusively on failures results in little change or lowers performance; using failures to identify possible causes and suggest possible corrective actions, however, can be beneficial (Bandura 1991). Individuals compare their current behavior to their previous behavior and strive for progressive improvements (Bandura and Schunk 1981). Because the progressive mastery of subgoals can provide more motivation for behavior than the accomplishment of an overarching end goal, strategies for behavior change should combine long-term aspirations with short-term self-guidance that promotes perceived self-efficacy (Bandura 1991).

Transtheoretical Model

Prochaska and DiClementi's transtheoretical model describes health behavior change as a six-stage process:

1. precontemplation: no intention to change within the next six months, typically due to being uninformed or unmotivated
2. contemplation: intending to change in the next six months
3. preparation: planning to change in the next month and has taken some behavioral steps in this direction
4. action: changed behavior for less than six months
5. maintenance: changed behavior for longer than six months and working to prevent relapse
6. termination: no temptation to relapse and total self-efficacy

According to the transtheoretical model, people move through the stages over time through processes of change, ten of which have received the most support through empirical research (see **Figure 7**).

Constructs	Description
Processes of Change	
Consciousness raising	Finding and learning new facts, ideas, and tips that support the healthy behavior change
Dramatic relief	Experiencing the negative emotions (fear, anxiety, worry) that go along with unhealthy behavioral risks
Self-reevaluation	Realizing that the behavior change is an important part of one's identity as a person
Environmental reevaluation	Realizing the negative impact of the unhealthy behavior or the positive impact of the healthy behavior on one's proximal social and/or physical environment
Self-liberation	Making a firm commitment to change
Helping relationships	Seeking and using social support for the healthy behavior change
Counterconditioning	Substitution of healthier alternative behaviors and cognitions for the unhealthy behavior
Reinforcement management	Increasing the rewards for the positive behavior change and decreasing the rewards of the unhealthy behavior
Stimulus control	Removing reminders or cues to engage in the unhealthy behavior and adding cues or reminders to engage in the healthy behavior
Social liberation	Realizing that the social norms are changing in the direction of supporting the healthy behavior change
Decisional Balance	
Pros	Benefits of changing
Cons	Costs of changing
Self-Efficacy	
Confidence	Confidence that one can engage in the healthy behavior across different challenging situations
Temptation	Temptation to engage in the unhealthy behavior across different challenging situations

Figure 7. Transtheoretical model constructs

Source: Glanz, Karen, Barbara K. Rimer, and K. Viswanath. 2008. *Health Behavior and Health Education: Theory, Research, and Practice*. John Wiley and Sons, July 28, 99.

People in the preparation stage are considered to be more promising candidates for action-oriented health intervention programs than those in the earlier stages, who may be too ambivalent to take meaningful action. They arrive at the decision to change after weighing pros and cons of changing, a model of decision-making called decisional balance. Self-efficacy refers to the situation-specific confidence that an individual can cope in high-risk conditions without relapsing to old behavior. Temptation – the intensity of urges to relapse – is typically driven by three factors: negative affect or emotional distress, positive social situations, and craving.

People apply specific processes of change when moving from one stage to the next (see **Figure 8**). Conscious evaluation of behavior and environment are most relevant in the earlier stages, while unconscious controls related to behavioral conditioning and environmental supports serve better in the maintenance and termination stages (Glanz, Rimer, and Viswanath 2008).

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

Note: Social liberation was omitted due to its unclear relationship to the stages.

Figure 8. Processes of change that mediate progression between stages of change in the transtheoretical model

Source: Glanz, Karen, Barbara K. Rimer, and K. Viswanath. 2008. *Health Behavior and Health Education: Theory, Research, and Practice*. John Wiley and Sons, July 28, 100.

Motivational Interviewing

The transtheoretical model contributed to the development of motivational interviewing, a method shown in healthcare settings to be more effective in promoting health behavior change than traditional advice (Wilson and Schlam 2004). Rather than directing patients to make lifestyle changes, which is often met with ambivalence, resistance, or passivity, the physician adopts the role of a well-informed guide. Three operational principles underlie motivational interviewing:

- Engage with and work in collaboration with the patient.
- Emphasize the patient's autonomy over decision-making.
- Elicit the patient's motivation for change.

By drawing out the patient's motivations and ideas for change, the physician helps them to retain a sense of autonomy, promote self-efficacy, and feel more engaged with personal health decisions. In motivational interviewing, the physician should ask open-ended questions that invite the patient to consider how and why they might change. Furthermore, the physician allows the patient to set their own agenda by asking which issue or behavior they want to tackle first and what targets they want to set, while providing guidance as needed. Motivational interviewing is thought to help the individual progress through the stages of change, particularly those in precontemplation and contemplation who are not yet ready to make a commitment.

Persuasive Technology

Researchers in the fields of psychology, computer science, and human-computer interaction have been exploring ways in which interactive computing technologies can be used to persuade people to change their behavior. Persuasion, in this context, is generally understood as getting someone to do or believe something through inducement or argument. Unlike coercion, which can also produce behavior change, it does not employ force or threats.

According to Fogg (2002), technologies can play three roles in persuading people to change their behavior: as tools, as media, and as social actors. As tools, they can take measurements or make certain behaviors easier. As media, they can enable experiences that motivate or persuade. And as social actors, they can exert social influence to reward people with positive feedback, model a desired behavior or attitude, or provide social support. By studying how persuasive technologies might integrate into the food ecosystem and manipulate factors that influence eating behavior, designers can envision new forms, applications, and strategies to counteract negative

influences beyond the individual's control. Fogg describes seven strategies that persuasive technologies can leverage:

1. suggestion: intervening at the right time with a compelling suggestion
2. reduction: simplifying a complex task
3. tunneling: having the user rely on an expert for guidance
4. tailoring: customizing to provide more relevant information to the user
5. self-monitoring: automatically tracking desired behavior
6. surveillance: publically observing behavior
7. conditioning: reinforcing target behavior

The suggestion strategy makes use of the principle in rhetoric known as *kairos* – the opportune moment at which the appropriate action will produce success. Designers looking to facilitate behavior change using the principle of *kairos* should consider two key moments:

- When and where is the person most motivated to act?
- When and where is the person most capable of taking action?

Triggering desired behavior when and where those two moments intersect results in effective facilitation.

To evaluate persuasive technologies in the health domain, Andrew et al. (2007) proposed dimensions of a design space that relate to the delivery and content of suggestions:

Technological

- subtleness of notification: ranging from subtle signalling to something that requires explicit acknowledgement
- display or feedback mechanism: how the suggestion is delivered to the user (embedded in appliance, personal device such as mobile phone, or environmental display such as an interactive wall)
- notification modality: which sensory channels deliver the suggestion
- sensor or context source: how the person's relevant context is detected
- timeliness: whether a suggestion is provided just-in-time or retrospectively
- interactivity: whether suggestions are simply presented or require acknowledgement/input

Content

- specificity of message: ranging from general (“Eat more vegetables”) to very specific (“Have a green lettuce side salad at dinner every night this week”)
- affect: positive, negative or neutral
- adaptive affect: affect that changes in response to the user’s state
- argumentation strategy: may rely more on logical or emotional argument
- overtness: whether a suggestion is more overt or vague in its wording
- explicitness: ranging from informative (implying a suggestion) to provocative
- social components: the level of social integration supported

Comparing persuasive technologies across dimensions, the researchers argue, can reveal areas for improvement. For example, positive affect is more likely to engage users than neutral or negative affect, a finding consistent with social cognitive/learning theory as described earlier. Content that is overly general poses a risk of misinterpretation, while highly specific content may seem too detailed after a period of familiarization.

Evidence suggests that persuasive technologies do have the potential to change health behaviors. For instance, web-based tools including as fitness and nutrition diaries, information sources for diet and exercise, and personalized weekly emails have been shown to have positive impact in controlled studies (Chatterjee and Price 2009). Virtual coach technology may also be used in the future to teach wellness-related skills (Ding et al. 2010). These examples all operate on an explicit level, enabling people to consciously pursue their wellness goals.

Persuasive Design

Lockton et al. (2008) include persuasive technology as part of a wider field they call Design with Intent, or design intended to produce specific user behavior. Design with Intent also encompasses the concepts of affordances and constraints from human-computer interaction, poka-yoke – the concept of mistake-proofing popularized in Japanese industrial design, and a host of other social and commercial strategies that operate across the spectrum from conscious to unconscious influence.

Taking a similar, broad perspective on persuasive design, Deterding (2009) classifies three families of behavior change strategies:

1. Constraints
2. Facilitation
3. Motivation

Constraints limit possible behaviors or preclude unwanted behaviors, thereby reducing opportunities to deviate from predetermined goals. To stop eating late at night, for example, a person can adopt a “food policy” (Wansink 2006) to not eat between the hours of 7:00 PM and 7:00 AM. Strict adherence to this policy constrains behavior in such a way that the person cannot indulge in regrettable food choices after hours.

Facilitation makes it easier for people to translate intentions into repeatable actions. It can be accomplished by making behavior and its consequences both salient and measurable, which is the goal of personal informatics (Li 2011). Personal informatics make an impact when they are presented in a way that clearly relates data and individual behavior. They enable users to see not only the the immediate consequences of their actions but also how those actions affected the big picture. To foster engagement with personal informatics and the activities they represent, it may help to visualize data in an abstract form (Consolvo et al. 2008; Hsieh et al. 2008). Abstract visualization can appeal on a more emotional level than raw numbers, which may in turn be more successful in motivating change than focusing on rational arguments (Lehrer 2009).

Motivation can be fostered either consciously or unconsciously. Conscious motivation is commonly tied to the setting and achievement of goals as described by Edwin Locke’s goal setting theory (Locke et al. 1990) and to perceived self-efficacy (Bandura and Schunk 1981). Unconscious motivation activated by subliminal priming – triggering thoughts about target behaviors and the rewards associated with them – can motivate people to invest more effort in those behaviors (Aarts, Custers, and Marien 2008).

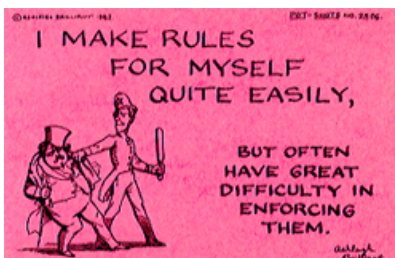


Figure 9. Pot-Shot by Ashleigh Brilliant
 Source: <http://www.ashleighbrilliant.com>

Design Implications

An ecological systems approach provides interaction designers with a holistic framework to explore the influence of environment on health and eating behavior. Mutually reinforcing interventions at multiple levels, collectively spanning physical, social, cultural, economic, and political dimensions, are likely needed to transform obesogenic environments into health-promoting ones (King 2010; McLeroy et al. 1988). Therefore, designers targeting microscale physical and social environments should not only pay attention to how dimensions interact, but also consider how their solutions interact with the entire food ecosystem. This is not a simple task, and as part of the effort, more accurate and comprehensive measuring, tracking and monitoring tools will be needed. While such tools aid in the evaluation of solutions, however, they should not be mistaken as solutions to obesity in themselves.

To make a real impact on the state of obesity in the U.S., designers must first appreciate the powerful effects of person-environment interaction. Moreover, they should use what is already known about environmental influences on behavior to shape those factors within their control. Persuasive design strategies should be leveraged as appropriate for the target audience, taking advantage of both conscious and unconscious channels to deliver mutually reinforcing messages. In the most ethical scenarios, people will know the overall intention behind persuasion in advance and agree after the fact that they have changed voluntarily. With these criteria satisfied, they need not be conscious of every persuasive design element on the microscale level. Indeed, over time, the environmental changes that provide scaffolding for desired behavior changes should fade from notice and become incorporated into the daily patterns of existence.

Chapter 3:

Design Approach

Mapping the System

The territory of this design problem is complex, with multiple dimensions and multiple levels of scale within each dimension. In examining the influence of environmental factors on eating behaviors, it is constructive to analyze these dimensions and how they relate to each other using a systems approach. **Figure 10** presents an ecological framework for categorizing influences on eating behavior, grouping them broadly into three levels: macroscale environment, personal environment, and individual.

The macroscale environment refers to influences that act on a population level to shape eating behavior, such as food policy and regulations, community design, and culture. The personal environment refers to influences in the individual's immediate settings, including such factors as food packaging, dining companions, and nutrition labels, and can be analyzed across physical, social, and information dimensions. The individual level encapsulates characteristics of the mind and body that influence behavior and are unique to a given person. By focusing on the two inner levels of the framework, this thesis aims to leverage the dynamics between personal environments and individual to shape behavior.

Design Process and Methods

The process leading to a final design solution consisted of three phases: exploration, concept generation, and refinement.

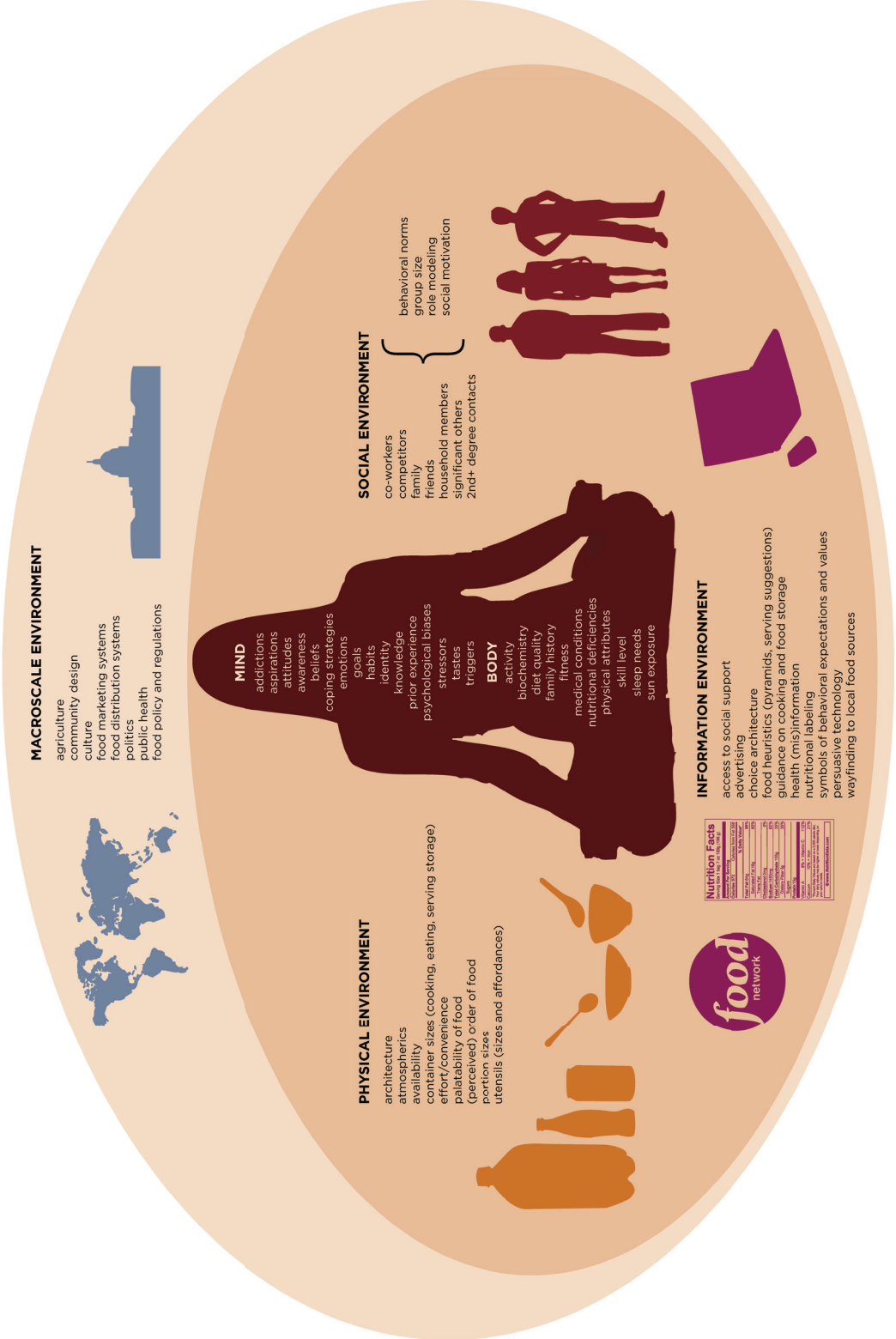
The exploration phase began with the identification of a general problem area: the rising prevalence of obesity in the United States. A literature review was conducted across multiple domains to map the territory of the issue, learn about related work, and understand challenges faced by others tackling this issue. Once a preliminary understanding was established, a hypothesis was posed that by redesigning aspects of their personal environments, individuals can be more successful in changing their own eating habits to achieve their wellness goals. This hypothesis guided subsequent primary research in the form of surveys, interviews, and journaling activities, which facilitated engagement with stakeholders

and further clarified the current state in terms of typical problem scenarios and design opportunities (see the Appendix for IRB application materials). Findings were synthesized using mapping and diagramming, personas, scenarios, and a list of design considerations and actionable criteria.

In the generation phase, concepts were ideated both individually and in brainstorming sessions with immediate feedback from stakeholders. They were analyzed in terms of how well they addressed unmet needs and opportunities that had been identified in the exploration phase, and the most promising concepts were explored through sketches, more detailed scenarios, and storyboards. Ultimately the concept chosen for the final design solution was that of a web-based tool for managing various aspects of wellness and personal environment design. A competitive analysis of related products and services revealed that the management of physical environmental factors is currently not addressed in the market, despite substantial evidence that physical environment significantly impacts food choices and eating behaviors. A card sorting activity was conducted to better understand people's mental models of personal environments and their relation to current and desired eating habits.

The concept of a web-based tool for personal wellness transformation was refined iteratively through the production of wireframes, mockups, and narratives of use. A poster and video sketch communicate the value of the tool and the aesthetic experience of the interaction to a general audience and were used to solicit feedback that shaped further concept refinement and informed next steps.

Figure 10. Influences on food choices and eating behaviors



Chapter 4:

Redesigning Personal Environments and Behaviors

Introduction

People are creatures of habit. We don't need to think through the pros and cons of brushing our teeth every morning or plan a fresh route from home to work. Our reliance on habit keeps us from being overwhelmed by the thousands of decision points we encounter each day, but it can also undermine our efforts to make positive lifestyle changes. With kitchens full of processed foods, cars large enough to accommodate bulk food purchases, and workplaces that furnish stress and snacks in equal measure, the majority of Americans are surrounded by environmental influences that promote overeating, unhealthy food choices, and physical inactivity. Personal environments – those settings in which we spend most of our daily life – are filled with cues that reinforce existing habits yet only dimly impact our conscious awareness. This thesis seeks to increase people's awareness of how personal environments influence their food choices and eating behaviors and provide them with the means to redesign their own environments to promote wellness.

Exploratory Research

The exploration phase of design began with the identification of a general problem area – the rising prevalence of obesity in the United States. What are the causes of this trend? Which drivers are systemic, and which ones are within the individual's power to change?

A literature review was then conducted to map the territory of the issue and learn about related work in the fields of HCI, behavioral economics, marketing, medicine, nutrition science, psychology, and public health (see Chapter 2). Factors that influence food choices and eating behaviors in personal environments were identified (see **Figure 10**) and challenges faced in prior health intervention programs were noted. Once a preliminary understanding of the problem domain was established, a hypothesis was posited that by redesigning aspects of their personal environments, individuals can facilitate their own behavior change to promote wellness. This hypothesis guided subsequent primary research in the form of surveys,

interviews, and journaling activities, which facilitated engagement with stakeholders and further clarified the current state in terms of typical problem scenarios and design opportunities. Findings were synthesized using mapping and diagramming, personas, scenarios, and lists of design considerations and actionable criteria (see the Appendix for a poster summarizing exploratory research).

Method 1: Survey

To sample a range of attitudes and behaviors, an anonymous, web-based survey was conducted of people’s everyday eating practices, nutrition goals, and motivations for eating healthfully (see the Appendix for survey questions). Out of 56 participants (average age 33.2, 32 females total), 75% of participants said there were specific situations or places that set off a period of overeating they later regret, with instances of negative affect (depression, feeling down, loneliness, frustration, and anxiety), fatigue, group gatherings, and high-stress situations being the most commonly cited. Late-night eating was a common recurring issue.

CRAVED FOODS

wine
sweets
salt
butter
cookies
ice cream

TRIGGER FOODS

fried cured pork
Duncan Hines Warm Delights
single servings of chocolate
pudding
peanut butter
goldfish crackers
Starbucks frappuccino

Most common motivations for eating healthfully
disease prevention and longevity
overall health and well-being
weight control
physical appearance
competitiveness in sports
liking the taste of healthy foods
fear of illness and death
knowledge of feeling good afterward

Most common challenges to eating healthfully
making the commitment of planning and time to shop
relative convenience of unhealthy foods in comparison to healthy foods
cravings for unhealthy foods
cost of good foods
fatigue
temptation outside the home
specific trigger foods

Method 2: Interviews

To gain a deeper insight into how people think about healthy eating and their own behavior, 20 individual semi-structured phone interviews of approximately 20 minutes each were conducted (see Appendix for interview questions). The objective of the interview was to learn

- how the individual determines whether a meal is healthy
- personal strategies and tactics for healthy eating
- personal struggles related to eating behavior
- how physical surroundings affect eating behavior, both positively and negatively
- how social surroundings affect eating behavior, both positively and negatively

"When I was living in college, we were all trying to save money. We ate all kinds of unhealthy stuff like ramen noodles."

"I grew up eating healthy, but in school, I didn't know how to cook and ate cookies and pudding and Chef Boyardee the entire freshman year."

"Time and space play a big part in what you're consuming. You have to go out and buy the food, you have to prepare it."

"As long as I schedule grocery store time, I'm fine. Otherwise I get takeout."

"Eating is something I had to do, not an experience to be had."

"I am on nicotine gum and haven't smoked since Monday. I don't know how long I'm going to go, but my appetite has increased - it's completely out of control."

"I have no self-control over chocolate pudding. I will eat 6 servings and regret it afterward."

Interview subjects generally reported that they

- do not pay much attention to how healthy their meals are
- do not have strategies for healthy eating
- may apply tactics such as compensation ("If I'm eating too much meat one week, next week I'll try to balance out with more vegetables and fruit") and food rules ("Protein is less than 25% of my plate")
- use qualitative rather than quantitative assessments to gauge the nutrition quality of a given meal, such as whether it is greasy or contains vegetables, protein, or sugar
- have experienced both positive and negative social influences on their eating behavior
- consider the home environment to be a zone in which they have the opportunity to exercise premeditated control over their food choices and usually avoid stocking foods at home that they consider to be unhealthy temptations

They acknowledged that social factors influence their eating in both positive and negative ways:

- "When I'm with friends who order healthy, that encourages me to do that too. Or if someone around the same size as me has stopped eating, I'll think to stop, too."
- "At work, my colleagues are all very health-conscious eaters. One has salad every day for lunch. Another one exercises a lot, so healthful living is part of the culture. That's part of the reason I choose to bring

certain things to work for lunch. It makes me self-conscious about what I eat in front of other people.”

- “My friend brought a fig cake to studio...I have very little control when I see something sweet.”
- “Went out to lunch...6 people...I wanted eggrolls as my side, but I was going to order salad because I would feel terrible being the only person ordering eggrolls. Then someone else ordered eggrolls, so I went ahead and ordered the eggrolls, too.”
- “When I’m with friends or family, it can make people feel defensive if I choose differently than them. I get frustrated walking the line between being polite and giving in. I try to be nice about it but sometimes people try to persuade me.”

The data suggested that people do not invest much in the development of healthy eating strategies for a variety of reasons:

- social pressures
- desire to save money
- lack of skills/knowledge
- lack of motivation
- lack of time and/or space to plan and prepare meals
- not built into routine
- too much mental or physical effort required compared to alternatives
- lack of enjoyment
- substance addiction

A few reported that they actively design their personal environments to influence their eating behaviors:

- “Being part of the CSA (community supported agriculture) helped a lot. You get a lot of fruits and vegetables and need to use them up.”
- “We try not to keep anything unhealthy snack foods in the house. Sometimes if I’m hungry I forage-eat, and if it’s not there, I can’t eat it. I also do the same at the office. There is a vending machine, but I don’t keep much cash or coins on me.”
- “At home, I try to find a smaller size plate because I tend to clean my plate and I’m a visual eater.”
- “I use a mug instead for cereal so it’s more of a measurable quantity.”

- “I bought Nalgene water bottles to work to remember to drink water in the day.”
- “I have a stack of recipe books in the kitchen. They tend to be healthy recipes.”

In summary, the interviews revealed many combinations of factors contributing to current eating habits and the perceived self-efficacy of healthful eating. Those participants who expressed interest in tackling personal wellness challenges also reported using various tools on a short-term basis to track their food intake and wellness goals:

- personal trainer
- paper-based food journal
- Lose It! iPhone application*
- MyPlate on LiveStrong.com*
- PEERtrainer.com*

Figure 11. PEERtrainer weight loss community forum

*For more information, see the competitive analysis section.

PEERtrainer™

home join take a tour success stories groups teams lounge diet fitness health coaching

community spotlight logs/blogs etiquette invite your friends success stories

lounge community:

SEARCH: **GO** **ADD NEW THREAD**

Topic:	Replies:	Last Post:
Antifreeze in our Food?!	5	Fri. May 6, 3:23pm
My Story	4	Fri. May 6, 2:14pm
kids are driving me nuts. Need help on how to deal with high energy kids	6	Fri. May 6, 11:06am
Is Olive Oil Good For The Skin?	196	Fri. May 6, 9:45am

invite your friends!

Buddy up. Slim down. Send an invitation to your friends to become a member of the PEERtrainer community today.

INVITE

- our sponsor -

Ads by Google

Sensa For Weight Loss

Revolutionary Weight Loss System. Patent-Pending Tastant Technology.

www.TrySensa.com

Source: <http://www.peertrainer.com/loungeCommunityMain.aspx>

Method 3: Food Journals

To understand the physical and social aspects of personal environments in which people eat, fifteen participants were recruited (five men and ten women) to keep a seven-day food journal. Each participant was provided with a bound paper journal, a ten-question dietary questionnaire, and instructions to document all of their meals (see the Appendix for details).

The dietary questionnaire, developed by Polivy et al. (1979), was used to assess whether or not participants had a restrained or unrestrained eating style. The restrained eating style is strongly correlated with behavioral and physiological characteristics of the obese as well as tendencies toward binge eating. Participants scoring sixteen or more on the questionnaire were designated as restrained, and those scoring less than sixteen were designated as unrestrained.

For the seven day activity, participants were instructed to take digital photographs of both the meal itself and the immediate setting in which they ate and answer questions in the journal about the following topics:

- their satiety levels at the beginning and end of the meal
- what they ate
- whether they felt they had eaten a healthy meal
- physical and social aspects of the eating environment, including their comfort level

Additionally, each participant was given a unique email address to which they would submit their journal photographs. Once sent, the photographs automatically appeared on a private blog, viewable only by the participant and the researchers. At the end of the activity, participants were debriefed in a short follow-up interview in which they were encouraged to reflect on the journaling experience.

The questionnaire responses supported findings in the literature, in that participants with a restrained eating style were more likely to have a BMI in the overweight range compared to those with an unrestrained eating style. They also indicated that women were more likely than men to think about food and experience guilt after overeating. Some interesting patterns emerged from the data:

- A given participant typically ate meals in the same small set of locations from day to day.
- Participants were almost always engaged in other activities during meals, often using a computer or mobile phone for work or leisure (surfing web, checking email, reading) or socializing. Food held little interest in comparison to these other activities.



Figure 12. Food journal on a dining table

Figure 13. Eating environments photographed by different participants during the food journal activity: (top to bottom) work, car, livingroom, kitchen



- Individual notions of what constituted a healthy meal varied greatly.
- Most participants usually ate at least one meal a day alone.

In follow-up interviews, participants responded positively to the task of documenting their meals. Taking photos with a camera phone and uploading photos via email was reported to be very easy, and reviewing the photos after the journal activity had concluded fostered valuable reflection on their eating patterns.

- “It is helpful to see the times and locations where I’m eating the most.”
- “I noticed that I eat alone a lot. 98-99% of the time.”
- “Looking at Trader Joe’s and frozen dinners in the journal, I must have been busy then.”
- “I didn’t occur to me that was eating in the dark at home. I need to find some lighting.”
- “The photos showed me my diet is the same things all the time.”
- “A lot of weight-loss programs have pre-planned meal plans to follow, whereas this is sort of the reverse. You’re planning your own meals, writing it down, and you can review it and make adjustments yourself instead of following a stringent plan. It’s fun to do if you have the free time. I would continue for a month to see how well I’m eating over the course of time, reflect and change my habits.”

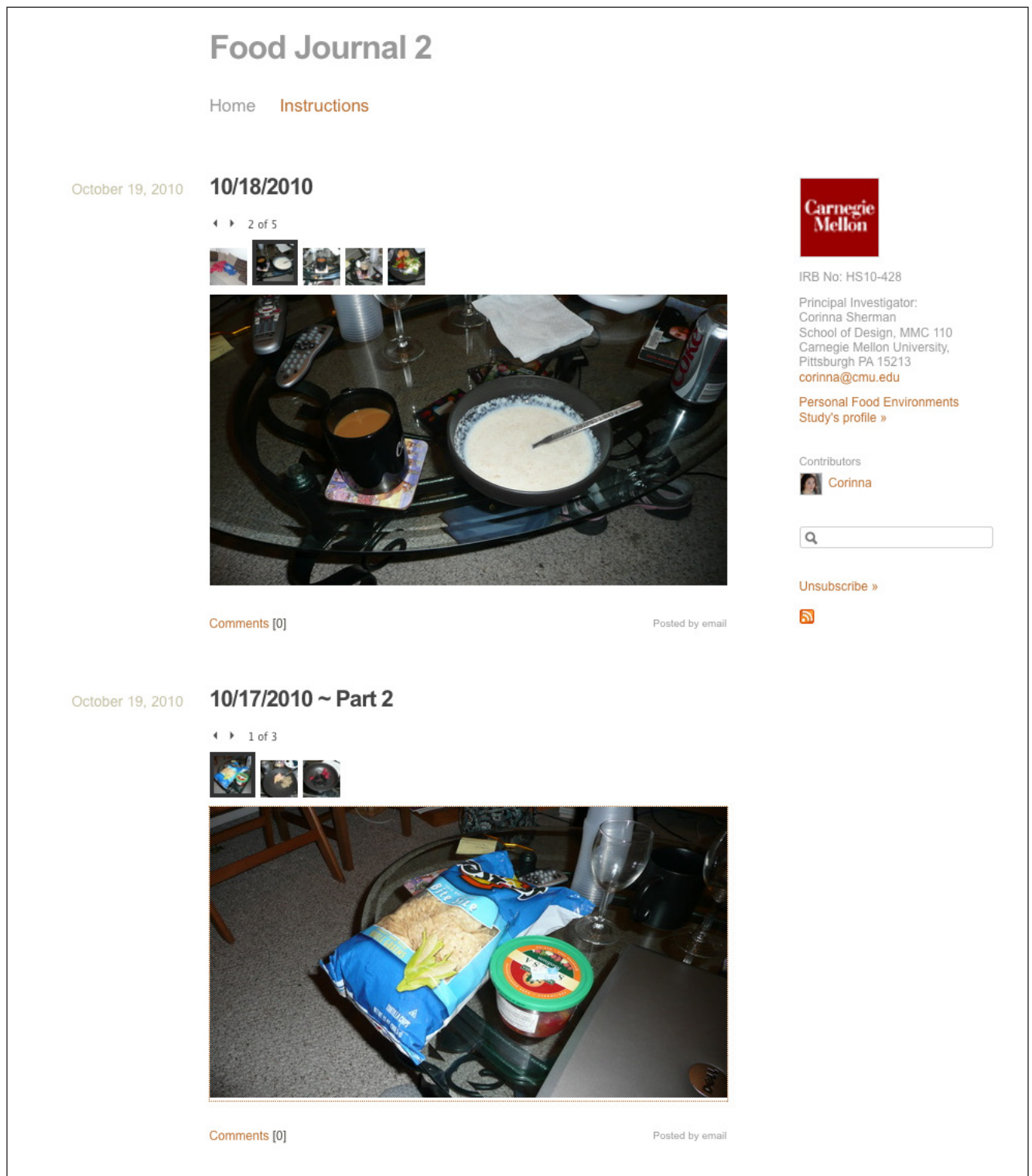


Figure 14. A food journal participant's online photo blog on Posterous.com

Method 4: Competitive Analysis

During a competitive analysis of popular web-based tools in the domains of wellness and personal environments (see page 112 in the Appendix for summary table), several relevant themes emerged:

- Assessing behavior change goals
- Fostering and sustaining engagement
- Presenting wellness advice
- Designing personal environments

Name of the Rootein

25

Be as specific as possible. "Run 10 blocks everyday" is better than "Go running"

Reminders & Notifications

☐ Remind me to do this at 9:00 am eg. 11:00, 9:15 am, 15:30,

☐ Remind me when I am slacking for 3 days

To receive reminders, please ensure that notifications are enabled.

☐ Share this Rootein with friends

Create Cancel

Figure 15. Assessment of and reminders for desired behavior change

Source: Rootein
<http://www.rootein.com/>

Assessing behavior change goals

Web-based tools for behavior change ask users to self-report their goals. The most general-purpose tools, like Rootein (see **Figure 15**) and Streaks, allow users to pursue any goal they choose. Health Month, in contrast, simplifies self-assessment by restricting users to a pre-defined set of goals (see **Figure 16**). DailyBurn, a tool that aims to provide both flexibility and guidance, steers users toward creating more personalized, measurable goals through the use of features such as

- questions (e.g. “What is your goal weight?”)
- suggestions (e.g. “Recommended Training Plans”)
- social comparison (e.g. “Popular challenges: Lose 20 lbs, 100 Pushups”)

According to social cognitive/learning theory, people’s goals are influenced by the social norms established by their peer groups (see Chapter 2), so including means of social comparison within a wellness tool might make sense. Depending on the size and degree of homogeneity within the member community, though, people with significantly different needs, constraints, and goals may find little value in comparing themselves.

Fostering and sustaining engagement

Since behavior change tools are intended to be used over a period of weeks or even months, they use various tactics to foster and sustain user engagement:

- reminders
- personal informatics
- social incentives

Choose your own rules for March

You will have until midnight on March 31st to edit this list.

Popular · Diet · Exercise · Mental · Misc · All Do Rules · All Don't Rules · Your Rules

Limit alcohol	Limit caffeine	Cook dinner	Limit dairy
Exercise	Limit white flour	Limit fried food	Eat fruit
Eat greens	Limit red meat	Take a multivitamin	Limit pasta
Limit soda	Drink enough water	Eat whole grains	

No rules selected yet.

Figure 16. Pre-defined set of goals for health behavior change

Source: Health Month
<http://www.healthmonth.com/>

Lose It! and Rootein offer daily goal reminders and daily/weekly reports via email to encourage users to check in. Users may ignore these nudges,

however, if they do not take advantage of the kairos principle (see the Persuasive Technology section in Chapter 2) by arriving when and where they are most likely to succeed. Research has shown location-based reminders to be more effective than time-based reminders for adherence to health regimens (Bickmore et al. 2007), yet interestingly, none of the tools reviewed offer location-based reminders.

Personal informatics has been shown to encourage people to continue to

Figure 17. Social incentives intended to foster engagement

Health Month, the game · [Your rules](#) · [Get ready](#) · [Your Game Wall](#)

March's Game Wall · Superbad Grads

Superbad Grads
Organized by [Corinna](#) · 3 people on this team
Mission: thesis + habit changes + ??? = profit!

Add something to the wall

[Thoughts](#) · [Question](#) · [Tip or trick](#) · [Check in](#)

Hello, Corinna! Are you available for a quick check in with your friendly spirit animal?

How much energy do you have right now?
 I have enough energy to do everything I want

How calm do you feel?
 Something is worrying me right now

How happy are you right now?
 I will probably smile sometime today

Elaborate on what these metrics mean to you. (optional)

[Save](#) (Or, [edit what you're tracking](#))

Filter: [All](#) · [Your friends](#) · [Your team](#)

2164 people playing

- [What's up with fruit and life points?](#)
- [What do the brackets mean?](#)
- [What are teams?](#)

Official Health Month bloggers

[Megan](#) is blogging at [Adventures in Adult Land](#)
 ❤️ 10 and 0 pts.

[Andrew Wilder](#) is blogging at [Eating Rules](#)
 ❤️ 10 and 0 pts.

[See their posts...](#)

Optional Information

Why are you playing Health Month?

How much did you weigh at the beginning of the month?
 _____ lbs

How much do you want to weigh at the end of the month?
 _____ lbs

Source: <http://healthmonth.com>

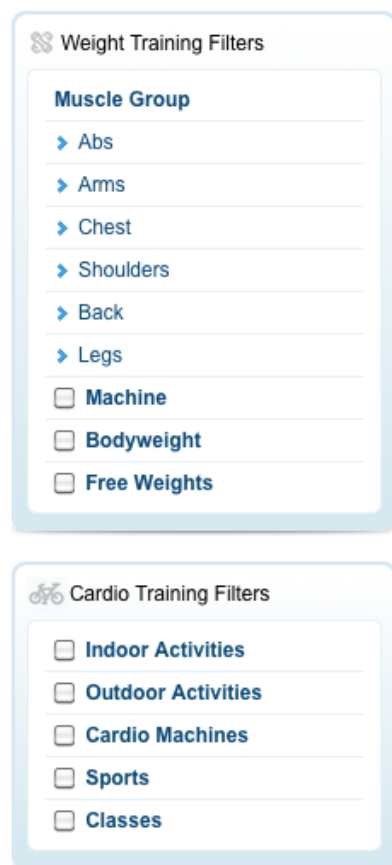


Figure 18. Filters for wellness information

Source: DailyBurn
<http://dailyburn.com/exercises>

use tools over the long term (see Chapter 2), and many of the tools reviewed visualize user data in some form. Some, like DailyBurn and MyPlate, show metrics such as calories consumed or distance traveled as charts or graphs and thus require detailed, somewhat time-consuming logging of meals and workouts. Simpler behavior tracking tools like Rootein and Streaks display calendars with checkmarks on days when specific behavioral goals have been met, meaning that daily logging takes seconds rather than minutes.

Social incentives in various forms provide compelling motivation for some to continue using web-based behavior change tools, especially once their initial novelty has faded. PEERtrainer and MyPlate cultivate member communities by encouraging users to invite their friends, follow friends' progress through email notifications or status update feeds, challenge others to join in the pursuit of a common wellness goal, and accept others' challenges in turn. Intangible rewards such as points can function as a form of social currency; Health Months users, for instance, are encouraged to “gift” each other points as gestures of support. Users who earn badges can easily advertise their achievements via channels such as Facebook and Twitter to garner recognition and kudos. Health Month also casts technology as a social actor by encouraging users to check in with a “friendly spirit animal” each day (see **Figure 17**).

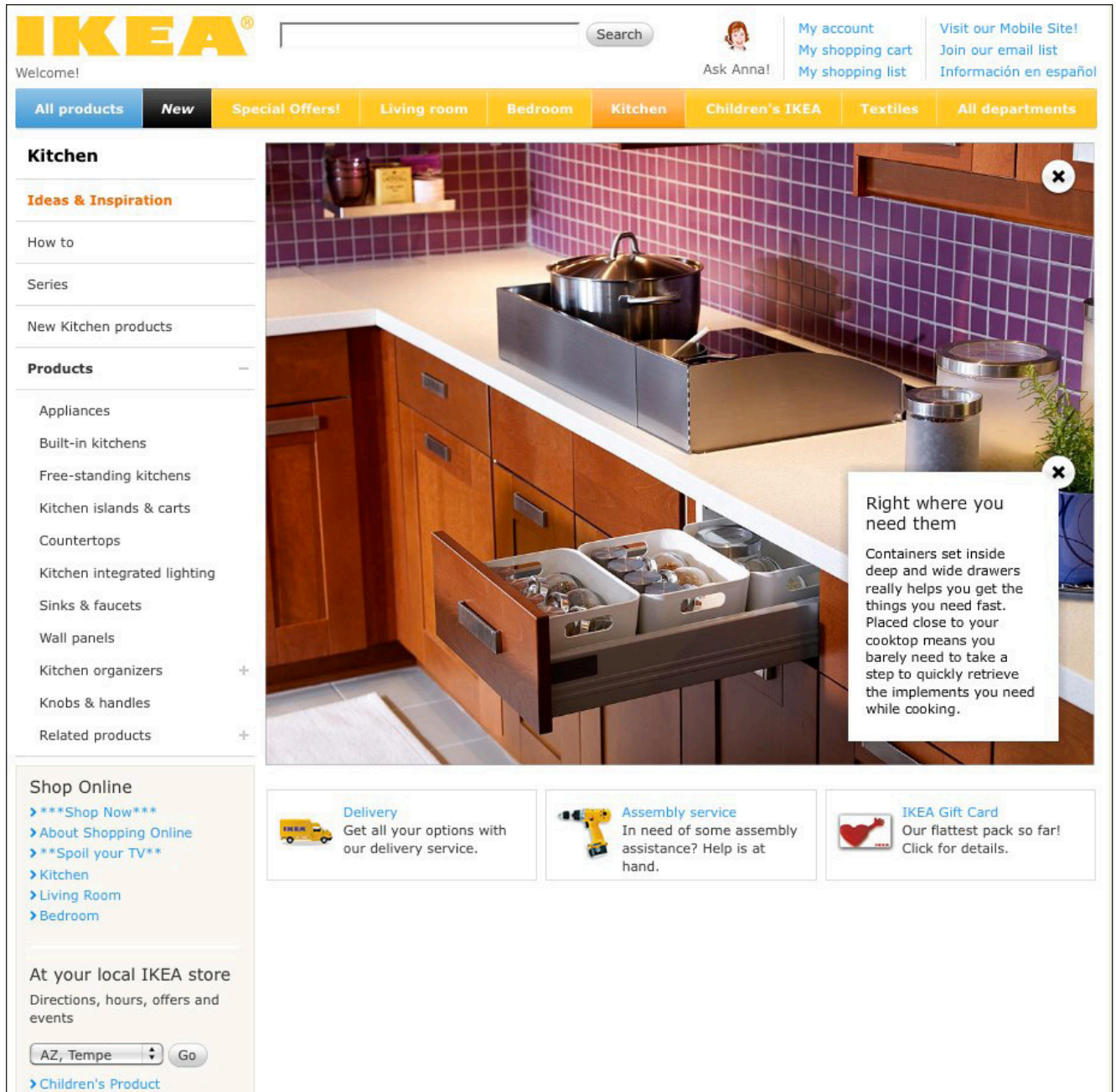
Presenting wellness advice

Tools targeting audiences interested in improving their health, such as DailyBurn and PEERtrainer, offer advice pertaining to nutrition, fitness, and motivation. Articles written in the tone of an expert – doctor, personal trainer, or dietician – are grouped and/or filtered according to category (see **Figure 18**). A supportive community of peers also swaps ideas about common challenges – ideas that typically reside in searchable, text-based forums. Despite being less succinct and polished than article content, community-based information can provide reassurance that a given piece of advice is “tried-and-true.” It may also include anecdotes of personal experience that add valuable context to its real-world application (e.g. “If you like sandwiches, try tuna or salmon salad on Ezekiel bread. Won’t elevate sugar the way regular bread does. You can find it in a health food store or a good grocery store that carries health food products”).

Customized design for personal environments

Websites such as Lowes.com and IKEA.com offer design ideas and inspiration for home settings that pertain to workflow efficiency and environmental aesthetics. The Lowes Virtual Room Designer and IKEA Kitchen Planner, for example, allow consumers to specify everything from room dimensions to fixtures to furniture to appliances in virtual 3-D space.

Figure 19. Kitchen design ideas and inspiration superimposed on a virtual showroom



Source: IKEA

http://www.ikea.com/us/en/catalog/categories/departments/kitchen/tools/kitchen_rooms_ideas

One of the most notable features of these tools is that they attempt to place information within a physical context. In **Figure 19**, for instance, a tip about kitchen storage containers is situated in a virtual kitchen showroom, giving viewers a sense of its application in the real world. These environmental design tools idealize home environments and do not address settings such as car and workplace, but the fact that they invite people to reimagine their physical settings makes them potential candidates for adaptation considering that wellness tools do not currently address the design of personal environments at all.

Figure 20. Highly visible, ready-to-eat foods within easy reach prompt people to ask themselves if they want to eat every time they open the refrigerator.



Figure 21. Frozen pizza offers high-sodium, high-fat convenience. Variety of ice cream flavors tempt people to have a scoop of each for dessert.



Figure 22. A pantry filled with cookies, cereal, and crackers can lead to an impulsive decision to snack.



Figure 23. Every time the cupboard is opened, an open bag of chips is visible and easy to reach.



Figure 24. A candy dish sits on a dining table as constant temptation.

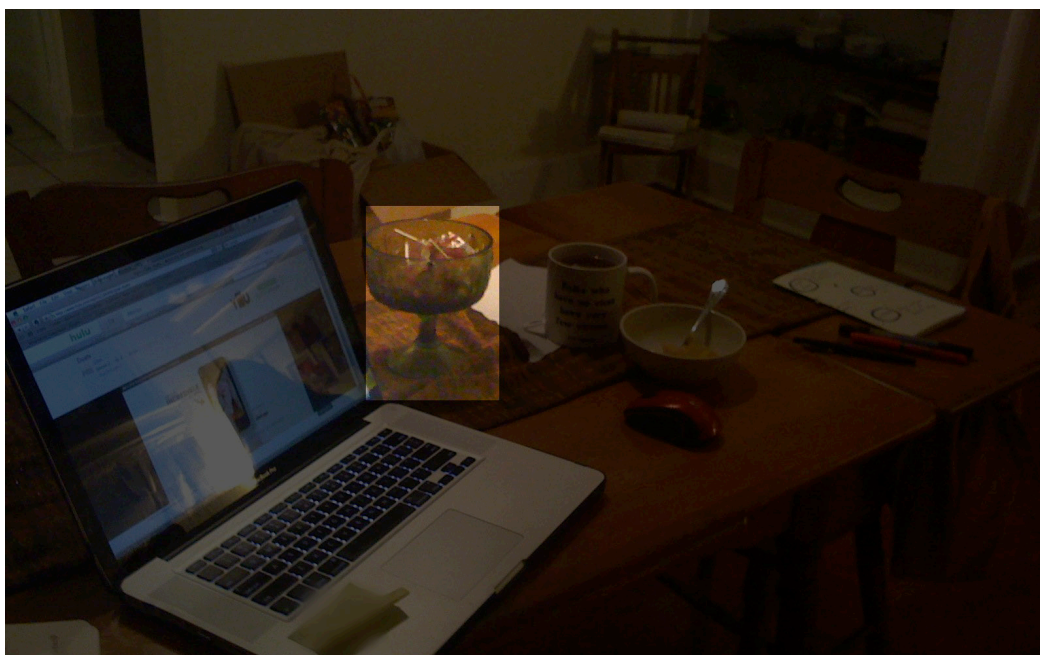


Figure 25. Computer usage provides distraction that makes it more difficult to notice the moment when satiety is reached.



Figure 26. Large package sizes suggest consumption norms that encourage overeating.



Problem Indicators

Obesity has risen dramatically in the last 20 years, and the animated map of U.S. obesity trends by state 1985-2009 on the Centers for Disease Control and Prevention website (CDC.gov) reliably generates gasps of alarm among audiences. Although researchers recognize that a variety of environmental factors promote obesity (Brownell and Horgen 2004), relatively few health interventions have focused on redesigning personal environments such as work, school, and home, where people daily face a relentless onslaught of cues that promote sedentary behaviors, unhealthy food choices, and overeating (see **Figures 20-26**). In a single day, one person makes over 200 food-related decisions (Wansink and Sobal 2007), yet most have no inkling how environmental factors *within their control* shape those decisions.

Problem Definition

Overwhelming evidence suggests that, for many Americans, the prevailing strategies and tools for changing food choices and eating behaviors fall short. Diets ranging from Atkins to the Zone promise to simplify everyday food choices but are too difficult for most people to sustain without supplemental education and support. Commercial weight-loss plans aim to take the guesswork out of portion control with food rules and point systems, but they can become expensive and lead to an overdependence on processed meals and snacks. Online services and tools help people track food intake and calories, host communities where members can seek social support, and are low-cost or free. Unfortunately, they also rely on sustained conscious effort and a daily time commitment in order to be effective. In the face of these challenges, the real question is how we can leverage what researchers have already learned about environment-behavior dynamics to reduce common barriers to health behavior change and empower individuals to promote their own wellness.

Requirements of the Problem

Efforts must address complex issues such as

- an overwhelming amount of choice in food selection, the majority of which is processed and not health-promoting
- cultural and social norms that reinforce overeating, sedentary activities, the repurposing of food as a means of entertainment or reward, and valuing other activities over healthy food preparation
- misinformation spread by commercial entities about the healthfulness of food products and eating practices, to the detriment of consumers

- lack of support at the level of community and organizations for healthy behaviors
- the failure of willpower and education alone to sustain healthy behaviors

None of these issues can be resolved by a single-level intervention. An ecological systems approach to tackling the obesity epidemic is needed, and a comprehensive solution targeting multiple levels should address them all.

Objectives & Design Goals

This thesis focuses on the microscale level to create a tool for individuals that helps them reach their wellness goals through the progressive redesign of their personal environments and behaviors. By specifically targeting people who want to change their eating habits, the tool is intended to help motivated individuals change their lifestyles (rather than convince unmotivated individuals that they should want to change). The tool should

- educate people about nutrition and the influence of environmental factors on their food choices and eating behaviors to the extent that they can make informed design decisions and seek out additional, relevant information
- guide people in the process of redesigning their personal environments and behaviors to help them achieve their wellness goals
- help people see incremental changes as part of a holistic, long-term wellness strategy

Considerations and Constraints

Person

Designing a tool for people who want to change their eating habits requires holistic consideration of the unique individual. Combinations of personal and environmental factors make designing a tool that has the right balance of adaptability and specificity a critical yet nontrivial task.

People's mental models of their personal environments and their routines within those environments should be considered so that the terminology and representations the tool employs match user expectations.

The individual's motivations for change also need to be considered. People who have just been diagnosed with a medical condition linked to diet, for example, may be open to more significant redesign efforts than people who knows they should eat healthfully but feel no sense of urgency.

Cooking and dietary preferences, as well as the factors that shape those preferences, should also be considered since they combine to determine the foods that people purchase, store, prepare, and eat on a regular basis. Some of these factors, such as childhood diet, are personal. Access to transportation, quality of neighborhood grocery stores, and others depend more upon geographic and socioeconomic environments beyond the individual's control and constrain what a tool targeting the individual can realistically achieve.

Market

The ability to change personal environments relies in part on the market's support for DIY healthy home design. Knowing that a portion of food appears larger (and more satisfying) on an eight-inch dinner plate than on a twelve-inch plate (Wansink 2006) does consumers little good if they visit Target.com, where plate attributes are presented in a non-standardized format and only the first and last of the seven dinner plates have width listed

Figure 27. Dinner plates for sale at Target.com

Narrow by Clear All

Category: Dinner Plate (7)

Category ▼

Select category(s) Clear

- ☐ Appetizer Plate Set (4)
- ☐ Appetizer Plates (22)
- ☐ Charger (4)
- ☐ Chargers (21)
- ☐ Dessert Plate Set (3)
- ☐ Dessert Plates (15)
- ☒ Dinner Plate (7)
- ☐ Dinner Plates (111)
- ☐ Salad Plate (3)
- ☐ Salad Plates (105)
- ☐ Soup Bowls (2)

Price ▼

Select price(s) Clear

- ☐ \$0-\$14 (1)
- ☐ \$15-\$24 (4)
- ☐ \$25-\$49 (2)
- ☐ \$50-\$99
- ☐ \$ From - \$ To

Color ▼

Select color(s) Clear

Dinnerware : Plates (7)

View as: Grid Compare List Items per page: 30 60 90 Items 1-7 of 7

Sort by: [Featured](#) | [Best Sellers](#) | [Best Rated](#) | [New](#) | [Price Low-High](#) | [Price High-Low](#)

Moderno Set of 12 Dinner Plates **\$24.99** + Add to Cart

★★★★★ (2)

- 12 large clear plates for formal meals or everyday dining
- 100% glass
- Part of the Moderno collection (each sold separately)
- Dishwasher safe
- Each measures 10.5" dia.

Acrylic Swivel Dinner Plate Set of 4 - Clear **\$19.99** + Add to Cart

★★★★★ (1)

- Material: Acrylic
- Number of Pieces: 4
- Care and Cleaning: Dishwasher Safe Top Rack Only
- Protective Qualities: Break Resistant

Palm Tree Acrylic Dinner Plates Set of 4 **\$19.99** + Add to Cart

★★★★★ (1)

- Material: Acrylic
- Number of Pieces: 4
- Care and Cleaning: Dishwasher Safe Top Rack Only
- Protective Qualities: Break Resistant

Source: <http://www.target.com/>

in the description (see **Figure 27**). Rather than facilitating the task of buying smaller plates, the site bombards the consumer with a long list of options that include category, price range, color, material, shape, pattern, brand, and number of pieces in a set. Price and color appear to be the main product differentiators, while any sense of scale and proportion is ignored. The intent of the site is not to enhance the person's self-efficacy in healthy living but to sell home products based largely on their visual appeal and basic utility.

Environment

The environmental conditions under which the tool will be used should be taken into account, including

- lighting conditions under which a screen should be comfortably viewed
- ambient noise level above which any sound should be audible
- viewing angle from which data on a screen should be readable
- distance at which data must be readable
- privacy needs for data viewed in public places
- security needs, such as protecting settings from unauthorized changes
- frequency of interruption
- need to share or coordinate external actions in shared physical spaces

Research participants indicated that they would be most likely to use such a tool at home.

Materials

- need to fit within a certain size display
- possible contact with food or liquid if used during food preparation or consumption
- whether input will be hampered by gloves or dirty or wet hands

Cultural Factors

- social pressure to conform, e.g. eat what everyone else is eating, view food as reward, etc.
- traditions and social rituals that reinforce unhealthy behaviors, e.g. eating store-bought cake at birthdays and processed candy at Halloween, overeating at group events like Thanksgiving and parties

Problem Analysis

Following the bulk of research, a set of primary and secondary criteria was developed for the design of a personal environment and behavior transformation tool for use by individuals seeking to promote their own wellness. The tool frames behavioral change within a multidimensional, holistic context, emphasizing balance among physiological, mental, emotional, and social needs. By guiding the user through a continual process of personal and environmental assessment, it relates personal wellness goals to redesign opportunities spanning the dimensions of physical environment, social environment, and information environment to influence behavior.

Physical Environment

Primary Criteria

- must increase awareness of how physical environmental factors influence food choices and eating behaviors
- must facilitate assessment of the physical attributes of personal environments with regard to how well they support personal wellness goals
- must offer suggestions for cultivating physical environmental conditions that support personal wellness goals, i.e.
 - » remove unhealthy and trigger food items from personal spaces
 - » organize kitchen for efficient and safe preparation, cooking, and storage of healthy foods
 - » create eating environments that promote eating for health and enjoyment through the manipulation of ambient factors such as light, color, sound, and temperature

Secondary Criteria

- should enable long-term planning for life

Social Environment

Primary Criteria

- must offer suggestions for counteracting social influences that undermine personal wellness goals.
- must strengthen connections to social relationships and networks that

support wellness goals

Secondary Criteria

- should increase awareness of how social factors influence food choices and eating behaviors

Information Environment

Primary Criteria

- must manage the individual's action plan for personal environment redesign
- must illustrate trends of behavioral and environmental change over time at multiple levels of granularity
- must juxtapose incremental changes in personal environments with long-term progress toward goals

Secondary Criteria

- should increase self-efficacy with regard to healthy behaviors
- should enable critical thinking about health knowledge

Behavior

Primary Criteria

- must facilitate the breaking or weakening of undesired habits
- must facilitate the formation or strengthening of desired habits
- must guide behavior change in incremental steps
- must encourage reflection on personal wellness goals, motivations, challenges, and progress
- must acknowledge incremental and long-term accomplishments
- must not provide a pathway to failure

Secondary Criteria

- should account for predictably irrational biases and behaviors

System

Primary Criteria

- must not make contradictory demands on the individual
- must deliver suggestions and feedback with a positive affect

Secondary Criteria

- should calibrate specificity of messages over time
- should complement other components of the wellness ecosystem
- should calibrate demands on the user to respect the individual's time, money, physical, mental, emotional, and social constraints
- should encourage priming for and triggering of desired behaviors in opportune settings according to the principle of kairos

Development

Archetypes

Based on data gathered during the exploratory research phase, six archetypes were created to summarize the most common challenges and goals related to eating healthfully (see **Figures 28-39**).

Chronic Overeater

I tend to overeat at mealtimes and always clean my plate. I often take second helpings when I'm at home. Sometimes I eat so much that I feel physically uncomfortable afterward.

I want to develop a habit of eating less – and maybe more slowly – so I can enjoy meals without regret afterwards.

Snack Monster

Sweets, fats, and salty snacks – if they're around, I just can't resist. Sometimes I eat because I'm nervous or bored, or it gives me something to do while I'm watching TV or reading. I might even be addicted to my favorite snacks. I often eat out of habit rather than hunger.

I want to snack less and, ideally, only eat when I'm truly hungry. If I do snack, I want to eat healthier snacks.

Distracted Diner

I tend to eat badly when I'm distracted. It could be a happy distraction like a party, an unhappy distraction like an argument, or I could just be too busy to bother eating a proper meal.

I want to focus on my food at mealtime and make eating a pleasurable experience in itself.

Special Treats Opportunist

Random free food, birthday cakes, restaurant appetizers and desserts – when I'm confronted with the opportunity to eat an unexpected or rare treat, I just can't resist. The problem is that these opportunities happen way too often.

I want to resist temptation, ideally without calling too much attention to myself when I'm with other people.

Busy Non-Cook

I don't cook real meals, so I end up eating a lot of frozen and prepared meals, restaurant take-out, or food from vending machines.

I want to cook more, learn how to cook healthy meals that are quick and simple, and learn enough about nutrition that I can figure out my healthiest snack and convenience food options.

Late-Night Indulger

I use food to relax and unwind after a long day. I know I should make healthier choices, but after a certain time at night, I don't have the energy to care anymore.

I want to eat a nutritious dinner, then not eat until the next day. I could use some strategies for soothing myself without food.

Personas

Real people often identify with traits from more than one archetype and have resource constraints and priorities that change over time. Personas were therefore synthesized from survey, interview, journal, and card sorting data to capture patterns with more nuance than the archetypes can convey (see page 257 in the Appendix for persona sheets).

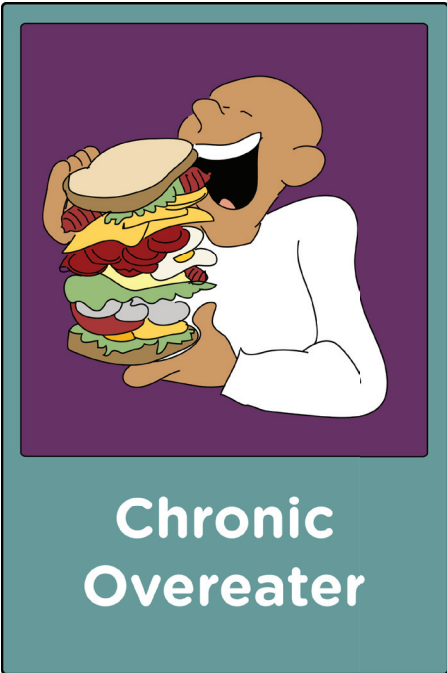


Figure 28. Archetype of chronic overeater (card design, front)



Figure 30. Archetype of snack monster (card design, front)



Figure 29. Archetype of chronic overeater (card design, back)



Figure 31. Archetype of snack monster (card design, back)

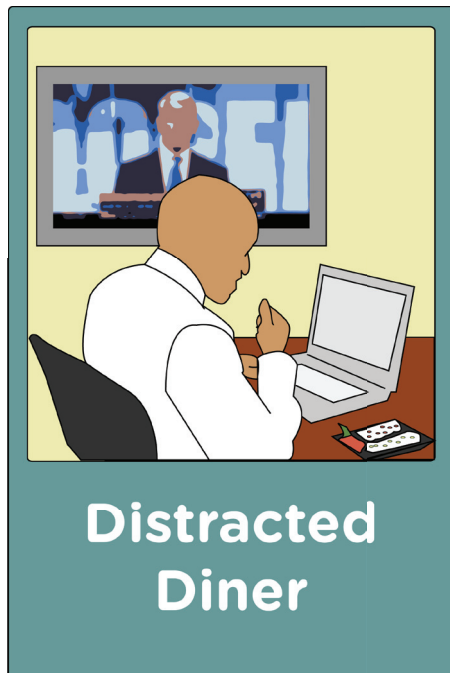


Figure 32. Archetype of distracted diner (card design, front)



Figure 33. Archetype of special treats opportunist (card design, front)



Figure 34. Archetype of distracted diner (card design, back)



Figure 35. Archetype of special treats opportunist (card design, back)

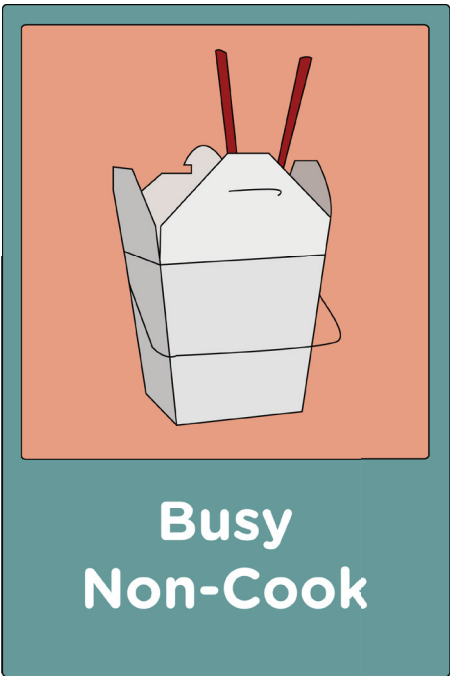


Figure 36. Archetype of busy non-cook (card design, front)



Figure 37. Archetype of late-night indulger (card design, front)

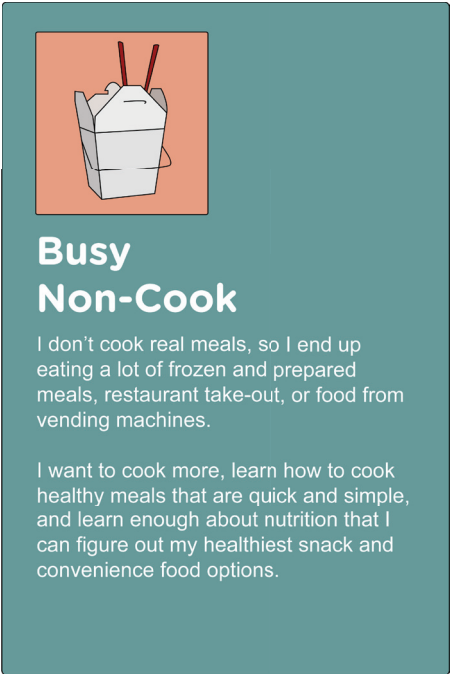


Figure 38. Archetype of busy non-cook (card design, back)



Figure 39. Archetype of late-night indulger (card design, back)

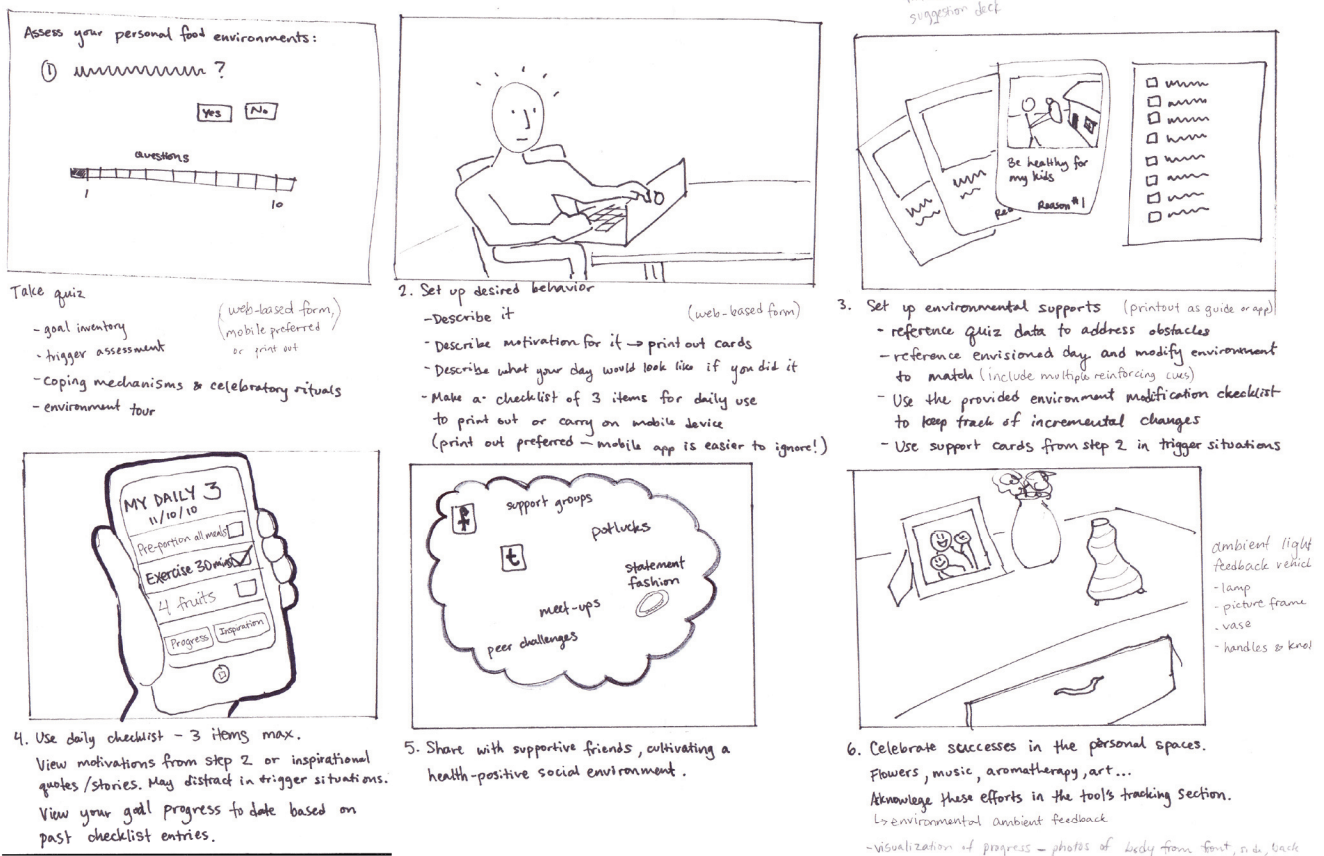
Scenarios

Scenarios were developed iteratively, starting with high-level use cases such as “New user signs up for account” and developing into detailed walkthroughs of the tool’s features. In their more detailed form, the scenarios helped validate the flow of tasks and content of various screens within the application (See page 261 in the Appendix for detailed descriptions).

Generative Modeling

Most of the time, personal environments do not demand our attention. Once we have arranged the furniture, adjusted the temperature and lighting, and organized other environmental elements to satisfy our critical day-to-day needs, we both expect and rely upon this scaffolding to remain fairly constant. Because mental models of personal environments and their affordances influence behavior in these settings, a card sorting activity was

Figure 40. Sketches of potential user experiences



conducted to explore the following questions:

- What mental models do individuals use in thinking about their personal food environments?
- What taxonomies and categories do they employ?
- What are their preferred organizational structures?
- What are their preferred modes of interaction within these environments?

Nine participants were selected for the activity. Participants were adults aged eighteen or older who were interested in changing their eating habits and had at least some control over the content and arrangement of the physical aspects of their personal environments.

Participants were grouped based on their living situations: those who lived alone performed the activity on their own, while those who lived together in a household sorted cards as a group. This arrangement elicited useful information about how household members negotiate and resolve organizational issues in shared personal environments.

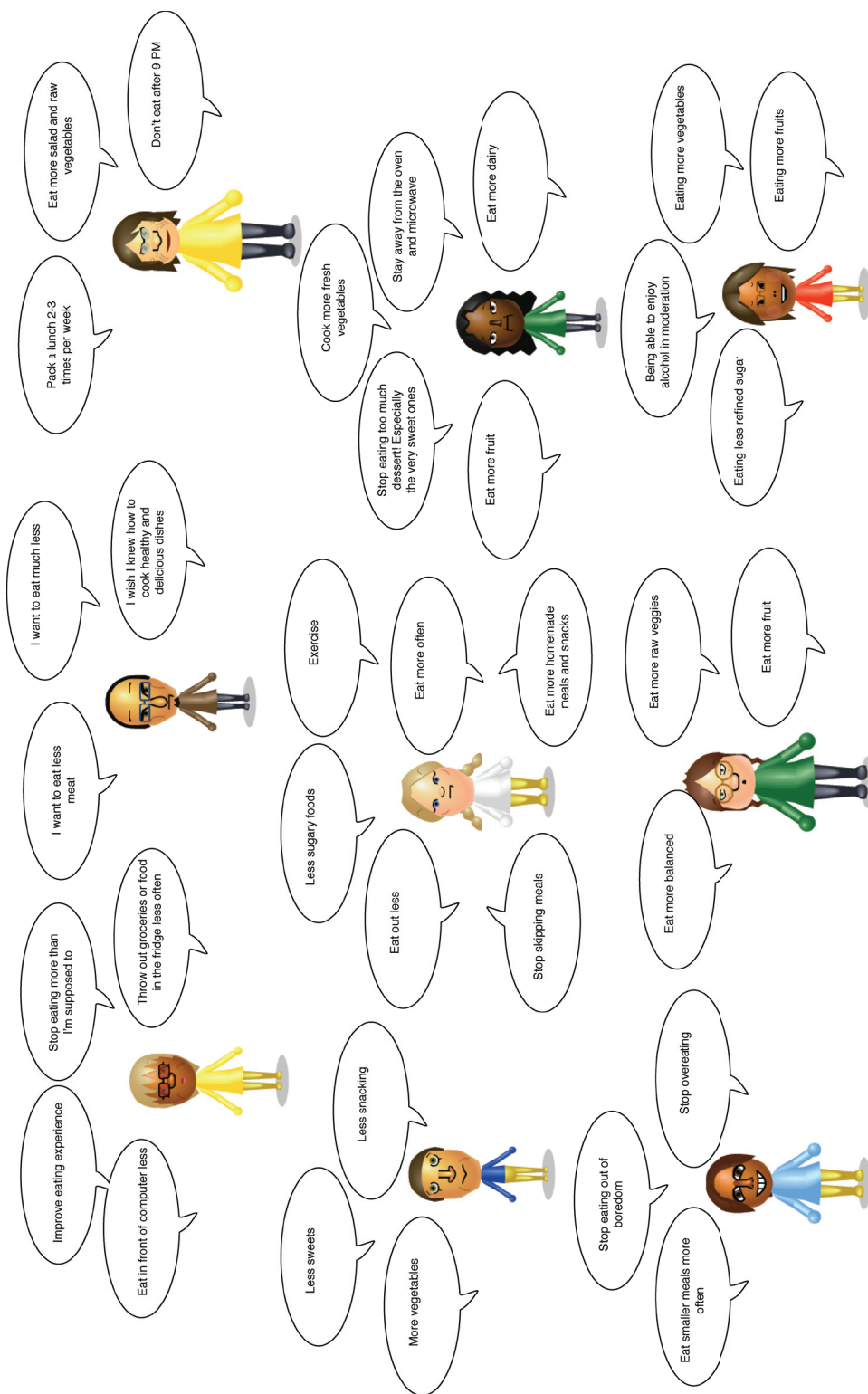
Card content was based on proposed content for the tool, including common physical settings in which food is eaten, social roles, health goals, inspirations, challenges to reaching health goals, objects related to food

Figure 41. Generative modeling activity with one participant



Figure 42. Participants' food/nutrition goals in the generative modeling activity

Characters generated using
<http://www.myavatareditor.com/>



selection, preparation, cooking, eating, and storage, and actionable tasks that could result in environmental or behavioral changes.

Prior to the card sorting activity, participants were asked to think about one to three personal habits related to food or nutrition that they would like to change (see **Figure 42**). During the session, they wrote these habit changes down and did a series of card sorting activities pertaining to these personal wellness goals.

Findings from the generative modeling activity suggest that although people do not normally think of wellness goals in terms of challenges and opportunities posed by their physical environments, they can readily identify environment-based issues when prompted. Furthermore, having a specific wellness goal in mind appears to provide essential context for conducting an assessment of environmental influences; participants adjusted the relative importance of various settings depending on the goal under consideration (see **Figure 44** versus **Figure 45**).

An interesting pattern that emerged during the sorting of potential categories for a wellness tool (task 6 - see the Appendix for protocol details) was the negative reaction to the card labeled competition. Participants expressed reluctance to think of their personal transformations as a means of competing with other people. They preferred to keep their self-improvement efforts private, comparing themselves to others in anonymity only.

Figure 43. Generative modeling activity with two participants from the same household



Concept Sketches

Concept ideation began by mapping out possible functions and features of the tool (see **Figure 46**).

The concept map grouped functions into five critical areas:

- 1. personal assessment
- 2. preparation for change
- 3. practice of new behaviors
- 4. reflection on the effectiveness of changes made
- 5. social connection

Figure 44. Personal environments sorted by their perceived importance in achieving a personal wellness goal

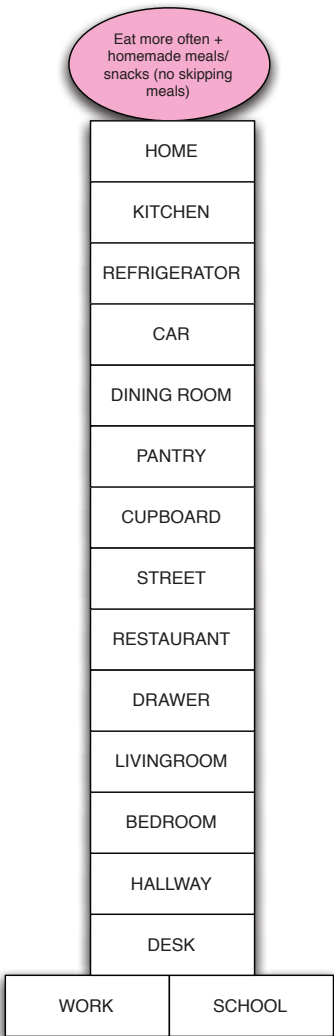


Figure 45. Personal environments sorted by their perceived importance in hindering a personal wellness goal

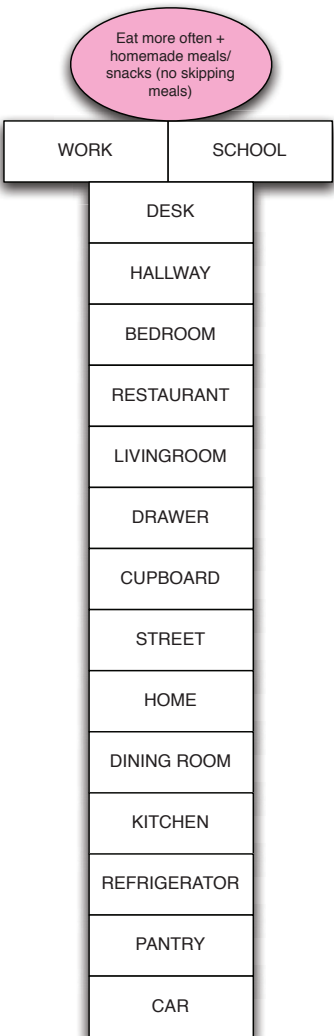
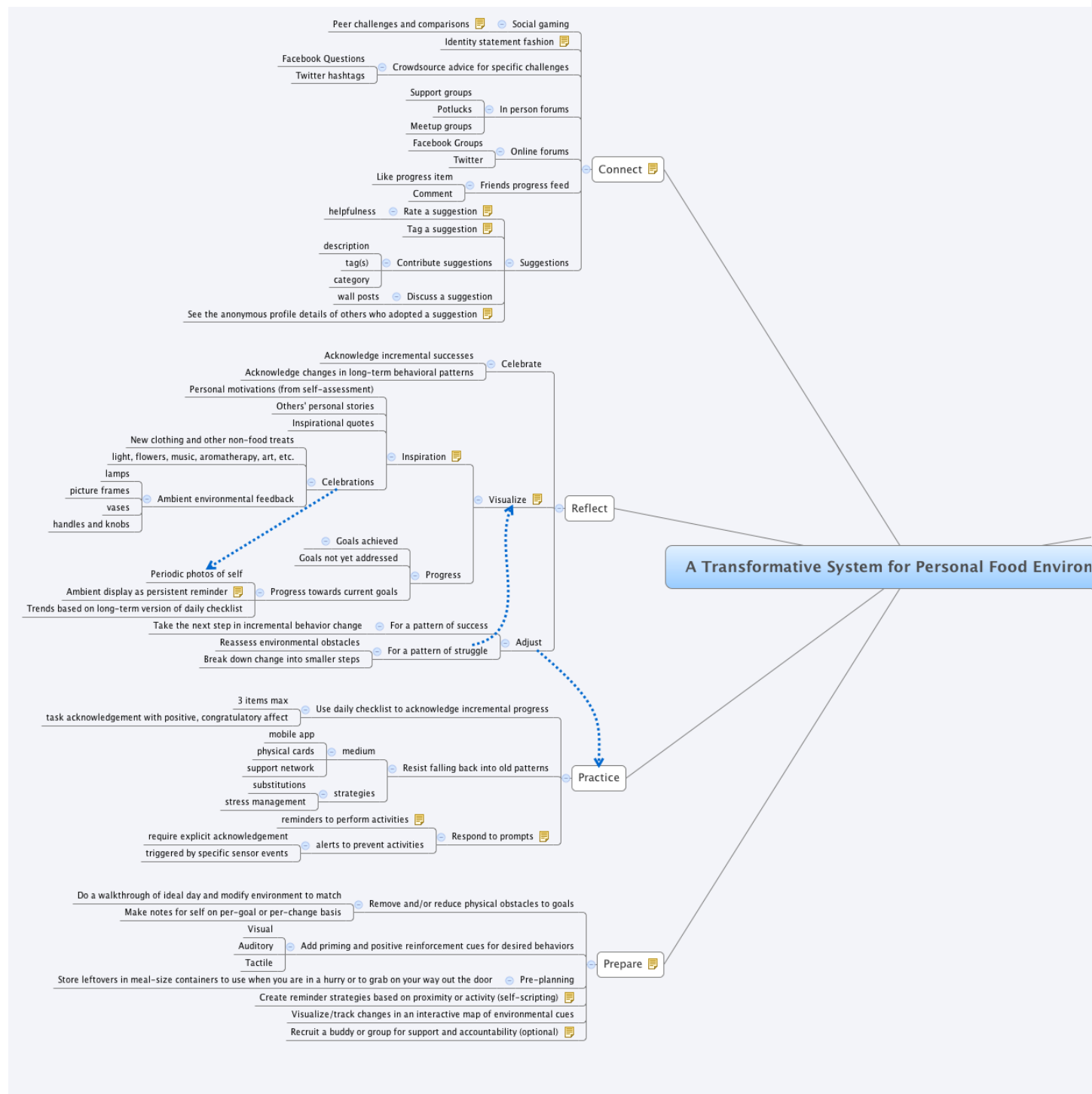
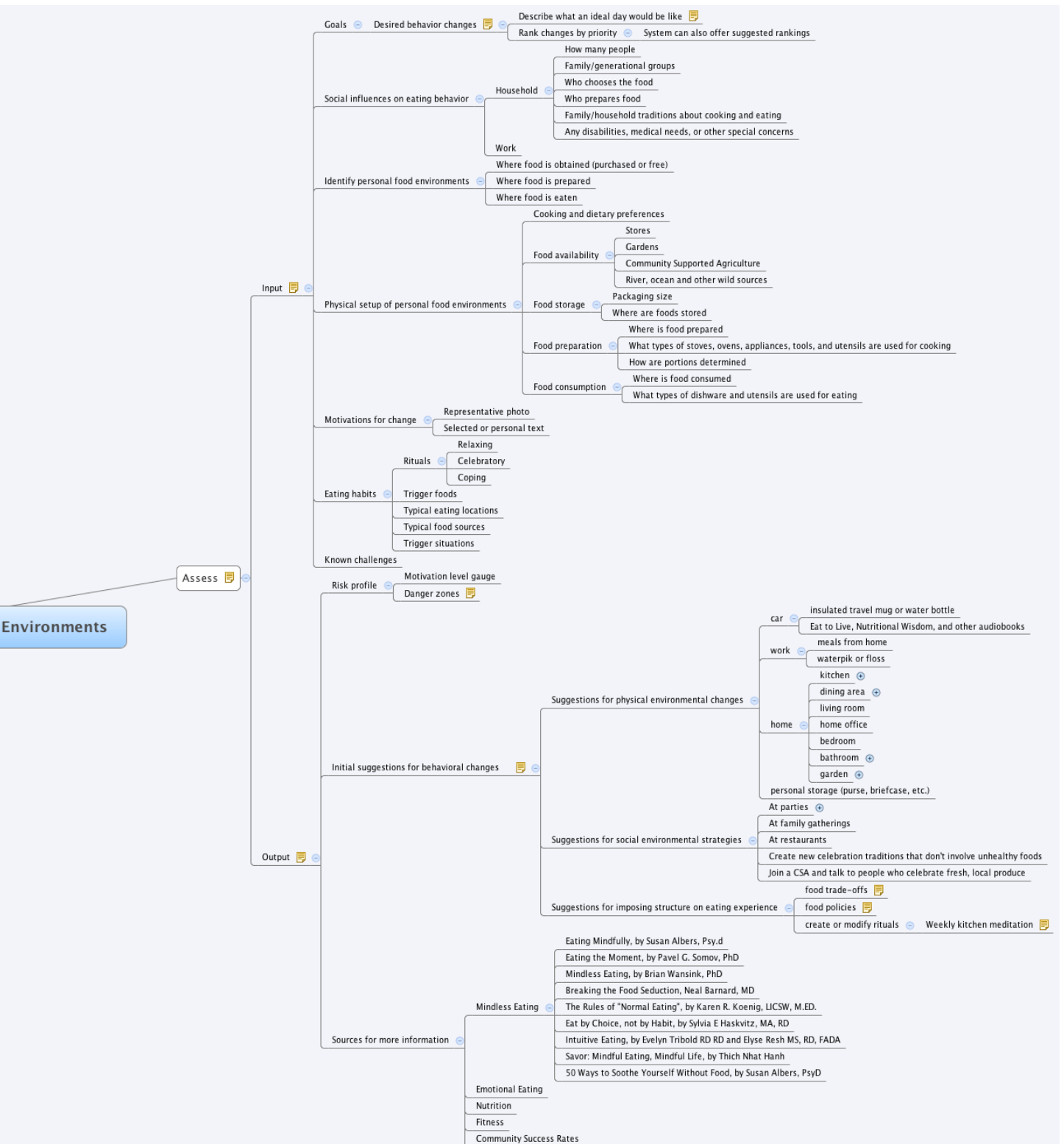


Figure 46. Concept map for a transformative system for personal food environments





Rapid sketching produced an array of concepts for possible forms of the solution (see **Figure 47** and the Appendix for additional concept sketches). One of the concepts initially explored was an ambient light source designed to promote mindful eating by changing color to reflect the amount of food consumed over time (see **Figures 48-49**). It was determined that while such a feature might be one small piece of the wellness-promoting ecosystem, an organizing framework is needed to manage and coordinate the pieces. Ultimately, the concept that evolved into the final design— a web-based tool called Seeds of Health – is intended to be that framework.

Figure 47. Notes from a rapid ideation session with fellow designers

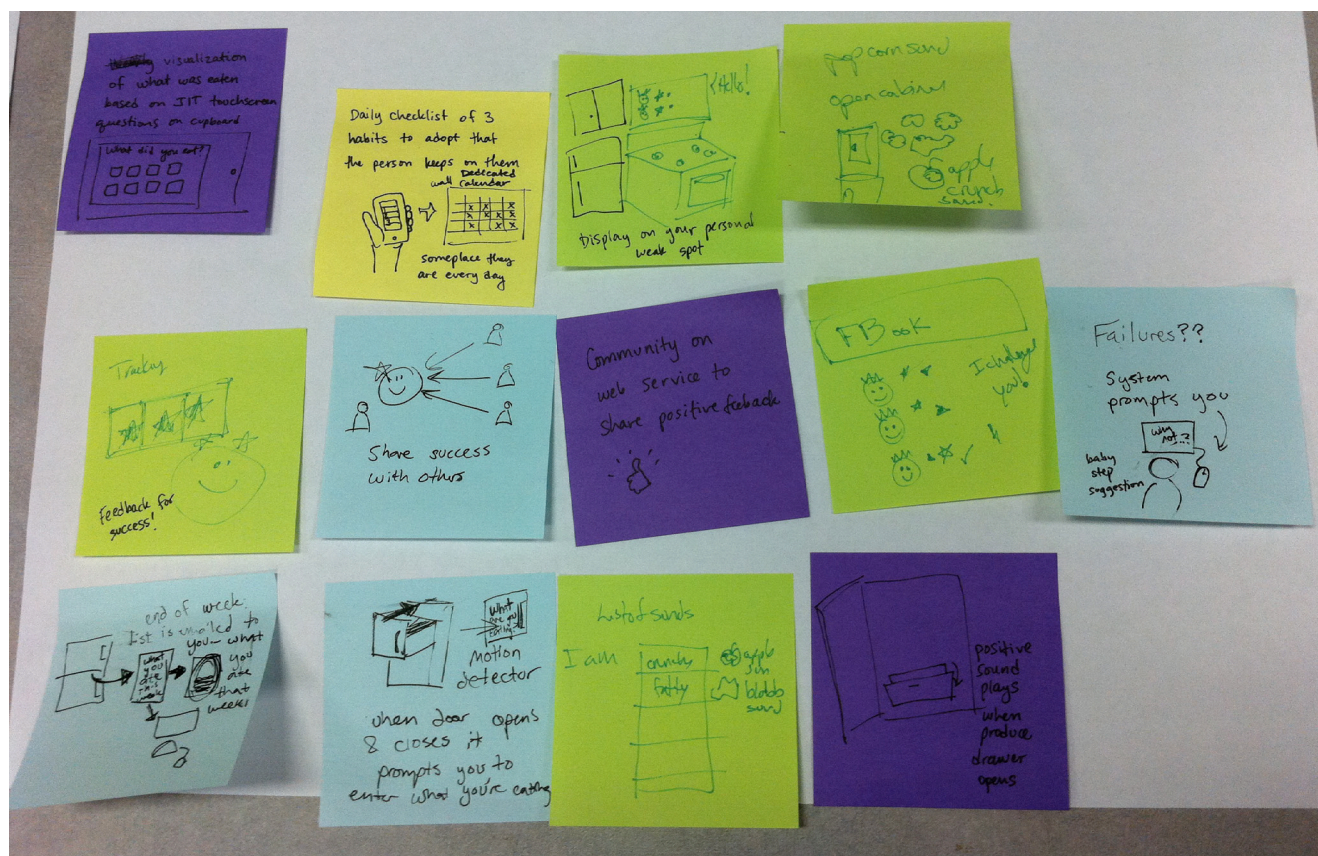
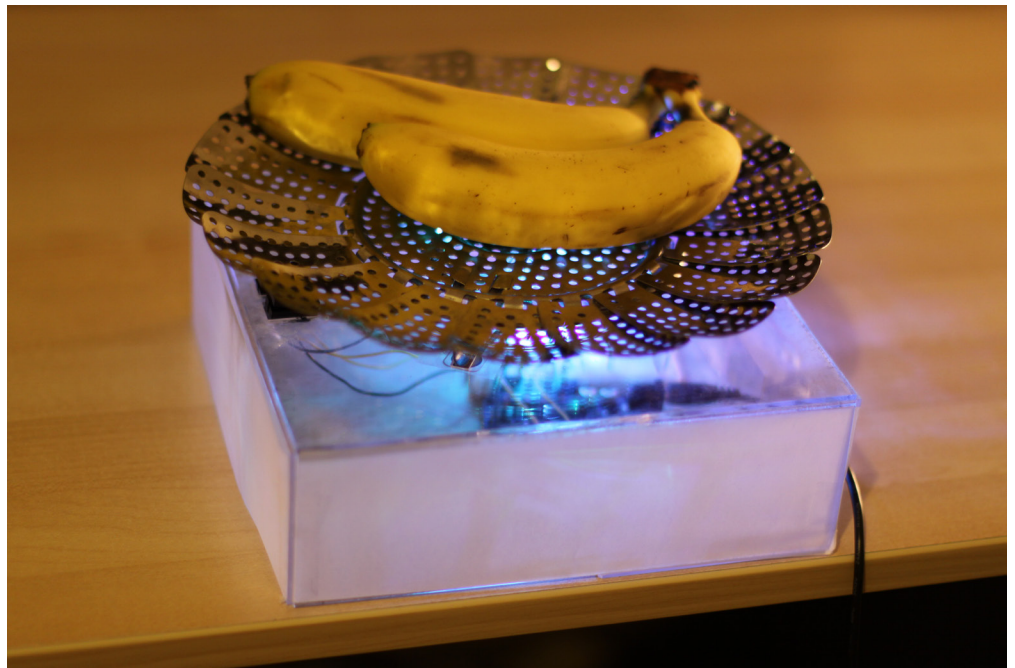


Figure 48. Prototype of an ambient light source that encourages mindful eating.



Figure 49. The light's hue changes color as food is removed from the weight-sensing dish.



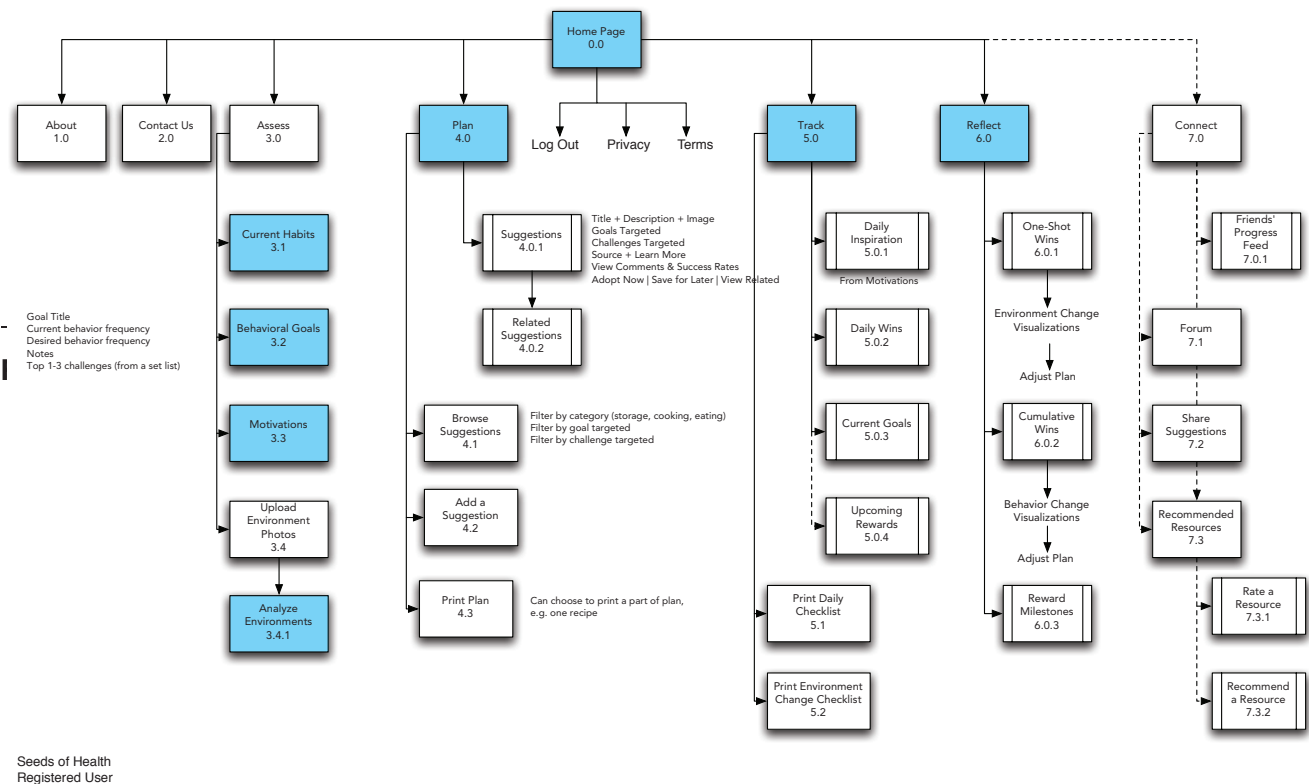
Refinement

A sitemap for the Seeds of Health website was created to articulate the different sections that needed to be designed (see **Figure 50**). The sitemap highlights the primary pages in blue; page subsections are shown as boxes with vertical bars. The Connect page was intentionally not developed due to time constraints and is therefore shown on the sitemap with a dotted line.

Based on the sitemap, wireframes for the primary pages were iteratively developed using Omnigraffle. The wireframes were used to create paper prototypes, which were then used to validate the layout and flow of interactions (see the Appendix for wireframes and testing protocol). Higher fidelity mocks were produced in Illustrator and Photoshop and presented for feedback in printed form and as part of a video sketch (see the Appendix for the design solution poster, video sketch script, storyboard, and video URL).

The video sketch was created to show the user experience at a higher level than was conveyed by the mocks and to answer the questions:

Figure 50. Sitemap for Seeds of Health
(see the Appendix for a larger version)



Why should someone use this tool?

- » To take control of their personal health
- » To make living healthfully easier to do

Why would someone want to use this tool?

- » To learn to assess the healthfulness of personal environments
- » To get personalized suggestions
- » To share wellness tips with people facing similar challenges

What keeps them using it over the long term?

- » Continue to grow with guided progress and timely prompts
- » Stay motivated by seeing results of actions visualized as trends

Figure 51. Person using Seeds of Health

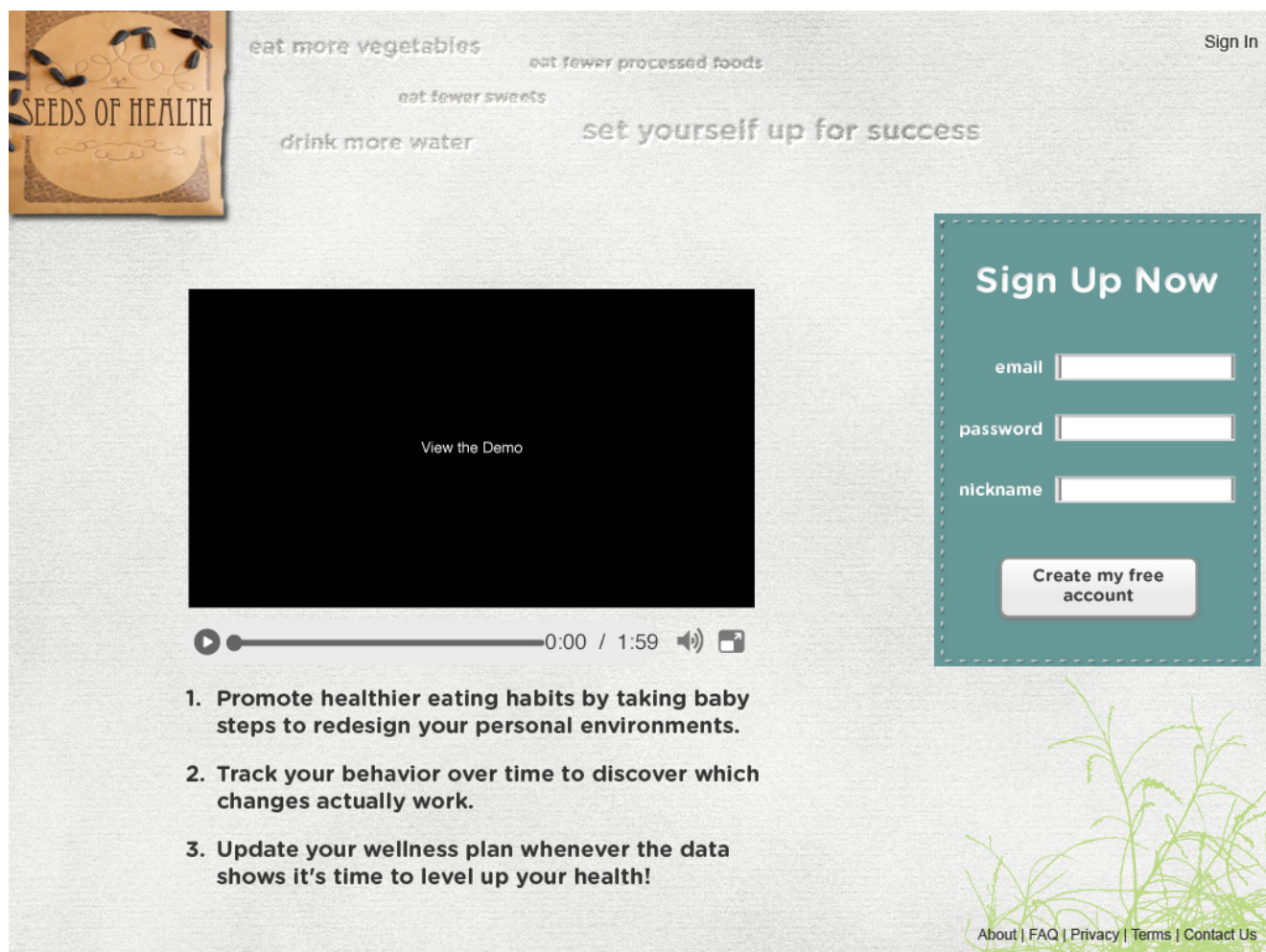


Final Design Proposal

Intended to serve as a personal wellness guide, planning tool, and evolving record of an individual's behavioral and environment changes, the web-based tool Seeds of Health provides an adaptive framework for personal wellness transformation in an iterative, four-phase process:

1. Exploration and Assessment
2. Planning and Preparation
3. Practice and Tracking
4. Reflection and Adjustment

Figure 52. The Seeds of Health home page features a demo video, value propositions, and a sign-up panel

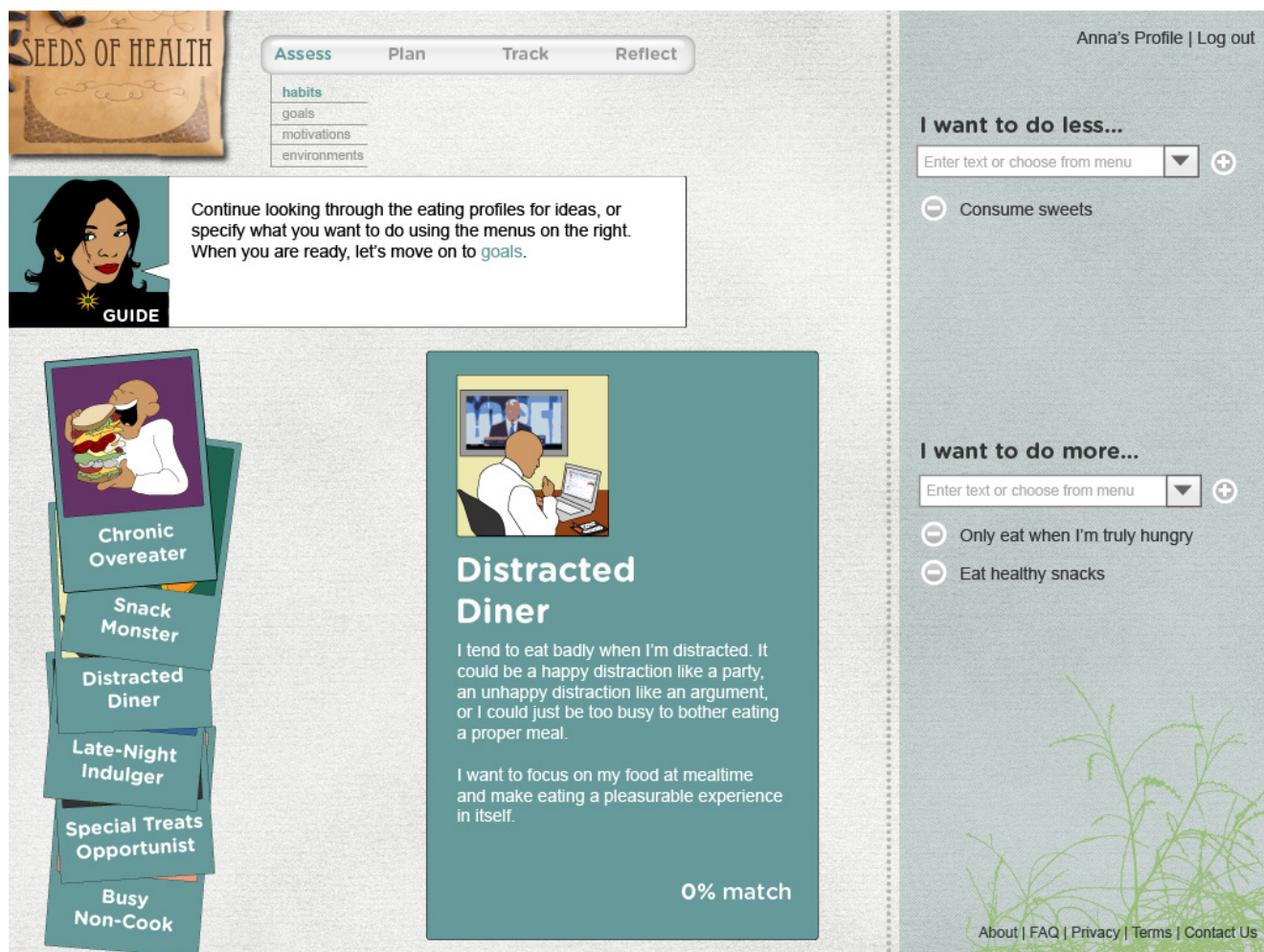


Exploration and Assessment

The user begins by signing up for an account on the website (see **Figure 52**), which enables Seeds of Health to persist data entered and personalize content. Next, they select the appearance of a virtual guide. Allowing the user to determine the appearance of the guide is intended to foster engagement with the tool and personalize the experience from the beginning.

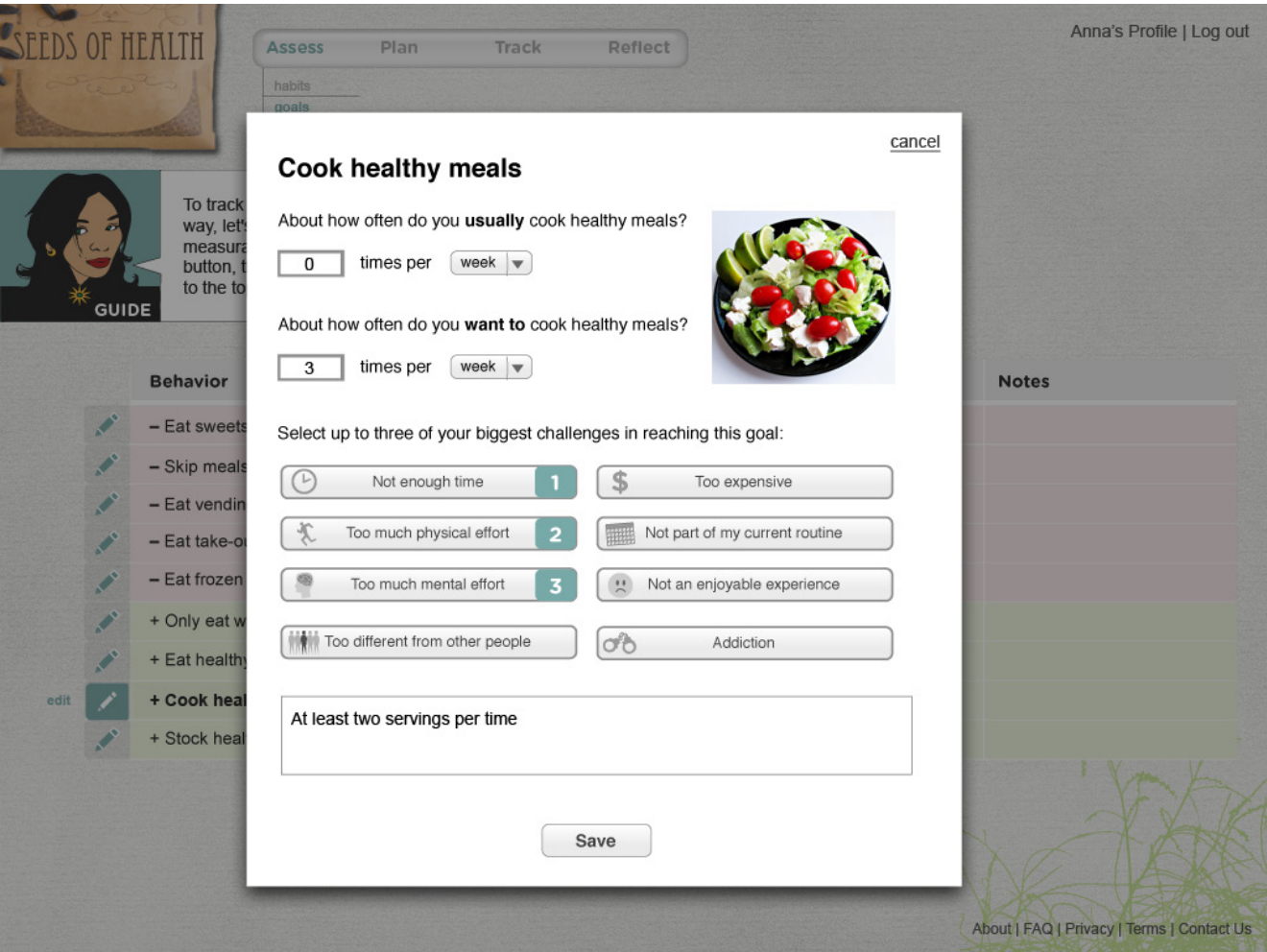
Taking an approach that fuses motivational interviewing and virtual coaching (see Chapter 2), the virtual guide invites the user to assess current eating habits and desired eating habits by reviewing archetype description in the form of cards. Clicking words and phrases in the card descriptions that resonate with them saves these items in the user's profile, a snippet of which is shown in the sidebar for the user's reference (see **Figure 53**).

Figure 53. Assessment of current and desired habits



Next, the guide asks the user to specify measurable wellness goals and perceived challenges (see **Figure 54**). These goals are compiled into a summary table and become part of the user’s wellness profile. The user may enter as many goals as desired, and the tool structures their wellness plan so that only a small number of goals (3-5) are actively pursued at a given time. As the user demonstrated consistent goal achievement over time, the tool prompts them to level up by adopting some of the goals that are still pending in their wellness plan.

Figure 54. Specifying a measurable goal and perceived challenges



Once wellness goals have been entered, the guide asks the user to assess their motivations for behavior change (see **Figure 55**). Predefined motivations are categorized into five groups: emotional experience, relationships, physical wellbeing, appearance, and performance (see the Appendix for motivation card designs). The user can browse through the categories and select motivations that resonate (see **Figure 56**) or enter a motivation in their own words via a form field in the sidebar (see **Figure 57**). Goals entered in the prior step of the assessment are shown in the sidebar for the user's reference.

Figure 55. Assessment of motivations for change

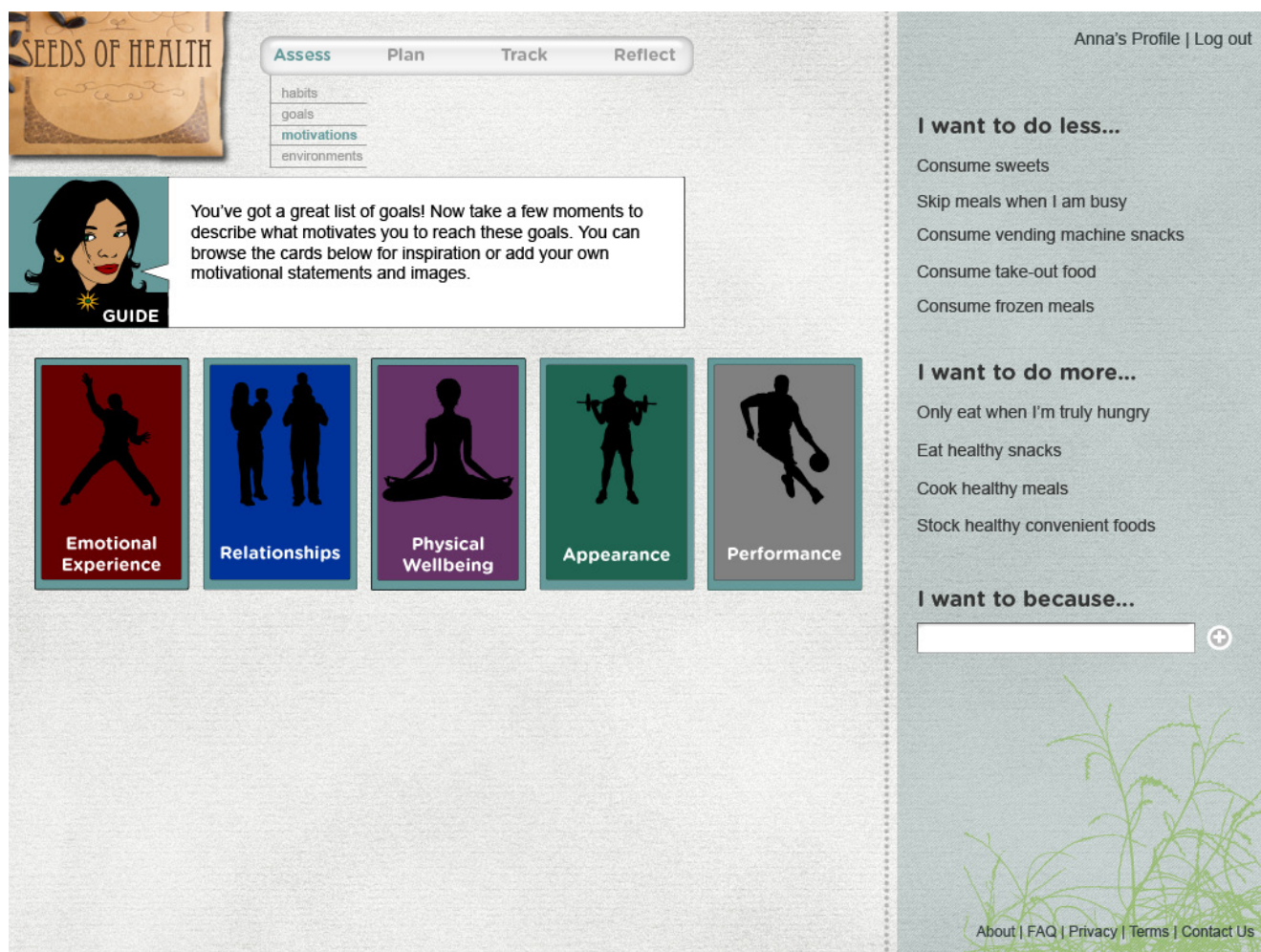


Figure 56. Choosing a predefined motivation

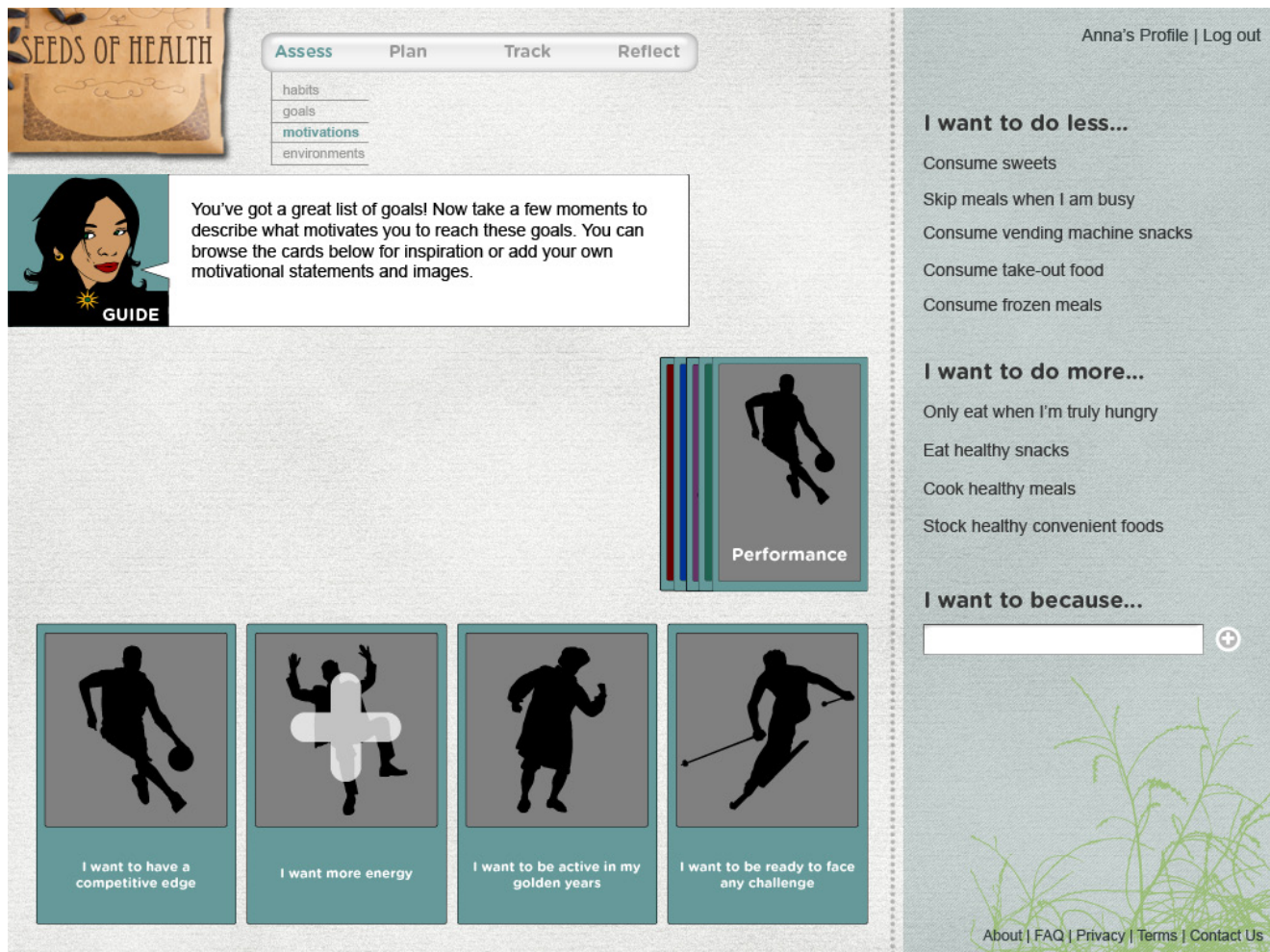
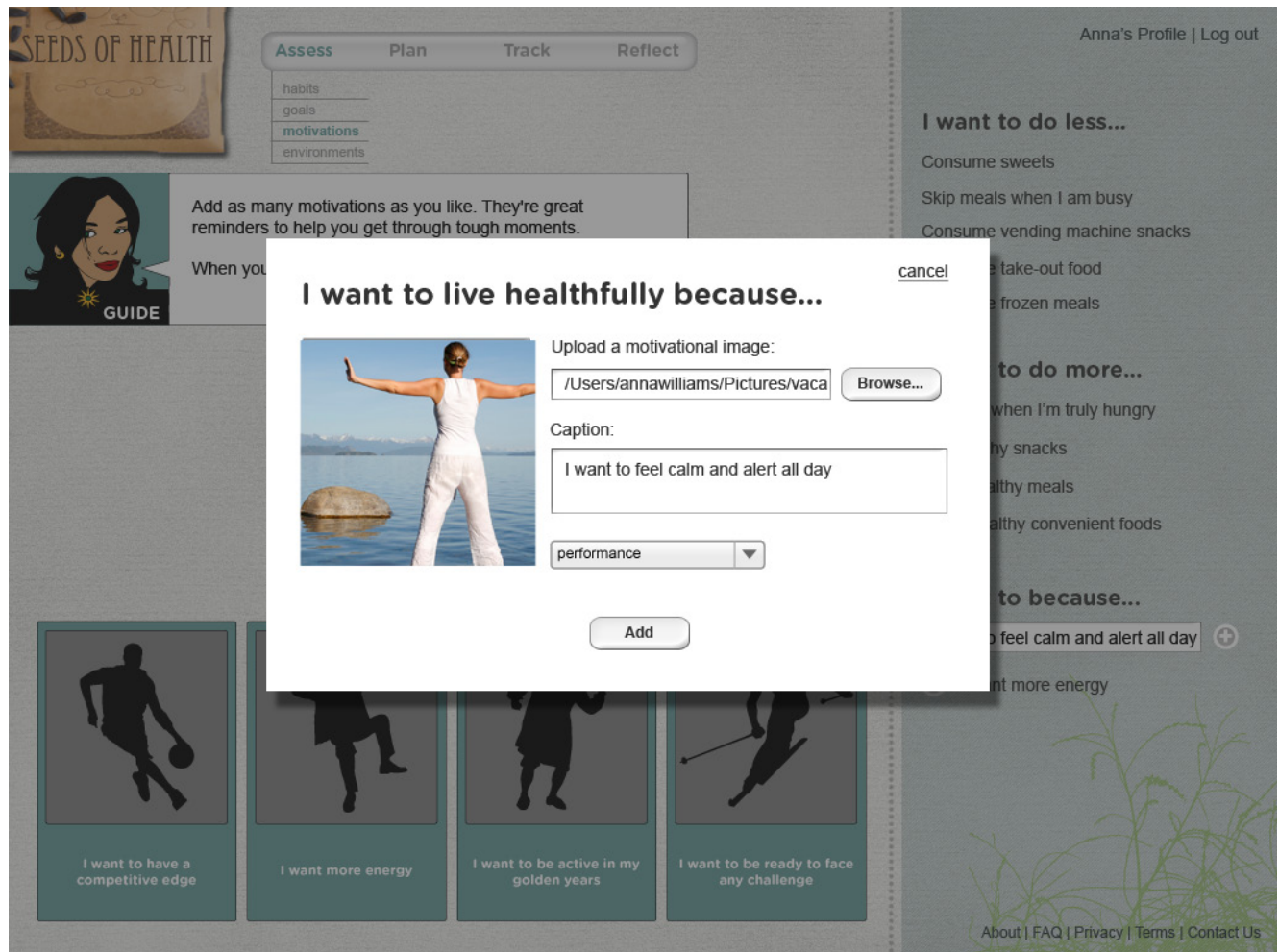


Figure 57. Entering a custom motivation



The final step in the assessment phase has the user take photos of personal environments where they store, cook, and eat food and upload them to the site. They can either send photos directly from a camera phone to an email address for automated upload or transfer digital photos from a camera to the site themselves (see **Figure 58**). Uploaded photos are grouped into galleries representing physical spaces such as kitchen, dining room, etc., which the user can edit at any time by rearranging, rotating, or removing photos or splitting into additional galleries (see **Figure 59**).

Once photos have been uploaded, the guide walks the user through an assessment of personal environments. The user specifies what a space is used for (food storage, equipment storage, food preparation, and/or eating) and has the option to rate the physical qualities of any space, including light, temperature, moisture, etc. Relevant tips are shown based on ratings (see **Figure 60**).

Figure 58. Instructions for uploading personal environment photos to Seeds of Health

The screenshot displays the 'Seeds of Health' website interface. At the top left is the logo. A navigation bar includes 'Assess', 'Plan', 'Track', and 'Reflect'. Below 'Assess' is a list: 'habits', 'goals', 'motivations', and 'environments > upload photos > rate qualities'. On the right, 'Anna's Profile | Log out' is visible. A central 'GUIDE' section features a woman's portrait and text explaining the purpose of the site and providing instructions on how to upload photos and start an environmental assessment. Below this is an 'Email instructions' section with 'FROM', 'TO', and 'SUBJECT' details. On the right side, there is an 'Upload images...' button, a gallery showing '10 images' for the 'kitchen' category, and a link to 'Assess these environments >>'. The footer contains links for 'About | FAQ | Privacy | Terms | Contact Us'.

SEEDS OF HEALTH

Assess Plan Track Reflect

habits
goals
motivations
environments > **upload photos** > rate qualities

Anna's Profile | Log out

Upload images...

10 images
Click to edit

kitchen

Assess these environments >>

GUIDE

Most people don't realize how much the physical environment reinforces their existing habits. Fortunately, once you become more aware of environmental influences, you can set up your personal spaces to help you break old behavioral patterns and reach your wellness goals more easily.

To start, take pictures of the personal spaces where you store, prepare, and eat your food.

Upload your photos in the sidebar or, if you prefer, [follow these email instructions](#) to send the photos to me, and I will upload them for you.

When you are ready, start the [environmental assessment](#).

Email instructions

FROM:
Make sure to send them using the email account linked to your Seeds of Health profile, so I will know the photos are from you:
anna@gmail.com

TO:
photos@seedsofhealth.com

SUBJECT:
The email subject should be a location name. For example, if all the photos in the email were taken in the kitchen, set the email's subject to "kitchen". If the photos in the email were taken in more than one place, you can just leave the email subject blank and add the photo locations later on the Seeds of Health website.

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Figure 59. People take photos of personal environments and save them in editable photo galleries

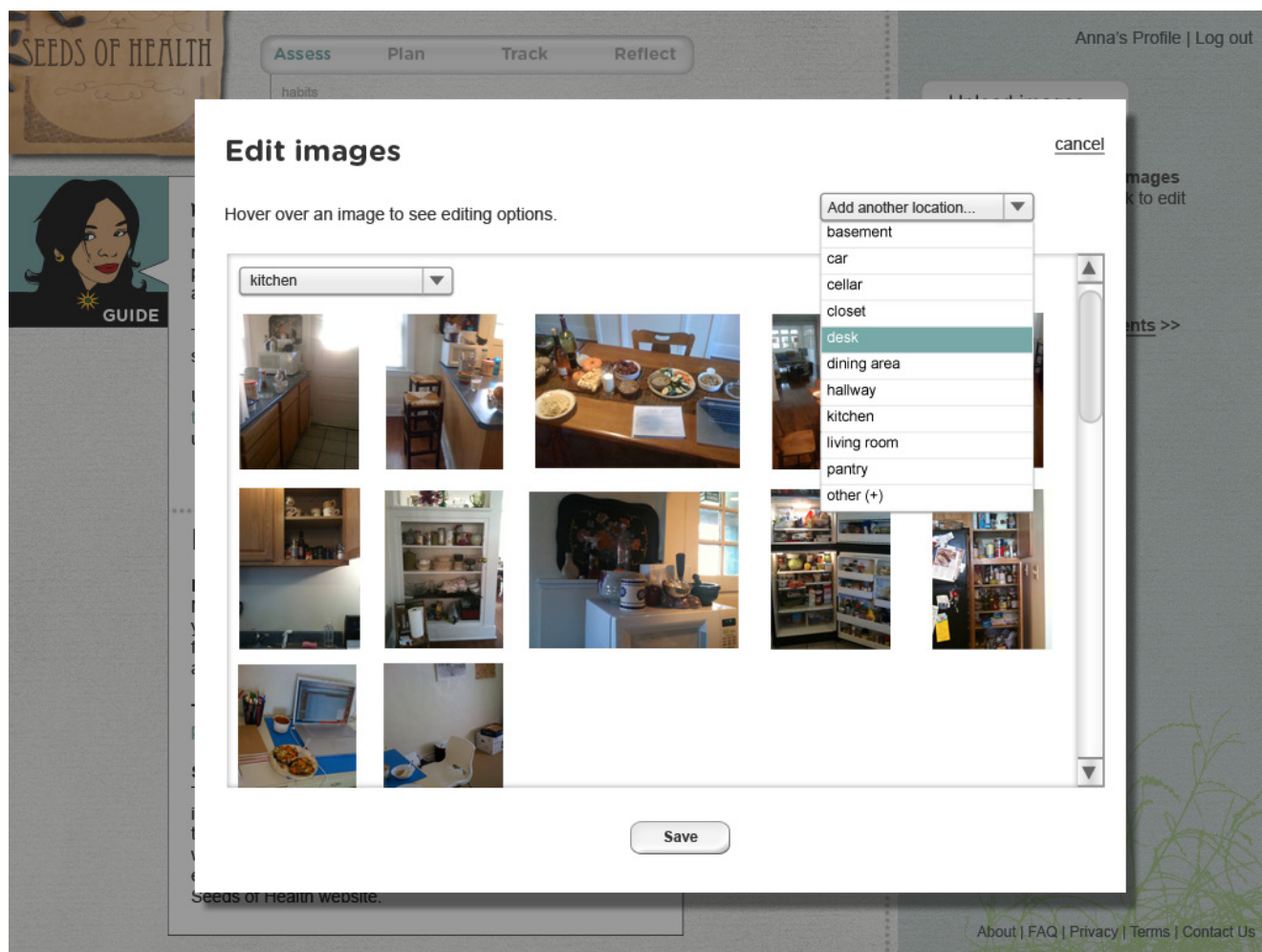
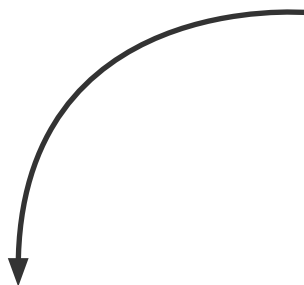
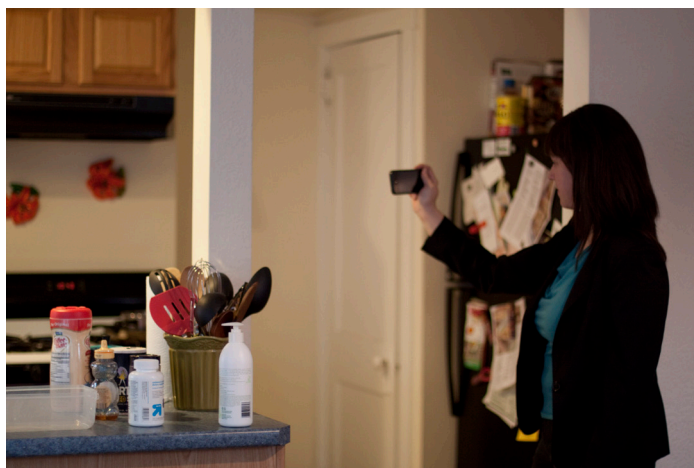


Figure 60. Personal environment assessment based on a kitchen photo, with a food storage tip shown as a result of the user rating the space as a dry environment

[Assess](#)
[Plan](#)
[Track](#)
[Reflect](#)

[habits](#)
[goals](#)
[motivations](#)
[environments](#) > [upload photos](#) > [rate qualities](#)

[Anna's Profile](#) | [Log out](#)

[<< Edit photo galleries](#)

Rate the qualities of the spaces you photographed, and I'll use your ratings to improve my suggestions for your wellness plan. If you notice any environmental changes you'd like to make as you review your photos, you can also add notes for yourself. When you are ready, move on to your wellness [plan](#).

GUIDE

kitchen

1
2
3
4
5
6
7

kitchen 1 **April 8, 2011**

Qualities

light

dark

warm

cold

dry

moist

open

enclosed

ordered

disordered

clean

dirty

airy

stuffy

quiet

loud

Food storage tip

Dry foods like barley and millet last longer when stored in dark, dry, cool environments.

Functions

I use this space for

☒ food storage
☒ equipment storage
☐ food preparation
☐ eating

[Add note](#)

[About](#) | [FAQ](#) | [Privacy](#) | [Terms](#) | [Contact Us](#)

Planning and Preparation

Seeds of Health uses information gathered in the assessment to propose a small set of personally relevant, actionable suggestions aimed at helping the user reach their wellness goals (see **Figure 61**). The user may choose any number of suggestions to add to their wellness plan. Suggestions range from behavioral changes (see **Figure 62**) to environmental changes (see **Figure 63**). They are presented in a way that highlights their interrelations, reflecting the social ecological framework that shaped this work and guiding the user to create a wellness strategy with mutually reinforcing components.

Figure 61. Personalized wellness suggestions based on the user's assessment information

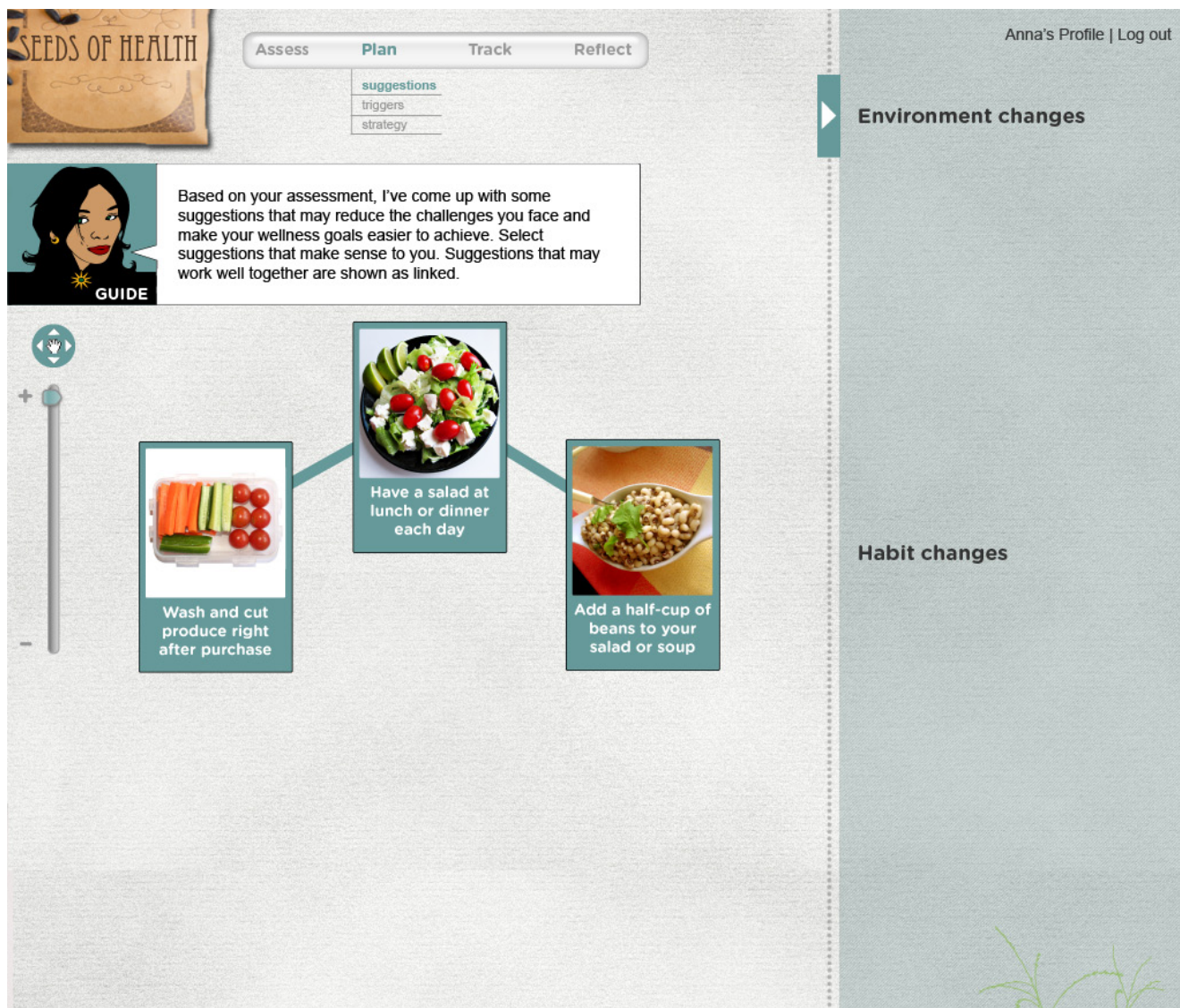



Figure 62. Suggestion for behavior change



Have a salad at lunch or dinner each day

Why?

Targets goals:


- Eat vending machine snacks
- + Cook healthy meals

Cultivating a habit of eating a salad every day takes some practice, but it is a great way to get in a large serving of raw vegetables. Plus, the fiber will keep you fuller longer, reducing your desire to snack between meals. Add beans for extra protein and resistant starch, which enhances satiety.

Community experiences

81 members have adopted this one-shot goal.
16 members have adopted this goal in the past month.
22% achieved success after 1 month.

[View comments >>](#)




Related suggestions

- Wash and cut produce right after purchase
- Buy bagged salad
- Cook a large batch of beans once a week

[Adopt](#)

Figure 63. Suggestion for environmental change



Have a large soup pot

Why?


Targets goals:

- Eat take-out food
- Eat frozen meals
- + Cook healthy meals

Want to save money and have the convenience of tasty, homecooked food all week long? It starts with the right cooking equipment. A large soup pot enables you to cook a large batch of food, then freeze meal-sized portions to have in the future when you don't feel like cooking. You only need one, but it will last you a lifetime.

Community experiences

204 members have adopted this one-shot goal.
6 members have adopted this goal in the past month.
90% achieved success after 1 month.



Related suggestions

- Have a ladle
- Have portion-sized food storage containers
- Try recipes for soups

[Adopt](#)

A suggestion consists of the following:

1. a representative image
2. a caption
3. a note explaining which of the user's wellness goals are addressed
4. icons indicating which of the user's perceived challenges are addressed (corresponding to the icons used on the goal form in the assessment – see **Figure 54**)
5. a brief explanation of the suggestion's value
6. a summary of community experiences, including how many Seeds of Health members have adopted the suggestion, member success rates, and a link to comments on the forum
7. related suggestions that may interest the user


In preparation for changing a daily routine, the guide next invites the user to review their personal environment photos and plan the placement of triggers in these spaces that will cue desired behaviors. This step encourages people to visualize ways in which the physical environment can help them reach their immediate goals. For example, they might decide to place dry ingredients for a soup they intend to make each week in a prominent spot in the kitchen to serve as a visual reminder (see **Figure 64**).

As part of the personalized wellness plan, Seeds of Health also generates printable checklists of action items and lists of related resources that can be used to prepare for change. These may include

- one-time environmental changes to be made in the short-term (for immediate action)
- one-time environmental changes to be made over the long-term (for future planning and reflection purposes)
- shopping guides
- recipes
- daily target behaviors
- weekly target behaviors


If the user has decided to adopt a suggestion to have a salad for lunch or dinner each day, for instance, Seeds of Health can provide a list of salad and dressing recipes, grocery shopping list that includes the relevant ingredients, and a checklist of equipment the user may need to prepare and store salads and dressings.

Figure 64. The user can plan to place environmental cues to trigger target behaviors in personal environments



Assess
Plan
Track
Reflect


suggestions
triggers
strategy




GUIDE

To help you remember to do things that are not part of your current routine, plan to place physical reminders in your environments that will trigger you to perform the target behavior. A trigger could be as simple as a written note to yourself, or it could be an item you need to perform the task.

kitchen



1
2
3
4
5
6
7



cancel

After grocery shopping, put ingredients on microwave where I'll see them.

Add trigger

kitchen 1

April 8, 2011

Anna's Profile | Log out

To add a trigger...

First, think of a place and time where you want to perform a specific behavior on the list below. Ideally, the target behavior should immediately follow a behavior you already perform as part of your routine.

Next, drag the target behavior's icon from the list below to a photo to add a trigger in that location. If you cannot find an appropriate photo in your photo galleries, you can [upload](#) a new photo.

Aim for at least one trigger per behavior.

Target behaviors

- ☐ Have a salad at lunch or dinner each day
- ☐ Wash and cut produce right after purchase
- ☐ Add a half-cup of beans to your salad or soup
- ☒ Cook a large batch of beans once a week

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Practice and Tracking

Figure 65. Seeds of Health offers a simple checklist interface for efficient record-keeping and inspiration cards for motivation in tough moments

In the practice and tracking phase, the user addresses action items in the personalized wellness plan, performing a small set of goal behaviors on a daily and/or weekly basis and making one-time environmental changes as needed. Both recurring behavioral goals and one-time environment change goals can be checked off with a single click on the Seeds of Health track page. The user can also view inspiration cards representing the motivations they selected and/or created in the assessment phase.



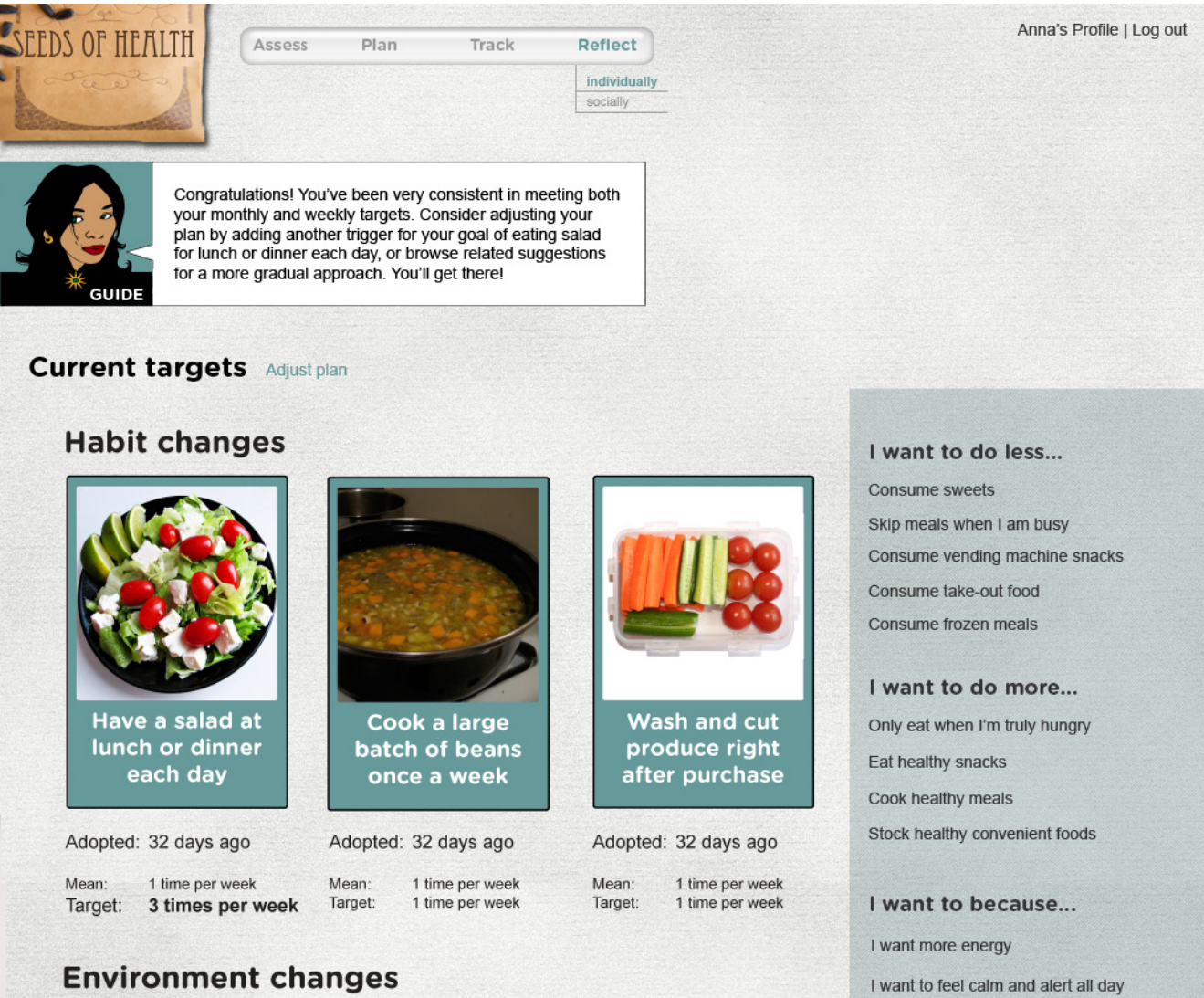
Reflection and Adjustment

The reflection and adjustment phase has two independent sections:

- 1. a page for individual reflection that summarizes and visualizes the user’s progress over time and enables plan adjustments
- 2. a page for social reflection that provides a connection with the Seeds of Health member community, including forums for advice and questions

On the individual reflection page, the guide acknowledges and celebrates the user’s incremental successes (see **Figure 66**). It also invites them to make adjustments to the wellness plan as needed. The user can change the goals

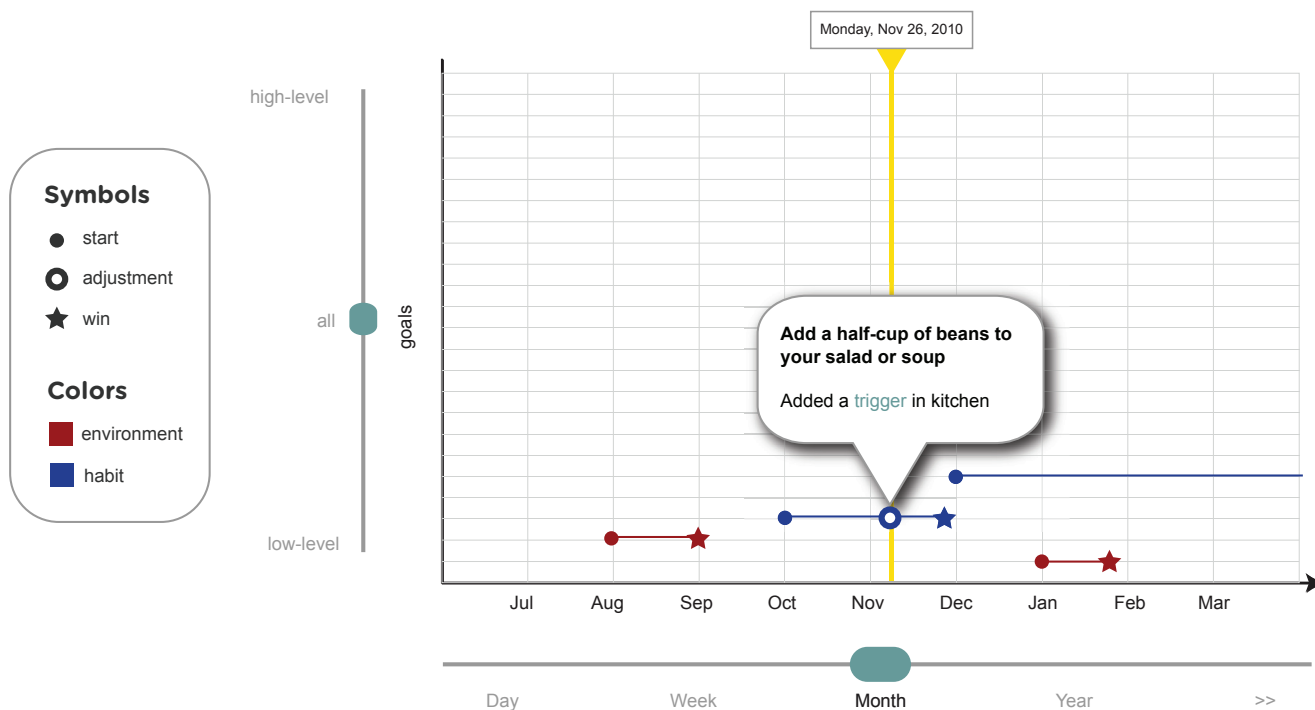
Figure 66. The individual reflection page



they are currently pursuing and either add or remove environmental triggers, depending on how effective they perceive the current ones to be. If they have been consistent in achieving a particular goal for some time, the guide lets them know that they should consider this goal a “win,” or solid habit, and may offer suggestions for leveling up with a more advanced goal. One-time environmental changes, once accomplished, are also considered wins.

Graph visualization helps the user see how they have progressed over time (see **Figure 67**). The user can view data at multiple levels of granularity, from high-level wellness goals as specified in the assessment (e.g. “Only eat when I’m truly hungry”) to low-level behavioral and environmental change goals (e.g. “Have a salad at lunch or dinner 3 times a week”). The user can also zoom to view data for a day, week, month, year, or longer. On the graph, initial goal adoption is represented as a dot. A plan adjustment, such as breaking a goal down into smaller steps or adding a new environmental trigger, is represented as a circle. A win is represented as a star. Environmental and behavioral goals are distinguished by color.

Figure 67. Graph visualization of progress on the individual reflection page



Chapter 5:

Conclusion

Reflection

In dealing with multiple sources of excessive and often contradictory wellness information, people need a tool that can organize, filter, and throttle information so that the content delivered is personally relevant, appropriately timed, and mindful of where they are in the personal transformation process. By providing ongoing guidance, Seeds of Health empowers people to progressively redesign their personal environments and promote their own wellness.

Physical Environment

- ☑ Must increase awareness of how physical environmental factors influence food choices and eating behaviors

Seeds of Health increases people's awareness of how physical environmental factors influence food choices and eating behaviors by guiding them through and providing space-centric tips during the assessment of their personal environments. Additionally, specific environment change suggestions (e.g. use smaller plates, store tempting snacks in places hidden from view) contain explanations that serve to educate people about the effects of physical environmental factors on their eating behaviors.

- ☑ Must facilitate assessment of physical attributes of personal environments with regard to how well they support wellness goals

The environmental assessment is driven by the information entered earlier in the wellness goal assessment. Additionally, people are prompted to create environmental triggers for specific personal wellness goals.

- ☑ Must offer suggestions for cultivating physical environmental conditions that support personal wellness goals

In the planning and preparation phase, the tool offers timely, relevant, mutually complementary suggestions that foster a cohesive support system. Some of these suggestions are changes to physical environments.

- ☑ Should enable long-term planning for life

The reflection and adjustment phase of the tool enables the user to maintain and evolve their personalized wellness plan over time.

Social Environment

- ☑ Must offer suggestions for counteracting social influences that undermine personal wellness goals
- ☑ Must strengthen connections to social relationships and networks that support wellness goals
- ☑ Should increase awareness of how social factors influence food choices and eating behaviors

One of the perceived challenges that people can select when they enter their goals is, “Too different from other people,” which relates to the social pressure they may feel as they attempt to change their lifestyle. By attaching this information to personal wellness goals, the tool can offer suggestions that specifically target this challenge.

The inclusion of community forums on the social reflection page provides an avenue for people to solicit advice from others who are also motivated to improve their health.

Although not the primary focus of the tool, increasing awareness of how social factors influence food choices and eating behaviors may be accomplished through suggestions in the planning and preparation phase that address situations such as group dining.

Information Environment

- ☑ Must manage the individual's action plan for personal environment redesign
- ☑ Must illustrate trends of behavioral and environmental change over time at multiple levels of granularity
- ☑ Must juxtapose incremental changes in personal environments with long-term progress toward goals
- ☑ Should increase self-efficacy with regard to healthy behaviors
- ☑ Should enable critical thinking about health knowledge

The tool creates a personalized wellness plan based on the information people enter during assessment and updates it based on data gathered in the tracking and reflection phases.

The individual reflection page visualizes behavioral trends and environmental changes over time at levels of time granularity ranging from day to year and at levels of goal granularity ranging from high-level wellness goal to specific and measurable daily behavioral goal.

The individual reflection page juxtaposes environmental changes and behavioral goal progress by visualizing them in the same graph using different colors. The time granularity slider enables people to view both incremental changes and long-term progress.

The information delivered through environment tips and personalized suggestions aims to educate people about healthy behaviors, and the practice and track phase is meant to increase their confidence in their ability to build healthy habits.

The explanations and related resources included in the wellness suggestions should provide enough context that people can think critically about health knowledge and seek out more information if they desire.

Behavior

- ☑ Must facilitate the breaking or weakening of undesired habits

The exploration and assessment phase has people identify their undesired eating habits through the review of archetypes. These undesired habits are automatically translated into wellness goals that people can work toward over time.

- ☑ Must facilitate the formation or strengthening of desired habits

The exploration and assessment phase has people identify their desired eating habits through the review of archetypes. These desired habits are automatically translated into wellness goals that people can work toward over time.

- ☑ Must guide behavior change in incremental steps

The tool stores all goals but addresses only a small subset (3-5) in the personalized wellness plan at any given time. Additionally, people can ask the guide to break down ambitious goals into sub-goals in the reflection and adjustment phase.

- ☑ Must encourage reflection on personal wellness goals, motivations, challenges, and progress

The reflection and adjustment phase encourages reflection on personal wellness goals, motivations, challenges, and progress through visualization of behavioral trends and environmental changes and through social interactions in community forums.

- ☑ Must acknowledge incremental and long-term accomplishments

On the individual reflection page, the guide explicitly acknowledges both incremental and long-term accomplishments. Data visualizations implicitly acknowledge these accomplishments as well. Extrinsic rewards such as badges or points are not used to avoid decreasing the intrinsic motivations entered in the personal assessment (see the section on Self Determination Theory in Chapter 2).

- ☑ Must not provide a pathway to failure

The guide offers to make plan adjustments when people are not meeting their short-term goals.

- ☑ Should account for predictably irrational biases and behaviors

Suggestions can account for biases that affect people's judgment of how much they are consuming (e.g. use tall, skinny drinking glasses rather than short, wide drinking glasses because people estimate volume by height, not width). Suggestions should also be worded in ways that account for principles such as loss aversion, although they must be evaluated on a case-by-case basis as new suggestions are added.

System

- ☑ Must not make contradictory demands on the individual

Related suggestions are presented together so that people can select ones that complement each other to include in their wellness plan.

<input checked="" type="checkbox"/> Must deliver suggestions and feedback with a positive affect	The guide adopts a positive or neutral affect at all times.
<input checked="" type="checkbox"/> Should calibrate specificity of messages over time	Because people have to create an account to use the tool, it can track which sections they have used before. New users may receive more verbose instructions while experienced users receive more succinct guidance.
<input checked="" type="checkbox"/> Should complement other components of the wellness ecosystem	The tool helps people organize and plan changes that affect their physical, social, and information environments. By considering all three of these dimensions, the likelihood increases that changes made throughout the wellness ecosystem will complement each other.
<input checked="" type="checkbox"/> Should calibrate demands on the user to respect the individual's time, money, physical, mental, emotional, and social constraints	By asking people about the perceived challenges to their wellness goals, the tool collects information it can use to make informed suggestions that respect unique constraints on the individual.
<input checked="" type="checkbox"/> Should encourage priming for and triggering of desired behaviors in opportune settings according to the principle of kairos	The guided placement of triggers in physical spaces to cue desired behaviors goes beyond what current wellness tools offer and gives people the flexibility to create their own opportune moments for change.

Next Steps

Seeds of Health's reliance on technology may, for some people, decrease its utility. Those without camera-equipped, web-enabled, mobile computing devices like smartphones and tablets may find the process of uploading photos to the site and tracking changes too burdensome. While they can still benefit from the behavioral assessment and personalized suggestions, they miss out on features that visualize the connections between wellness information and their personal environments. As a future step, physical cards could be designed as supplemental materials that users manually browse through and compare to their own settings. These cards would be missing real-time, network data like community feedback and success rates of individual tactics but would be accessible to a wider audience. They could potentially be integrated with the online tool through the use of QR codes.

Going forward, a small pilot study in which individuals use the tool to achieve short-term, measurable behavioral goals can be conducted to reveal usability issues and functionality gaps. Following any needed adjustments, as well as additional visual refinement, a larger-scale, longitudinal study can evaluate the impact of the tool on the order of weeks, months, or even years. Evaluation on this scale would likely require the prototype to be a fully functional web application that includes experience sampling mechanisms to inform future work.

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IRB Application

Carnegie Mellon University

Institutional Review Board

Federalwide Assurance No: FWA00004206

IRB Registration No: IRB00000603

Research Regulatory Compliance

Warner Hall, Fourth Floor

Pittsburgh PA 15213

412-268-1901

Irb-review@andrew.cmu.edu

Certification of IRB Approval

IRB Protocol Number: HS10-428
Title: How do immediate physical and social environments influence food choices and eating behavior?
Investigator(s): Corinna Sherman, Mark Baskinger
Department(s): Design
Date: September 16, 2010

Carnegie Mellon University Institutional Review Board (IRB) reviewed the above referenced research protocol in accordance with the requirements of Public Law 99-158 as implemented by 45 CFR 46 and CMU's Federalwide Assurance. The research protocol has been given **APPROVAL by Expedited Review on September 16, 2010 as authorized by 45 CFR 46.110 (7) and 21 CFR 56.110. This APPROVAL expires on September 15, 2011** unless suspended or terminated earlier by action of the IRB.

All untoward or adverse events occurring in the course of the protocol must be reported to the IRB within three (3) working days. Any additional modifications to this research protocol or advertising materials pertaining to the study must be submitted for review and granted IRB approval prior to implementation. Please refer to the above-referenced protocol number in all correspondence.

Federal regulations require that all records relating to this research protocol be maintained for **at least three (3) years after completion** of the research, and be accessible for inspection and copying by authorized representatives at reasonable times and in a reasonable manner.

The Investigator(s) listed above in conducting this protocol agree(s) to follow the recommendations of the IRB and the Office of the Provost of any conditions to or changes in procedure subsequent to this review. In undertaking the execution of the protocol, the investigator(s) further agree(s) to abide by all CMU research policies including, but not limited to the policies on responsible conduct research and conflict of interest.

The IRB maintains ongoing review of all projects involving humans or human materials, and at continuing intervals, projects will require update until completion. At the end of the current approval, a progress report and current consent form must be submitted to the IRB summarizing progress on the protocol during that period. Please be advised that the progress report requests information pertaining to women and minorities; therefore, this information should be tracked with your participants' data.

Please call the Research Regulatory Compliance Office at 412-268-1901 if you have any questions regarding this certification. Thank you.



David Danks, Ph.D., Chair, IRB

Carnegie Mellon University

Consent Form for Participation in Research

Study Title: Personal Food Environments

Principal Investigator:

Corinna Sherman
School of Design, MMC 110
Carnegie Mellon University, Pittsburgh PA 15213
phone: 510-371-5662
corinna@cmu.edu

Faculty Advisor: Mark Baskinger, Associate Professor

Purpose of this Study

The purpose of this study is to to understand how people perceive their physical and social environments to influence their food choices and eating behaviors.

Procedures

If you agree to be in this study, you will:

- Be interviewed about the the physical and social settings where you decide what to eat and where you actually eat; your food-related behaviors; and your nutritional challenges and/or aspirations. The interview will take about 30 minutes to complete and can be conducted in a location of your choosing: Carnegie Mellon's Pittsburgh campus, your home or workplace, a local café or restaurant, etc. With your permission, I would also like to record the interview.
- Take a brief questionnaire about your dietary attitudes and practices. The questionnaire should take about five minutes to complete.
- Keep a seven-day food journal describing the physical and social settings in which you eat; notes about when, what and how much you eat; your comfort level in these settings; and any eating-related challenges you experience. As part of this record, you will take a photo of each meal and a photo of the immediate surroundings where the meal is consumed. You should record each entry in the place and time the meal is actually consumed, or as soon as possible afterward.

Participant Requirements

Participation in this study is limited to individuals age 18 and older.

Risks

The risks and discomfort associated with participation in this study are no greater than those ordinarily encountered in daily life or during reflective activities in everyday environments.

IRB No: [HS10-428](#)

page 1

Approved: September 16, 2010

Expires: September 14, 2011

Modified:

Version 4/2010

Carnegie Mellon University

Consent Form for Participation in Research

Benefits

In the course of reflection, you may become more mindful of your own eating habits and environments. Even if there is no personal benefit from your participation in the study, the knowledge received may be of value to humanity.

Compensation & Costs

There will be no cost to you if you participate in this study.

Confidentiality

By participating in the study, you understand and agree that Carnegie Mellon may be required to disclose your consent form, data and other personally identifiable information as required by law, regulation, subpoena or court order. Otherwise, your confidentiality will be maintained in the following manner:

Your data and consent form will be kept separate. Your consent form will be stored in a locked location on Carnegie Mellon property and will not be disclosed to third parties. By participating, you understand and agree that the data and information gathered during this study may be used by Carnegie Mellon and published and/or disclosed by Carnegie Mellon to others outside of Carnegie Mellon. However, your name, address, contact information and other direct personal identifiers in your consent form will not be mentioned in any such publication or dissemination of the research data and/or results by Carnegie Mellon.

The researchers will take the following steps to protect participants' identities during this study: (1) Each participant will be assigned a number; (2) The researchers will record any data collected during the study by number, not by name; (3) Any original recordings or data files will be stored in a secured location accessed only by authorized researchers.; (4) Any video and/or audio recordings and photographs will not reveal the names or faces of participants.

Optional Permission

I understand that the researchers may want to use photographs from my food journal and/or a short portion of any video or audio recording for illustrative reasons in presentations of this work for scientific or educational purposes. I give my permission to do so provided that my name and face will not appear.

☐ YES ☐ NO (Please initial here _____)

IRB No: [HS10-428](#)

page 2

Approved: September 16, 2010

Expires: September 14, 2011

Modified:

Version 4/2010

Carnegie Mellon University

Consent Form for Participation in Research

Rights

Your participation is voluntary. You are free to stop your participation at any point. Refusal to participate or withdrawal of your consent or discontinued participation in the study will not result in any penalty or loss of benefits or rights to which you might otherwise be entitled. The Principal Investigator may at his/her discretion remove you from the study for any of a number of reasons. In such an event, you will not suffer any penalty or loss of benefits or rights which you might otherwise be entitled.

Right to Ask Questions & Contact Information

If you have any questions about this study, you should feel free to ask them now. If you have questions later, desire additional information, or wish to withdraw your participation please contact the Principal Investigator by mail, phone or e-mail in accordance with the contact information listed on the first page of this consent.

If you have questions pertaining to your rights as a research participant; or to report objections to this study, you should contact the Research Regulatory Compliance Office at Carnegie Mellon University. Email: irb-review@andrew.cmu.edu . Phone: 412-268-1901 or 412-268-5460.

Voluntary Consent

By signing below, you agree that the above information has been explained to you and all your current questions have been answered. You understand that you may ask questions about any aspect of this research study during the course of the study and in the future. By signing this form, you agree to participate in this research study.

PARTICIPANT SIGNATURE

DATE

I certify that I have explained the nature and purpose of this research study to the above individual and I have discussed the potential benefits and possible risks of participation in the study. Any questions the individual has about this study have been answered and any future questions will be answered as they arise.

SIGNATURE OF PERSON OBTAINING CONSENT

DATE

IRB No: [HS10-428](#)

page 3

Approved: September 16, 2010

Expires: September 14, 2011

Modified:

Version 4/2010

Online Survey

Consent

This survey is part of a research study conducted by Corinna Sherman at Carnegie Mellon University.
The purpose of the research is to understand how physical and social environments affect food choices and eating behaviors.

Procedures

This survey will ask you questions about your daily eating practices and nutrition goals. The survey will take you approximately 30 minutes.

Participant Requirements

Participation in this study is limited to individuals age 18 and older.

Risks

The risks and discomfort associated with participation in this study are no greater than those ordinarily encountered in daily life or during other online activities.

Benefits

There may be no personal benefit from your participation in the study but the knowledge received may be of value to humanity.

Compensation & Costs

There will be no cost to you if you participate in this study. You may also withdraw at any time without penalty.

Confidentiality

Qualtrics captures your IP address, but it will be deleted from our data sheet. Your email will only be used for the purpose of contacting you if you agree to participate in a follow-up interview, and will also be kept confidential along with the rest of your data. By participating in this research, you understand and agree that Carnegie Mellon may be required to disclose your consent form, data and other personally identifiable information as required by law, regulation, subpoena or court order. Otherwise, your confidentiality will be maintained in the following manner:

Your data and consent form will be kept separate. Your consent form will be stored in a password-protected spreadsheet on a secured hard drive in a locked location on Carnegie Mellon property and will not be disclosed to third parties. By participating, you understand and agree that the data and information gathered during this study may be used by Carnegie Mellon and published and/or disclosed by Carnegie Mellon to others outside of Carnegie Mellon. However, your name, address, contact information and other direct personal identifiers in your consent form will not be mentioned in any such publication or dissemination of the research data and/or results by Carnegie Mellon.

Right to Ask Questions & Contact Information

If you have any questions about this study, you should feel free to ask them by contacting the Principal Investigator: Corinna Sherman, School of Design, MMC-110, Carnegie Mellon University, Pittsburgh, PA 15213, (510) 371-5662, corinna@cmu.edu. If you have questions later, desire additional information, or wish to withdraw your participation, please contact the Principal Investigator by mail, phone or e-mail in accordance with the contact information listed above.

If you have questions pertaining to your rights as a research participant; or to report objections to this study, you should contact the Research Regulatory Compliance Office at Carnegie Mellon University. Email: irb-review@andrew.cmu.edu . Phone: 412-268-1901 or 412-268-5460.

Voluntary Participation

Your participation in this research is voluntary. You may discontinue participation at any time during the research activity.

I am 18 years or older.



Yes

☐ No

I have read and understand the information above.

☐ Yes

☐ No

I want to participate in this research and continue with the survey.

☐ Yes

☐ No

Eating Attitudes and Goals

Drag the slider to indicate the percentage of meals you eat that describes each statement.

	0	10	20	30	40	50	60	70	80	90	100
I want to eat in a manner that promotes my own health.											
I currently eat in a manner that promotes my own health.											
Regardless of my success level, eating in a manner that promotes my own health is a conscious struggle.											

What motivates you to eat healthfully?

What are your greatest challenges to eating healthfully?

Please indicate the adjustments you would like to make in your nutrition:

		decrease consumption	no change	increase consumption
caffeine	<input type="checkbox"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
calories	<input type="checkbox"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
fat	<input type="checkbox"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
fruits	<input type="checkbox"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
sugar	<input type="checkbox"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
vegetables	<input type="checkbox"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
water	<input type="checkbox"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Eating Behaviors and Habits

Select the statement that best describes your daily eating routine:

- ☐ I usually eat 1 meal a day
- ☐ I usually eat 2 meals a day
- ☐ I usually eat 3 meals a day
- ☐ I usually eat 4 meals a day
- ☐ I usually eat 5-6 meals a day
- ☐ The number of meals I eat varies greatly from day to day
- ☐ I eat throughout the day and don't have distinct mealtimes

Select the statement that best describes where you eat:

- ☐ I usually eat at the same places each day
- ☐ The places at which I eat vary from day to day

Where do you eat your meals?

	Never	Rarely	Sometimes	Quite Often	Very Often
Home	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Personal work space (not at home)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cafeteria or common eating space at work	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Public park or green space	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In a vehicle (car, train, bus, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Restaurant	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other (specify)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="text"/>					

Where do your meals come from?

	Never	Rarely	Sometimes	Quite Often	Very Often
Home	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cafeteria	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Street vendor	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Caterer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vending machine	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Restaurant	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Deli counter	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Convenience store	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other (specify)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="text"/>					

What else do you do while eating?

	Never	Rarely	Sometimes	Quite Often	Very Often
Nothing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Watch TV	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Listen to radio, audiobook, podcast, etc.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Chat	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Read	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Use a computer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other (specify)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="text"/>					

How do you decide when your meal is over?

How do you usually feel after your biggest meal of the day?

- ☐ So hungry you want to eat anything you can.
- ☐ All food looks good. Preoccupied with hunger.
- ☐ You are hungry and the urge to eat is strong.
- ☐ A little hungry but could wait to eat.
- ☐ Neutral. Not hungry, not full.
- ☐ No longer hungry. You sense food in your stomach but could eat more.
- ☐ Comfortably satisfied. May not feel hungry again for several hours.
- ☐ Not uncomfortable but definitely a full stomach.
- ☐ Stuffed. Uncomfortably full.
- ☐ Bursting, painfully full.

Are there specific situations or places that set off a period of overeating that you later regret?

- ☐ Yes
- ☐ No

What situations or places set off overeating that you later regret?

Are there specific situations or places that trigger you to eat a kind of food that you later regret choosing to eat?

- ☐ Yes
- ☐ No

What situations or places trigger the food choices you later regret?

Which of the following health metrics do you currently monitor on yourself?

		Never	Less than Once a Month	Once a Month	2-3 Times a Month	Once a Week	2-3 Times a Week	Daily
heart rate	<input type="checkbox"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
weight	<input type="checkbox"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
blood sugar	<input type="checkbox"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
blood pressure	<input type="checkbox"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
body mass index (BMI)	<input type="checkbox"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
cholesterol	<input type="checkbox"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
other	<input type="checkbox"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Have you ever kept a food journal to track what you eat?

- ☐ Yes
☐ No

Have you ever kept a fitness journal to track your exercise?

- ☐ Yes
☐ No

Demographic Information**What is your gender?**

- ☐ Male
☐ Female

In what year were you born?**Please indicate your highest level of education completed.**

- ☐ Grammar School
☐ High School or equivalent
☐ Vocational/Technical School (2 year)
☐ Some College
☐ College Graduate (4 year)
☐ Master's Degree (MA, MS, etc.)
☐ Doctoral Degree (PhD)
☐

Professional Degree (MD, JD, etc.)

- ☐ Other

Which of the following best describes your ethnicity?

- ☐ American Indian or Alaska Native
- ☐ Asian
- ☐ Black or African American
- ☐ Hispanic
- ☐ Native Hawaiian or Other Pacific Islander
- ☐ White
- ☐ Other (specify)

Which business sector best describes your work?

- ☐ Individual (students of any age, or other person with no business affiliations)
- ☐ Federal government
- ☐ State, county, local, or tribal government
- ☐ College/university
- ☐ Finance, insurance, or real estate
- ☐ Retail/wholesale company
- ☐ Media
- ☐ Market research, advertising, or consulting
- ☐ Religious, civic, or political organization
- ☐ Trade or professional association
- ☐ Other

Which of the following best describes your occupation/role?

- ☐ Student
- ☐ Professor/teacher
- ☐ Librarian
- ☐ Administrator
- ☐ Computer programmer, system analyst/administrator, computer technician
- ☐ Economist or social scientist
- ☐ Health professional (physician, nurse, etc.)
- ☐ Homemaker
- ☐ Journalist
- ☐ Marketing or sales professional
- ☐

Management consultant

- ☐ Policy analyst
- ☐ Senior management (president, VP, director, partner, etc.)
- ☐ Scientist or engineer
- ☐ Statistician
- ☐ Self employed
- ☐ Unable to work
- ☐ Unemployed and looking for work
- ☐ Unemployed and not looking for work
- ☐ Retired
- ☐ Other

Including yourself, how many people live in your household?

What is your combined annual household income?

Who is the primary decision maker for household food purchases?

- ☐ Self
- ☐ Spouse
- ☐ Parents
- ☐ Children
- ☐ Other

Follow-up

Can we contact you through email for a 10 minute follow-up interview?

- ☐ Yes, my e-mail address is:

- ☐ No

Interview Questions

How do you determine whether a meal is healthy?

Tell me about the last meal you had that you consider a healthy meal.

Tell me about the last meal you had that you consider an unhealthy meal.

Describe your strategies for healthy eating.

What do you do to use to ensure you are getting good nutrition?

What tactics do you use to moderate your food intake and minimize the likelihood of overeating?

Describe your struggles with eating.

What kinds of experiences have discouraged you in the past?

What led up to those experiences?

How did you recover or cope with setbacks?

What do you do to avoid repeat occurrences?

Describe any tactics you use to monitor and/or control your own food consumption, e.g. keeping a food journal, counting calories, setting restrictions on food types, setting restrictions on mealtimes, dieting, etc.

What has worked over the short term?

What has worked over the long term?

How do physical surroundings affect how you eat?

Tell me about a time when your physical surroundings affected how you ate in a positive way.

Tell me about a time when your physical surroundings affected how you ate in a negative way.

How does your social environment affect how you eat?

Tell me about a time when the people around you affected how you ate in a positive way.

Tell me about a time when the people around you affected how you ate in a negative way.

1. How often are you dieting? (Circle one)	Never	Rarely	Sometimes	Usually	Always
2. What is the maximum amount of weight (in pounds) you have ever lost within one month? (Circle one)	0-4	5-9	10-14	15-19	20+
3. What is your maximum weight gain in pounds within a week? (Circle one)	0-1	1.1-2	2.1-3	3.1-5	5.1+
4. In a typical week, how much does your weight fluctuate? (Circle one)	0-1	1.1-2	2.1-3	3.1-5	5.1+
5. Would a weight fluctuation of 5 lbs. affect the way you live your life (Circle one)	Not at all	Slightly	Moderately	Very much	
6. Do you eat sensibly in front of others and splurge alone? (Circle one)	Never	Rarely	Often	Always	
7. Do you give too much time and thought to food? (Circle one)	Never	Rarely	Often	Always	
8. Do you have feelings of guilt after overeating? (Circle one)	Never	Rarely	Often	Always	
9. How conscious are you of what you're eating? (Circle one)	Not at all	Slightly	Moderately	Extremely	
10. How many pounds over your desired weight were you at your maximum weight? (Circle one)	0-1	1-5	6-10	11-20	21+

GENDER (circle one) **M** **F**

AGE _____

WEIGHT _____

HEIGHT _____

PARTICIPANT # _____

FOOD JOURNAL

PARTICIPANT # _____

Research Study on Personal Food Environments
Principal Investigator: Corinna Sherman, corinna@cmu.edu

INSTRUCTIONS

For the next seven days, you will use this food journal to document your meals. Use one page for each meal.

BEFORE EATING

- 1. Photograph your meal. The photo should make apparent what the food is and how much of it there is. The photo should NOT include any people or sensitive/personal objects.
- 2. Photograph the immediate physical setting where you will eat. The photo should make apparent whether you are indoors or outdoors, the lighting conditions, the surface on which your meal sits, and any furniture you use while eating. The photo should NOT include any people or sensitive/personal objects.
- 3. Note how you feel, using the hunger/satiety scale provided.

AFTER EATING

- 4. Note how you feel, using the hunger/satiety scale provided.
- 5. Complete the journal questions for your meal.

GRAPHING HUNGER/SATIETY

Each journal page has a numbered bar you should use to indicate your hunger/satiety before and after a meal. It looks like this:

1 2 3 4 5 6 7 8 9 10
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

You should fill in the boxes that span the range of hunger/satiety you experienced.

Example 1:

Started at 3 (hungry) and ended at 7 (comfortably satisfied).
1 2 3 4 5 6 7 8 9 10
☐ ☐ ☒ ☒ ☒ ☒ ☒ ☐ ☐ ☐

Example 2:

Started at 5 (neutral) and ended at 9 (stuffed).
1 2 3 4 5 6 7 8 9 10
☐ ☐ ☐ ☐ ☒ ☒ ☒ ☒ ☒ ☐

QUESTIONS? ISSUES?

Please contact the Principal Investigator for this study:

Corinna Sherman
corinna@cmu.edu
510-371-5662

The Hunger/Satiety Scale used here is based on two sources:
Lisa Burgeon MS, RD, LD, Sports Nutritionist, SportWell Center, University of Illinois at Urbana - Champaign, 1998.
URL: www.mckinley/illinois.edu/interactive/.../hunger_satiety_scale.pdf. Accessed July 16, 2010.
Karin Kralina, PhD, MPE, RD, Nancy King, MS, RD and Dayle Hayes, MS, RD. Moving Away From Diets: Camera-Ready Handouts.
URL: http://www.nourishingconnections.com/moving_away_diets.htm. Accessed July 16, 2010.

THE HUNGER/SATIETY SCALE

- 1 So hungry you want to eat anything you can.
- 2 All food looks good. Preoccupied with hunger.
- 3 You are hungry and the urge to eat is strong.
- 4 A little hungry but could wait to eat
- 5 Neutral. Not hungry, not full.
- 6 No longer hungry. You sense food in your stomach but could eat more.
- 7 Comfortably satisfied. May not feel hungry again for several hours.
- 8 Not uncomfortable but definitely full.
- 9 Stuffed, maybe a little uncomfortable.
- 10 Bursting, painfully full.

1

DATE: _____

TIME MEAL STARTED: _____

DAY: M T W Th F Sa Su

TIME MEAL ENDED: _____

Graph your hunger/satiety from start to end of meal.

1

2

3

4

5

6

7

8

9

10

Where did you eat your meal?

☐ home

☐ school

☐ work

☐ other (specify) _____

FIRST – REMEMBER TO TAKE PHOTOS!

☐ a photo of your meal before you eat

☐ a photo of the physical setting

Please do not include people or sensitive/personal objects in any of the photos.

What did you have to eat and drink? (specify food and amount)

When did you decide your meal was over?

How many other people were with you during your meal? _____

Socially, how comfortable did you feel in this setting? (Circle one)

1

Very uncomfortable. Couldn't wait to leave.

2

Uncomfortable. Didn't want to linger.

3

Slightly uncomfortable.

4

Neutral.

5

Slightly comfortable.

6

Comfortable. Wanted to linger for a while.

7

Very comfortable. Could have stayed a long time.

While eating, did you have in mind a specific activity to do after your meal was over?

(Circle one) Yes No

Did you remain in the same physical space after your meal to do your next activity?

(Circle one) Yes No

Did you feel you had a healthy meal once you were finished eating?

(Circle one) Yes No

Journal Follow-Up Interview Questions

Thank you for participating in the food journal study. While doing your journal activity...

How did your awareness of your eating habits change over the course of the journaling activity?

Did you notice anything in your physical environment that you hadn't noticed before?

Did you make any changes to your physical environment in response?

Did you notice anything in your social setting that you hadn't noticed before?

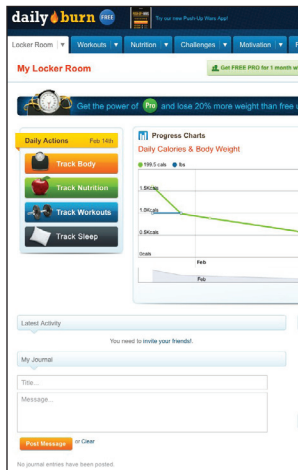
Did you change your food choices or eating behavior over the course of the journaling activity?

Is keeping a food journal something you would consider doing in the future to improve your eating habits?
Why or why not?

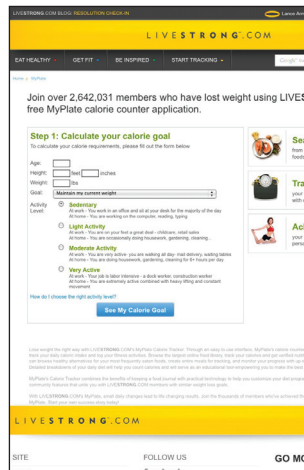
Have you consulted any resources to shape your home environment to support your nutritional goals?

Competitive Analysis

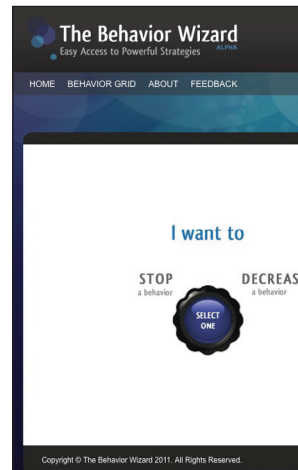
A visual sampling...



Source: <http://dailyburn.com>



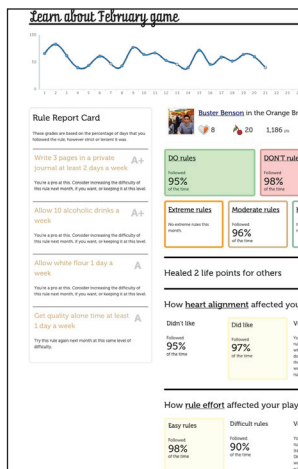
Source: <http://www.livestrong.com/thedailyplate/>



Source: <http://www.behaviorwizard.org/wp/>



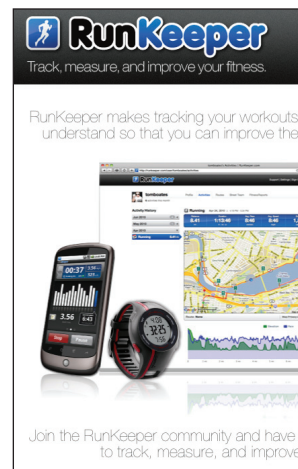
Source: <http://munch5aday.com/>



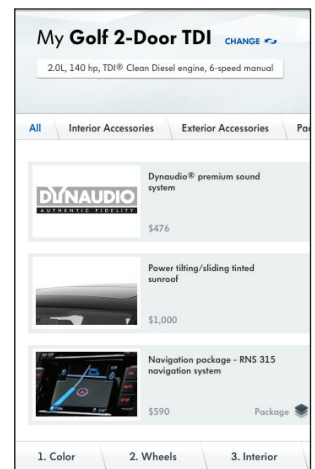
Source: <http://healthmonth.com/>



Source: <http://www.loseit.com/>



Source: <http://runkeeper.com/>



Source: <http://configurator.vw.com/ihdcl/configurator.html>

Summary Table

Product	URL	Description	Free Version
100 Pushups	http://hundredpushups.com/	100 Pushups is a six-week training program designed to guide even people who have never done pushups before to reaching a goal of doing 100 consecutive pushups.	Yes
DailyBurn	https://dailyburn.com/	The DailyBurn website enables people to track metrics for body, nutrition, sleep, and workouts.	Yes
Flickr	http://www.flickr.com/	Flickr is a web-based tool for organizing and sharing digital photos and videos.	Yes
Glucose Buddy	http://www.glucosebuddy.com/	Glucose Buddy is a web-based diabetes tracking tool.	Yes

Pay Version	Touchpoints	Social Components	Track	Data Visualization
Yes	Website, iOS app, Android app, Windows Phone 7 app	Optional web-based tool Push Ups Logger enables people to view others' progress and post their own progress to Twitter or Facebook. Anyone can post a badge declaring they completed the 100-pushup challenge on a web page or blog.	Optional web-based tool Push Ups Logger enables people to log and track their progress	None
3 tiers	Website, iOS apps for Daily-Burn, FoodScanner, and Push-up Wars, Zeo sleep meter, Withings scale, Body-Trace, iGoogle Gadget	Select community members to be personal motivators. Challenge other community members and monitor their site activity. Integration with Facebook.	Metrics for body, nutrition, sleep, and workouts. Journal entries. Progress photos.	Calendar with activity symbols (weights, cardio, nutrition recorded, meals planned), progress charts with combinations of metrics
Yes	Website	View photostreams from Flickr contacts. Annotate regions of a photo to provide more information to viewers.	N/A	Photos and videos contributed by members, organized into albums and photostreams
No	Website, iOS app	Integration with Facebook and Twitter	Blood sugar, medication, foods	Tabular data

Product	URL	Description	Free Version
Health Month	http://healthmonth.com/	Health Month is a web-based social game in which people team up with friends to change their health behaviors on a month-by-month basis. Offering both a free version and a pay version, Health Month allows users to select behavioral goals they intend to reach that month and collect points for each day they meet their targets.	Yes
IKEA Kitchen Planner	http://www.ikea.com/ms/en_AU/rooms_ideas/splash-planners.html	The IKEA Kitchen Planner is a web-based tool that enables people to plan the design of kitchen and dining rooms in their homes using IKEA products.	Yes
LoseIt	http://www.loseit.com/	Lose It! is a web-based tool that enables people to create a personalized diet and exercise plan and track their food, workouts, and weight.	Yes
Lowes Virtual Room Designer	https://lowes.2020.net/planner/UI/Pages/VPUI.htm	The Lowes Virtual Room Designer is a web-based tool that enables people to plan the design of kitchen, bathroom, and laundry room in their homes using Lowes products.	Yes
Munch 5-a-Day	http://munch5aday.com/	Munch 5-a-Day is an iPhone app that enables people to set goals for and record their daily intake of fruits and vegetables. They earn badges as rewards for consistent goal achievement.	Yes

Pay Version	Touchpoints	Social Components	Track	Data Visualization
Yes	Website, email, Fitbit	Team-based play, community statistics, team pages	Daily behaviors	Charts and graphs
No	Website	Email designs to others	Room designs can be saved for future reference	Color, vector-based diagrams of room layouts, furniture, and fixtures
No	Website, Twitter, Facebook, iOS app, email reports and reminders, Withings scale	Friends list of community members. Integration with Facebook and Twitter. Forums on fitness, diet, miscellaneous topics, feature suggestions	Foods, weight, BMI, exercises, calories	Graph of metrics
No	Website	Email designs to others	Room designs can be saved for future reference	Color, vector-based diagrams of room layouts, furniture, and fixtures
No	Website, iOS app	Share progress on Facebook and Twitter	Daily fruit and vegetable intake	Charts

Product	URL	Description	Free Version
MyPlate	http://www.livestrong.com/thedailyplate/	MyPlate is a calorie counting and meal planning tool on the LiveStrong.com website. It offers a food database that people can use to get nutrition information and find healthier substitutions as well as a fitness planner and log to track calories burned.	Yes
Nike+	http://nikerunning.nike.com/nikeos/p/nikeplus/en_US/plus/	Nike+ is a service that integrates Nike shoes, fitness equipment, and iPods to enable people to track their workouts and connect with the user community.	No
PEERtrainer	http://www.peertrainer.com/	PEERtrainer is a website that offers daily weight loss motivation tips; daily logs for meals, workouts and goals; and small groups for support and accountability	Yes
Posterous	http://www.posterous.com/	Posterous is a web-based blogging tool that automatically posts emailed content to one or more destinations.	Yes
Rootein	http://rootein.com/	The Rootein website enables people to set and track recurring behaviors for the purpose of forming habits.	Yes

Pay Version	Touchpoints	Social Components	Track	Data Visualization
No	Website, iOS app	Dares, groups, forums, food map	Calorie intake, calories burned, foods	Charts and graphs
Yes	Website, iOS app, fitness tracking equipment	Team challenges, Recent activity feeds, community member comparisons of performance stats	Workout metrics and goals	Charts and graphs
Yes	Website	Groups of 1-4 members support each other by reviewing and commenting on each others' daily logs. Forums host community discussions. Teams bring together people in pursuit of a common goal.	Daily meals and exercise in journal entry form	Text
No	Website, iOS app, Android app, email	Friends feed. Group pages. Integration with Facebook, Twitter, and third-party blogs.	N/A	Photos and video contributed by members, organized into post-specific galleries
No	Website, Facebook app, email reminders	Integration with Facebook	Daily behaviors	Calendar with checkmarks

Product	URL	Description	Free Version
RunKeeper	http://runkeeper.com/	RunKeeper is a website that enables people to track, measure, and improve their fitness.	Yes
Streaks	http://fanzter.com/products/streaks	Streaks is a mobile app featuring a motivational calendar that enables people to track recurring behaviors.	No
Temptd	http://www.mobilewillpower.com/	Temptd is a Facebook app that enables people to take baby steps toward improving their health with the help of their social networks	Yes
The Behavior Wizard	http://www.behaviorwizard.org/wp/	The Behavior Wizard is a website that helps people design for behavior change.	Yes
VW Build & Price	http://configurator.vw.com/ihdcc/configurator.html	The Build & Price feature on Volkswagen's website enables people to customize a car to their specifications for purchase.	Yes

Pay Version	Touchpoints	Social Components	Track	Data Visualization
Yes	Website, email, iOS app, Android app, Windows Phone 7 app, Facebook, Twitter, FourSquare, Withings scale, Fitbit body monitor, Zeo sleep meter.	User selects motivating team from local RunKeeper community members, Facebook friends and Google contacts. Contact integration with Facebook, Twitter, FourSquare. Post personal records to Twitter and Facebook.	Weight, % body fat, workout metrics (distance, duration, calories burned, etc.), nutrition metrics (calories consumed, carbs/fat/protein consumed, etc.), sleep	Charts and graphs
Yes	iOS app	None	Daily behaviors	Calendar with checkmarks, List of current and past streaks (contiguous days of a specific goal met)
No	Website, Facebook	Karma point system incentivizes sending encouragement to other Temptd members	Daily avoidance of undesired habits	Facebook-style activity feeds
No	Website	None	N/A	None
No	Website	Email designs to others	Car configurations can be saved for future reference	Photos of car exterior and interior at different angles

Redesigning Our Personal Environments & Behaviors

People are creatures of habit. We don't need to think through the pros and cons of brushing our teeth every morning or plan a fresh route from home to work. Our habit-based reliance on habit keeps us from being overwhelmed by the thousands of decision points we encounter each day, but it can also undermine our efforts to make positive lifestyle changes. With kitchens full of processed foods, cars large enough to accommodate bulk food purchases, and workplaces that furnish bread and snacks in equal measure, the malty of

Americans are surrounded by environmental influences that promote overeating, unhealthy food choices, and physical inactivity. Personal environments – those settings in which we spend most of our daily life – are filled with cues that reinforce existing habits yet only dimly impact our conscious awareness. This project seeks to increase people's awareness of how personal environments influence their food choices and eating behaviors and provide them with tools to redesign those environments to promote wellness.

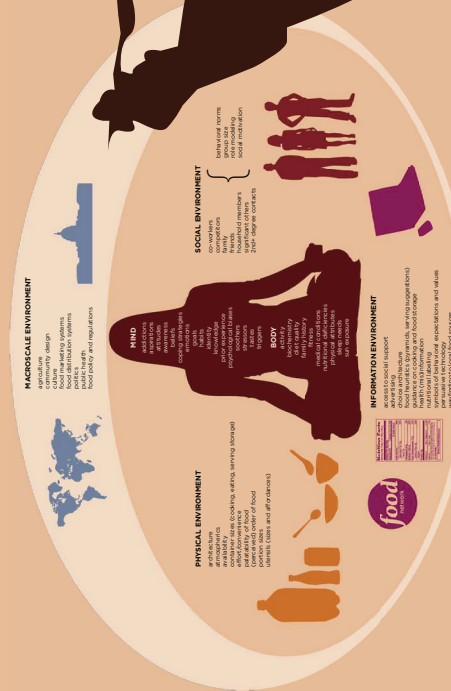
Domain Exploration

Goals

- Review the current state of related work in the fields of HCI, behavioral economics, marketing, medicine, nutrition science, psychology, and public health.
- Identify the factors that influence food choices and eating behaviors in personal environments.
- Examine past attempts to shape food choice and eating behaviors through health interventions.
- Identify behavioral and psychological biases that influence the effectiveness of design solutions.

Theory & Prior Work

- **Ecological Systems Theory** – an approach to the study of human development that examines the dynamic relationship between a person and the multiple levels and dimensions of environment in which that person lives
- **Goal-Setting Theory** – describes how people set goals and which motivations are effective
- **Integrated Change Model** – incorporates insights from the theory of planned behavior, social cognitive theory, and the transtheoretical model
- **Copology** – the study of persuasive technologies
- **Presentation of Self in Everyday Life** – describes how people use different self-presentation or self-projected to others in daily social interactions
- **Cognitive Dissonance Theory** – describes what happens when people realize their attitudes and behaviors are inconsistent



GOE/S/

- Understand how people relate to their personal environments in the context of eating.
- Identify common obstacles to healthful eating.
- Identify the motivations, needs, and behaviors of people who are interested in changing their eating behaviors.
- Ascertain where environmental redesign efforts have the highest potential for positive impact.

Survey Findings

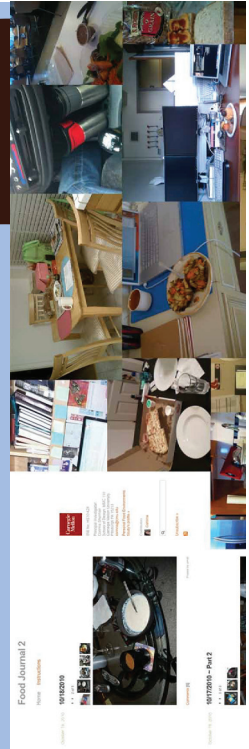
56 responses to a web-based survey revealed information about respondents' everyday eating practices and nutrition goals.

Most common motivations to eat healthfully

- | Practices and rationales goals: | Most common motivations to eat healthfully | Most common challenges to eat healthfully |
|--|--|---|
| <ul style="list-style-type: none"> > overall prevention and longevity > disease health and well-being > weight control > physical appearance > to be competitive in sports | <ul style="list-style-type: none"> > making the commitment of planning and time to shop for and prepare healthy meals > relative convenience of unhealthy foods compared to healthy foods > cravings for unhealthy foods > cost of good food | |

Interviews & Food Journals

Five men and ten women discussed their food experiences, rituals, and attitudes in one-on-one interviews. They also maintained week-long food journals documenting their meals and the physical and social aspects of their eating environments. Following the journaling activity, they reflected on their experience in a follow-up interview.



Carnegie Mellon University

Institutional Review Board

Federalwide Assurance No: FWA00004206

IRB Registration No: IRB00000603

Research Regulatory Compliance

Warner Hall, Fourth Floor

Pittsburgh PA 15213

412-268-1901

lrp-review@andrew.cmu.edu

Certification of IRB Approval

To: Corinna Sherman, Mark Baskinger

From: David Danks

Date: February 14, 2011

Re: HS10-428: How do immediate physical and social environments influence food choices and eating behavior?

This is to notify you that your modification request submitted on February 4, 2011 to include a change in study design and recruitment was approved on February 11, 2011 by expedited review. Please be reminded that if additional changes are to be made, those changes will need to be reviewed prior to implementation. Please refer to the above referenced protocol number in all correspondence regarding this protocol.

Approval for this study expires September 15, 2011.

Please call the Research Regulatory Compliance office at 412-268-1901 if you have any questions regarding this memo. Thank you.



David Danks, Ph.D., IRB, Chair

Carnegie Mellon University

Consent Form for Participation in Research

Study Title: Personal Food Environments: Generative Modeling Activity

Principal Investigator:

Corinna Sherman
School of Design, MMC 110
Carnegie Mellon University, Pittsburgh PA 15213
phone: 510-371-5662
corinna@cmu.edu

Faculty Advisor: Mark Baskinger, Associate Professor

Purpose of this Study

The purpose of this study is to understand people's preferred organizational structures and modes of interaction with regard to information about their personal food environments and eating-related behaviors. Personal food environments include the immediate settings in which people prepare and/or consume food, such as kitchens, livingrooms, and desktops. Eating-related behaviors may include food selection, preparation, cooking, eating, and storage of food and cooking equipment.

Procedures

If you agree to be in this study, you will be asked to describe and conceptually organize

- the personal environments in which you prepare and eat food
- eating-related habits you wish to start, stop, or change
- past and current challenges to changing these habits
- past and current supports for these habits

The activity will take about 20 minutes to complete and be conducted on Carnegie Mellon's Pittsburgh campus or a quiet location of your choosing. With your permission, I would also like to record the activity.

Participant Requirements

Participation in this study is limited to individuals age 18 and older.

Risks

There are no anticipated or known physical, psychological, or emotional risks in participating in this study.

IRB No: [HS10-428](#)

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Approved: September 16, 2010

Expires: September 15, 2011

Modified: February 11, 2011

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Carnegie Mellon University

Consent Form for Participation in Research

Benefits

In the course of reflection, you may become more mindful of your own eating habits and environments. Even if there is no personal benefit from your participation in the study, the knowledge received may be of value to humanity.

Compensation & Costs

There will be no compensation or cost to you if you participate in this study.

Confidentiality

By participating in the study, you understand and agree that Carnegie Mellon may be required to disclose your consent form, data and other personally identifiable information as required by law, regulation, subpoena or court order. Otherwise, your confidentiality will be maintained in the following manner:

Your data and consent form will be kept separate. Your consent form will be stored in a locked location on Carnegie Mellon property and will not be disclosed to third parties. By participating, you understand and agree that the data and information gathered during this study may be used by Carnegie Mellon and published and/or disclosed by Carnegie Mellon to others outside of Carnegie Mellon. However, your name, address, contact information and other direct personal identifiers in your consent form will not be mentioned in any such publication or dissemination of the research data and/or results by Carnegie Mellon.

The researchers will take the following steps to protect participants' identities during this study: (1) Each participant will be assigned a number; (2) The researchers will record any data collected during the study by number, not by name; (3) Any original recordings or data files will be stored in a secured location accessed only by authorized researchers.; (4) Any video and/or audio recordings and photographs will not reveal the names or faces of participants.

Optional Permission

I understand that the researchers may want to use photographs of the activity and/or a short portion of any video or audio recording for illustrative reasons in presentations of this work for scientific or educational purposes. I give my permission to do so provided that my name and face will not appear.

☐ YES ☐ NO (Please initial here _____)

Rights

Your participation is voluntary. You are free to stop your participation at any point. Refusal to participate or withdrawal of your consent or discontinued participation in the study will not result in any penalty or loss of benefits or rights to which you might otherwise be entitled. The Principal Investigator

IRB No: [HS10-428](#)

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Carnegie Mellon University

Consent Form for Participation in Research

may at his/her discretion remove you from the study for any of a number of reasons. In such an event, you will not suffer any penalty or loss of benefits or rights which you might otherwise be entitled.

Right to Ask Questions & Contact Information

If you have any questions about this study, you should feel free to ask them now. If you have questions later, desire additional information, or wish to withdraw your participation please contact the Principal Investigator by mail, phone or e-mail in accordance with the contact information listed on the first page of this consent.

If you have questions pertaining to your rights as a research participant; or to report objections to this study, you should contact the Research Regulatory Compliance Office at Carnegie Mellon University. Email: irb-review@andrew.cmu.edu . Phone: 412-268-1901 or 412-268-5460.

Voluntary Consent

By signing below, you agree that the above information has been explained to you and all your current questions have been answered. You understand that you may ask questions about any aspect of this research study during the course of the study and in the future. By signing this form, you agree to participate in this research study.

PARTICIPANT SIGNATURE

DATE

I certify that I have explained the nature and purpose of this research study to the above individual and I have discussed the potential benefits and possible risks of participation in the study. Any questions the individual has about this study have been answered and any future questions will be answered as they arise.

SIGNATURE OF PERSON OBTAINING CONSENT

DATE

Carnegie Mellon University

Consent Form for Participation in Research

Study Title: Personal Food Environments: Prototype Evaluation Activity

Principal Investigator:

Corinna Sherman
School of Design, MMC 110
Carnegie Mellon University, Pittsburgh PA 15213
phone: 510-371-5662
corinna@cmu.edu

Faculty Advisor: Mark Baskinger, Associate Professor

Purpose of this Study

The purpose of this study is to gather general feedback and comments on paper and/or digital prototypes of a tool for managing information about personal food environments and eating-related behaviors. Personal food environments include the immediate settings in which people prepare and/or consume food, such as kitchens, livingrooms, and desktops. Eating-related behaviors include food selection, preparation, cooking, eating, and storage of food and cooking equipment.

Procedures

If you agree to be in this study, you will be asked to complete a series of tasks using one or more prototypes of a tool for managing changes in your personal food environments and eating-related behaviors. Afterward, you will be asked to provide your general feedback and comments about the efficacy of the tool. The activity will take about 30 minutes to complete and be conducted on Carnegie Mellon's Pittsburgh campus or a quiet location of your choosing. With your permission, I would also like to record the activity.

Participant Requirements

Participation in this study is limited to individuals age 18 and older.

Risks

There are no anticipated or known physical, psychological, or emotional risks in participating in this study.

Benefits

In the course of reflection, you may become more mindful of your own eating habits and environments. Even if there is no personal benefit from your participation in the study, the knowledge received may be of value to humanity.

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The researchers will take the following steps to protect participants' identities during this study: (1) Each participant will be assigned a number; (2) The researchers will record any data collected during the study by number, not by name; (3) Any original recordings or data files will be stored in a secured location accessed only by authorized researchers.; (4) Any video and/or audio recordings and photographs will not reveal the names or faces of participants.

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I understand that the researchers may want to use photographs of the activity and/or a short portion of any video or audio recording for illustrative reasons in presentations of this work for scientific or educational purposes. I give my permission to do so provided that my name and face will not appear.

☐ YES ☐ NO (Please initial here _____)

Rights

Your participation is voluntary. You are free to stop your participation at any point. Refusal to participate or withdrawal of your consent or discontinued participation in the study will not result in any penalty or loss of benefits or rights to which you might otherwise be entitled. The Principal Investigator may at his/her discretion remove you from the study for any of a number of reasons. In such an event, you will not suffer any penalty or loss of benefits or rights which you might otherwise be entitled.

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Voluntary Consent

By signing below, you agree that the above information has been explained to you and all your current questions have been answered. You understand that you may ask questions about any aspect of this research study during the course of the study and in the future. By signing this form, you agree to participate in this research study.

PARTICIPANT SIGNATURE

DATE

I certify that I have explained the nature and purpose of this research study to the above individual and I have discussed the potential benefits and possible risks of participation in the study. Any questions the individual has about this study have been answered and any future questions will be answered as they arise.

SIGNATURE OF PERSON OBTAINING CONSENT

DATE

Card Sorting Activity Plan

Purpose and Goals

The card sorting activity was designed to answer the following questions:

- What mental models do individuals use in thinking about their personal food environments?
- What taxonomies and categories do they employ?
- What are their preferred organizational structures?
- What are their preferred modes of interaction within these environments?

Location and setup

Sessions were conducted in a classroom at Carnegie Mellon University. Audio was recorded with a smartphone, and photographs were taken with a digital camera.

Participant Characteristics

10 participants were selected for the activity. Participants were adults aged 18 or older who were interested in changing their eating habits and had at least some control over the content and arrangement of the physical aspects of their personal environments.

Methodology

Card content was based on proposed content for the web site, including common physical settings in which food is eaten, social roles, health goals, inspirations, challenges to reaching health goals, objects related to food selection, preparation, cooking, eating, and storage, and actionable tasks that could result in environmental or behavioral changes.

100 3x5" index cards were labeled with brief pieces of content. A letter/number combination to be used during analysis was written on the back of each card. The cards were shuffled prior to participants' arrival and placed on a table along with additional blank cards and pens for participants to add additional categories if they desired.

Prior to the card sorting activity, participants were asked to think about one to three personal habits related to food or nutrition that they would like to change.

Participants were grouped based on their living situations: those who lived alone performed the activity on their own, while those who lived together in a household sorted cards as a group. This arrangement elicited useful information about how household members negotiate and resolve organizational issues in shared personal environments.

Introduction to Participants

Thank you for coming. I'm currently in the initial stages of designing a tool to help people reach their eating and nutrition related goals. In order to make it as easy to use as possible, I'd like to get some input from people who might use it, and that's where you come in. I'm

going to ask you to perform a very simple exercise that will give me some insight into how to make this tool easier to use.

Here's how the activity will work. In front of you are stacks of cards. These cards represent the content and functionality for the tool. I'm going to guide you through a set of tasks in which you should try and sort the cards into groups that make sense to you. I'm interested in seeing how you would organize things into groups you would expect to find things in.

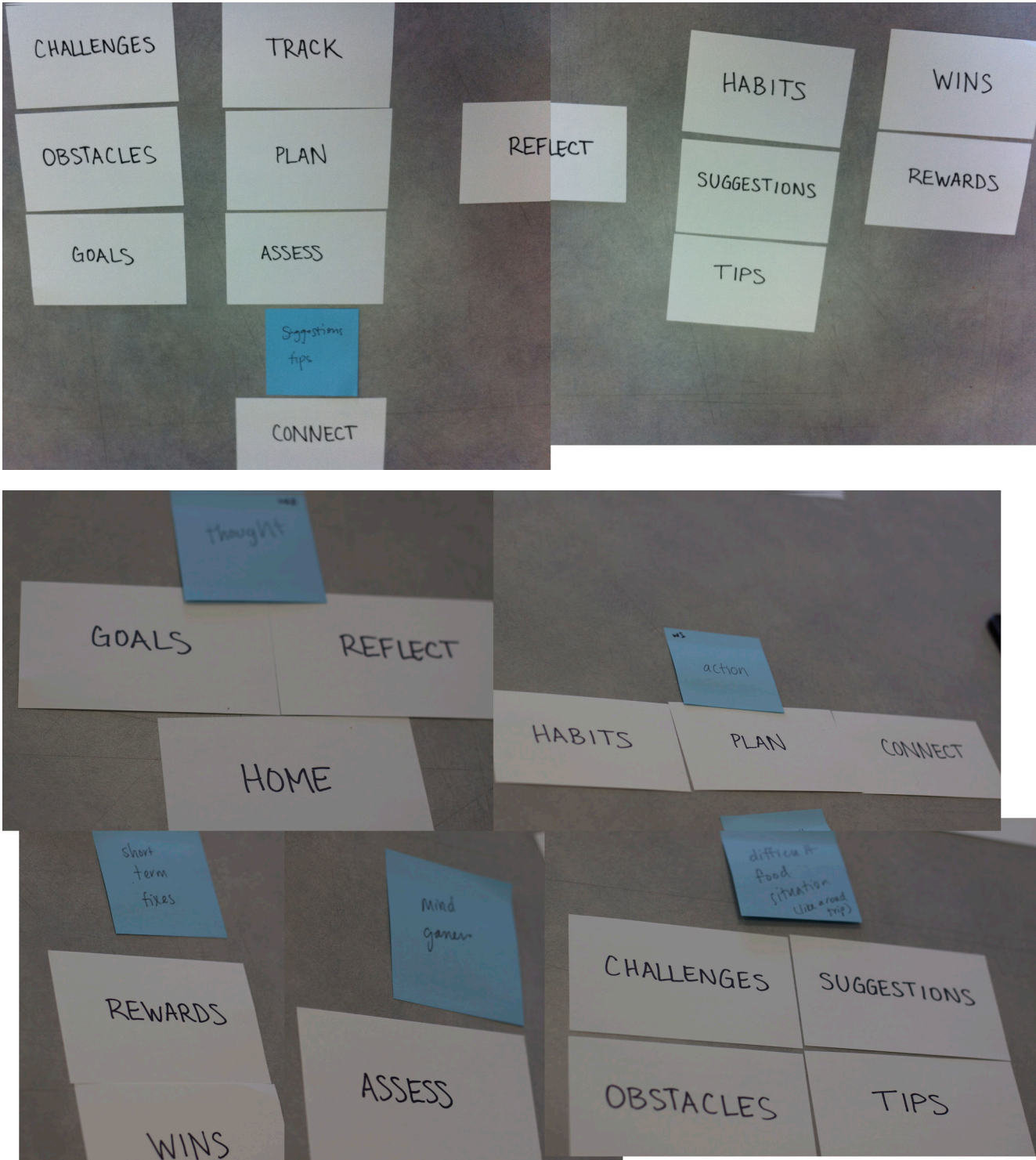
Once your groups are established, I'd like to have you give each group a name that makes sense to you. You are allowed to make sub-groups if you feel that's appropriate. If you feel something is missing, you can use a blank index card to add it. Additionally, if a label is unclear, feel free to write a better label on the card. Finally, if you think something doesn't belong, you can make an "ignore" pile.

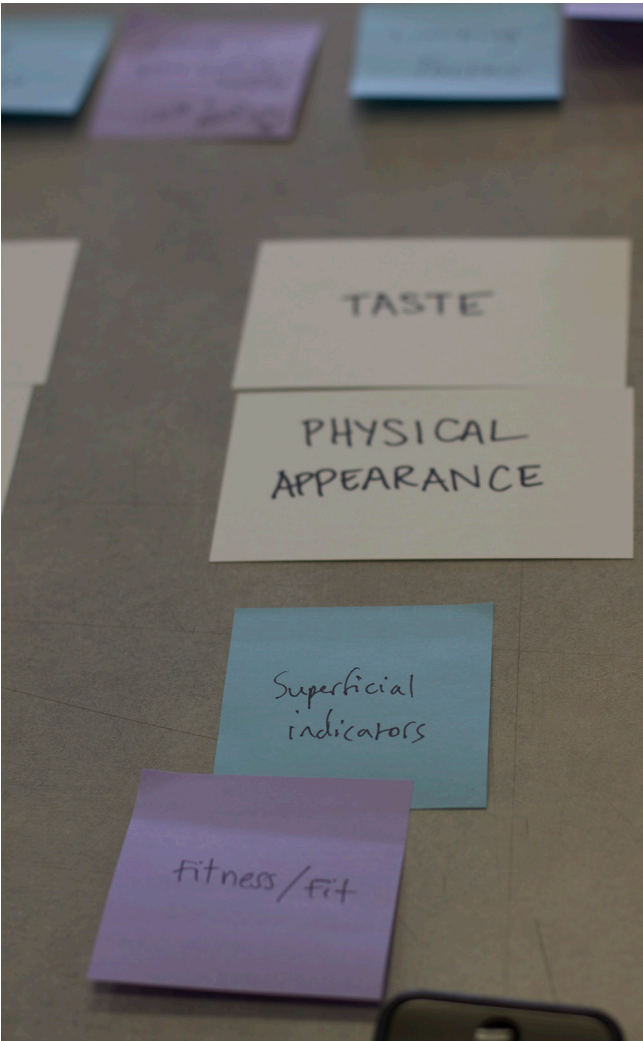
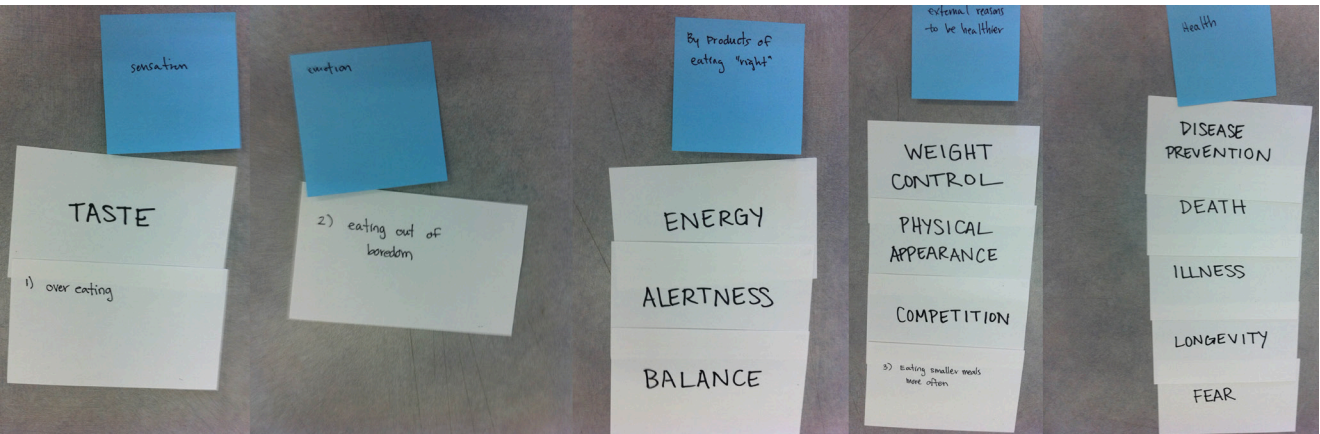
Feel free to ask questions during the exercise if you feel the need. I can't guarantee that I can answer them during the exercise, but I'll do my best to answer them when you're finished.

During the activity

The investigator asked the participants to complete the following tasks:

1. Write down on blank cards one to three habits related to food or nutrition that you would like to change. These will be your Goal Cards.
2. Group card set A (challenges) into categories. Try to think aloud as you do the grouping. When you're finished grouping, use blank cards and a pen to label the categories. File your Goal Cards into appropriate categories. If they don't fit into any of the existing categories, you can create new categories.
3. Group card set B (motivations) into categories. Try to think aloud as you do the grouping. When you're finished grouping, use blank cards and a pen to label the categories. File your Goal Cards into appropriate categories. If they don't fit into any of the existing categories, you can create new categories.
4. For each Goal Card, rank card set C (environments) from settings that pose the greatest challenge to achieving the goal to those that pose the least challenge. Try to think aloud as you do the ranking. Use blank cards to add any settings that you feel are important but missing, and set aside ones that are not applicable.
5. For each Goal Card, rank card set C (environments) from settings that offer the greatest support to those that offer the least support. Try to think aloud as you do the ranking. Use blank cards to add any settings that you feel are important but missing, and set aside ones that are not applicable.
6. Group card set D (labels) in a way that is meaningful to you. Try to think aloud as you do the grouping. If you had a tool to help you reach your habit change goals, how would it be organized? If you want, add new cards to create groups you feel you would need. You can use a piece of paper to make sketches or notes of what you would want the tool to be able to do or the form you would want it to take.





Participants' free-form notes during generative modeling

Better
Cookware

gym

Meal Planner

Personal
Trainer

Exercise Planner

Better
Cafeteria

Exotic
fruit

Cooking
Club

Basket
ball

Issues

Jan

Tips

Wins / Goals

Rewards

↓
discounts on
produce, healthy
food, etc

Cooking class / potluck sharing

~~repetitive~~

know food you have & suggests recipes

screen on refrigerator

↓

cheaper laptop / tablet
(voice control)

Participants' free-form notes during generative modeling

Not be stuck at a desk

To find a balance and rhythm between eating + exercise effortlessly
personal relationships (holistically it was; daily it wasn't)

Not worry about what people think

PAST

Not be stuck at a desk

Cultivate a balance

Learn and grow at wellness

Not be judgmental about other people's habits (lifestyle)

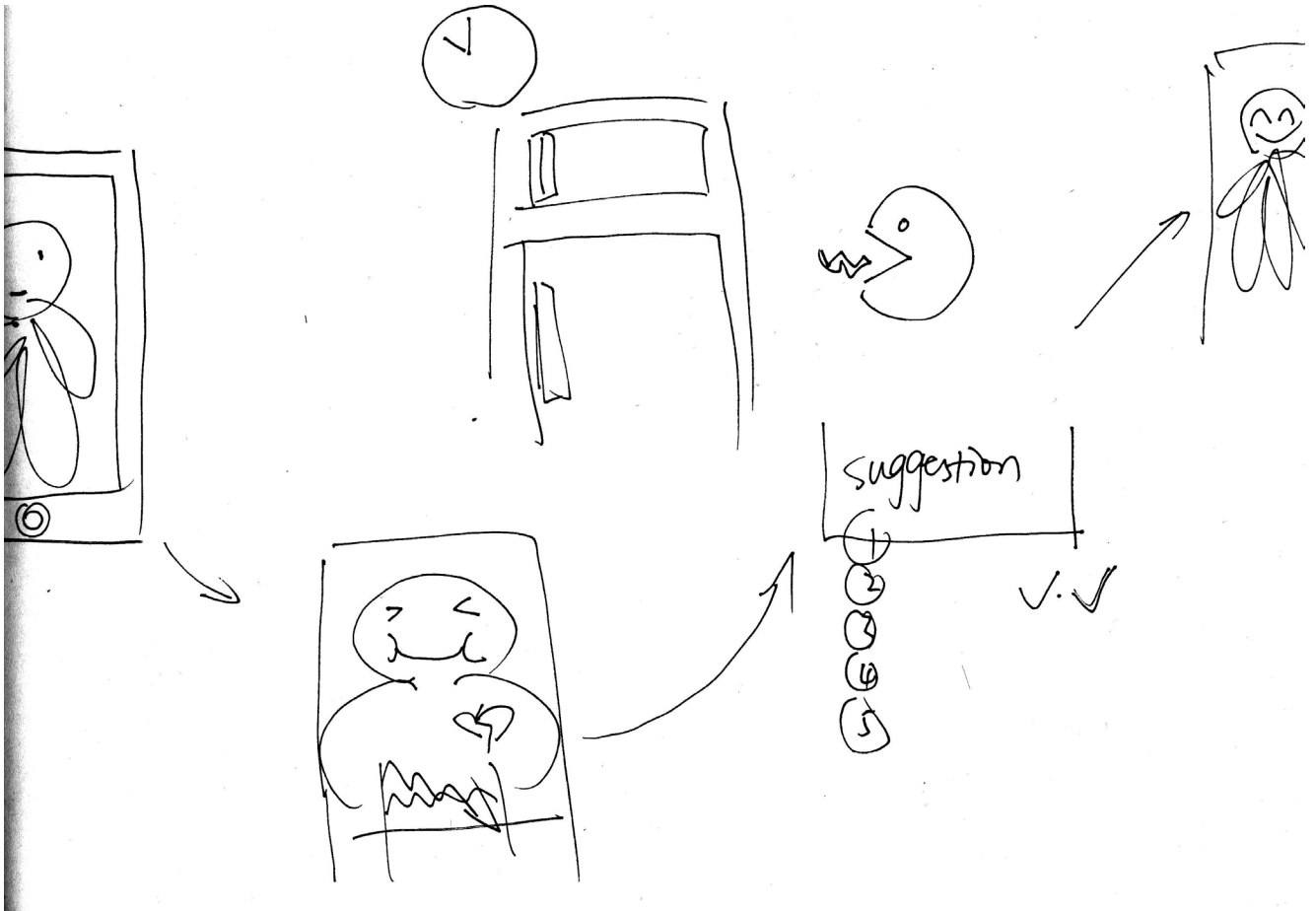
PRESENT

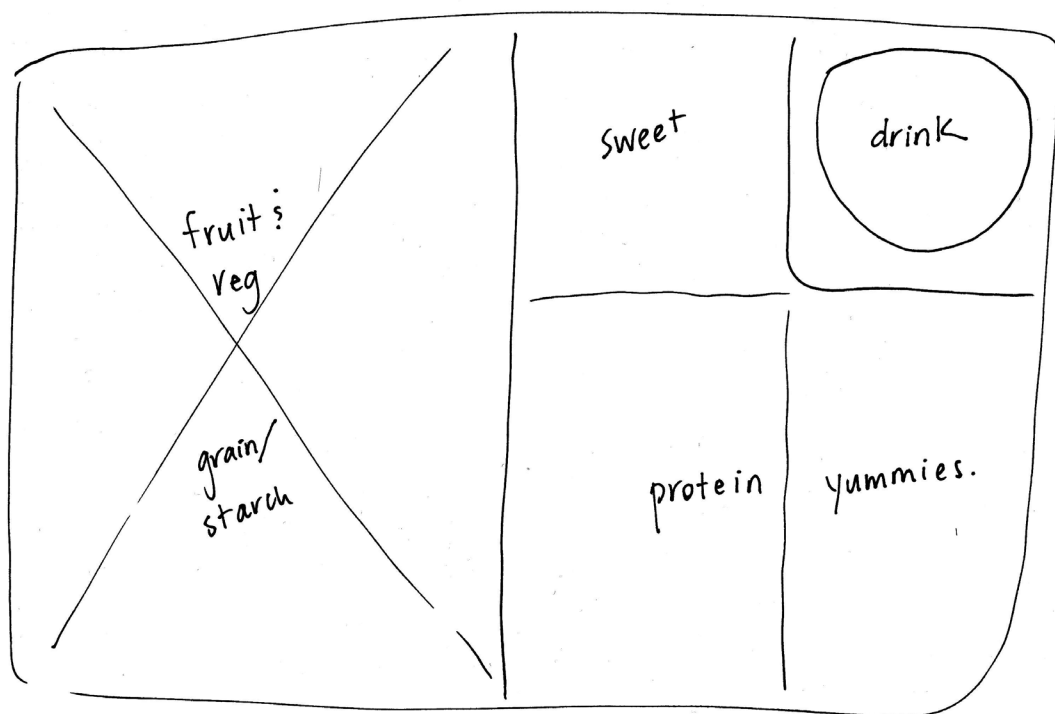
community with a different culture with

[health as a top priority	for everyone to pursue
	+ life balance	
	+ happiness	

What if everyone knew everyone else's
life priorities?

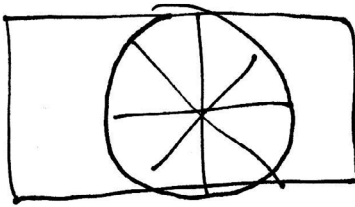
Participants' free-form notes during generative modeling





My ideal food tray ≠ plastic

★ vegetable planner ^{use on couch} (in livingroom)



What kind of veg do you like?

raw or cooked?

How much time do you have?

⇒ Suggestions of how to prepare them

⇒ grocery list

⇒ prep guide

★ grocery inventory check off list

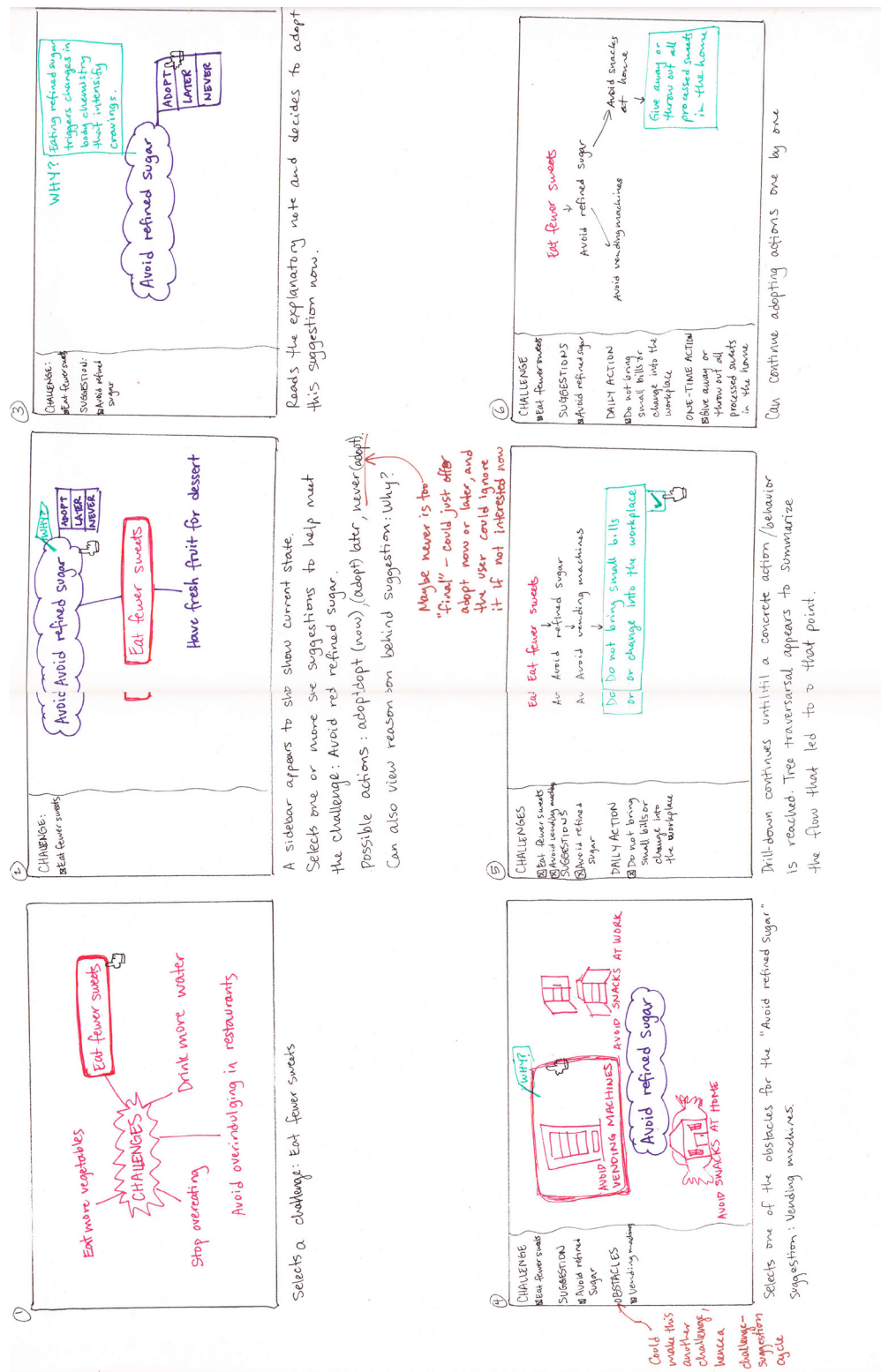
↳ helps me purchase + use my purchases

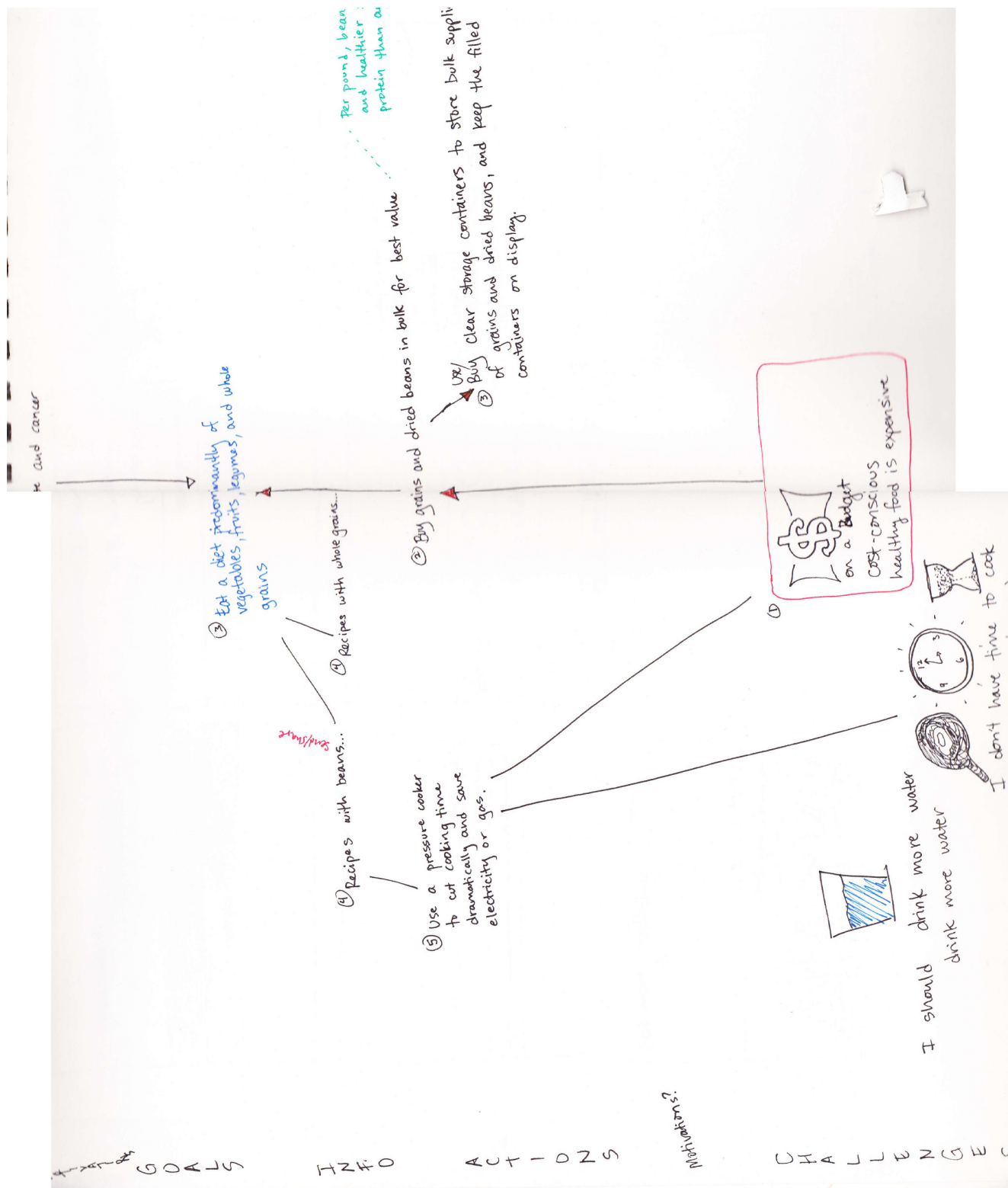
↳ use right before trip to store



Checklist on fridge:
"Did you eat salad today?"

- When I don't want to cook & ~~feel~~ feel lazy... ^{and} I have vegetables ^{that are going to rot soon,} I want to give away (or exchange) my vegetable ~~generally~~ in my fridge to my friends.
- I want to share or eat together after cooking with friends - without taking too much time.
- I want a tool that can stop me ^{over-} eating in a gentle way!
- or, when I go to a restaurant where the portion is ~~too~~ huge for me, I'd like to know how much is the proper portion to eat before / ~~and~~ while eating. & so that I don't overeat.





eat more healthfully

Plan / Print / Track
Motivating Goals
Resources
Actions
Obstacles

My priorities (goal-specific)

1. TIME
2. MONEY
3. PHYSICAL EFFORT
4. BRAIN CYCLES
5. ROUTINE
6. SOCIAL CONSCIOUSNESS

Drag to reorder

STORY BY KEY RESOURCE

Icons: a person, a dollar sign, a house, a calendar, a bar chart, a person with a star, a person with a star, a person with a star.

disease prevention & longevity

health & wellbeing

weight control

physical appearance

What's your motivation?

What's your motivation? ○ ○ ○ ○ ○

What's stopping you? ◀ ○ ○ ○ ○ ▶

Make a plan. Print it. Track it.

We all want to eat more healthfully.

What's your motivation?

What's stopping you?

Make a plan

What's your motivation?

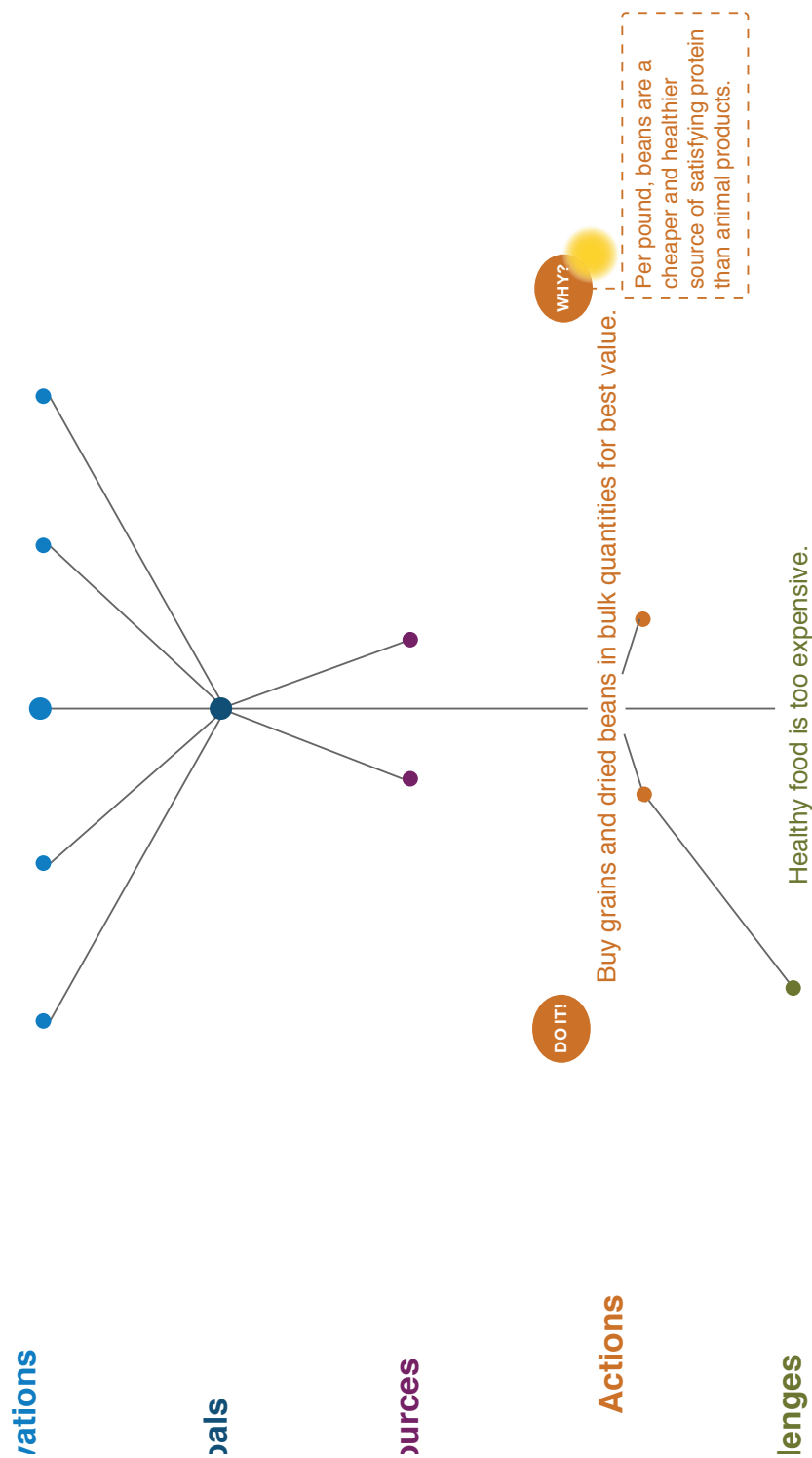
What's stopping you?

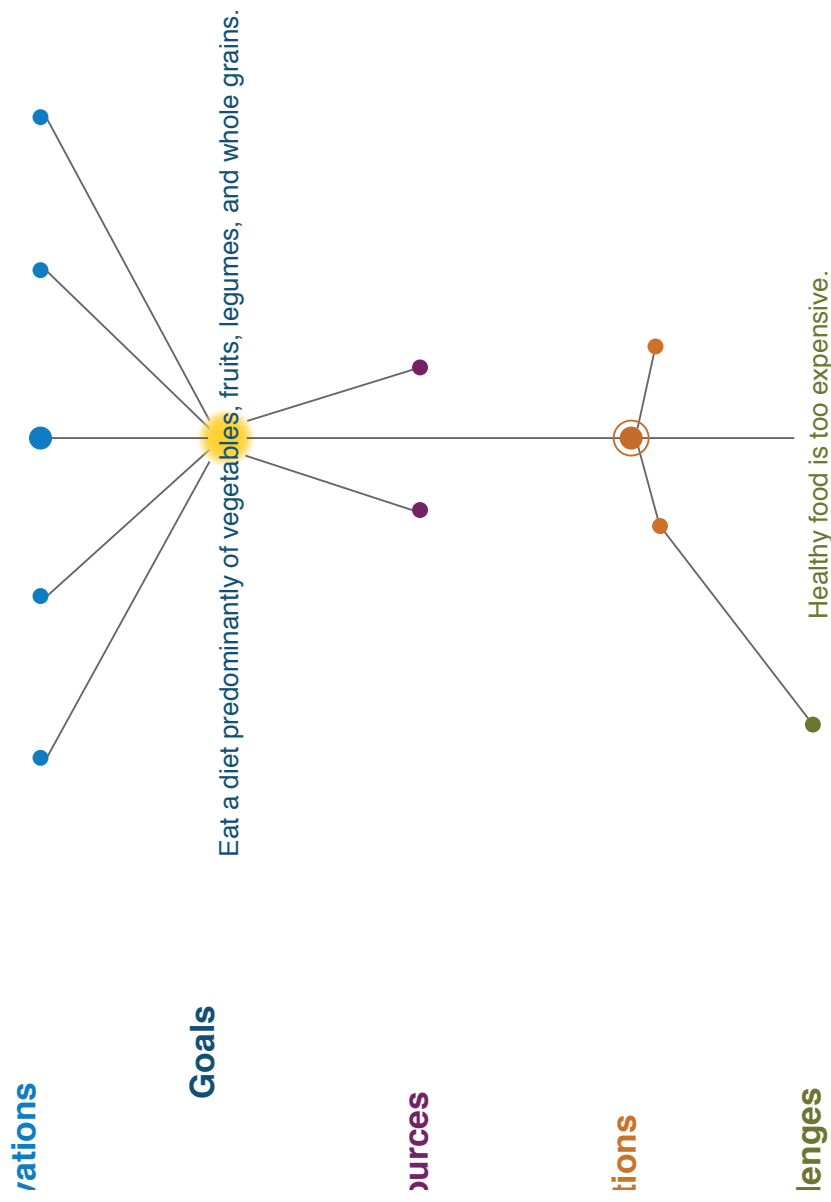
eat more healthfully

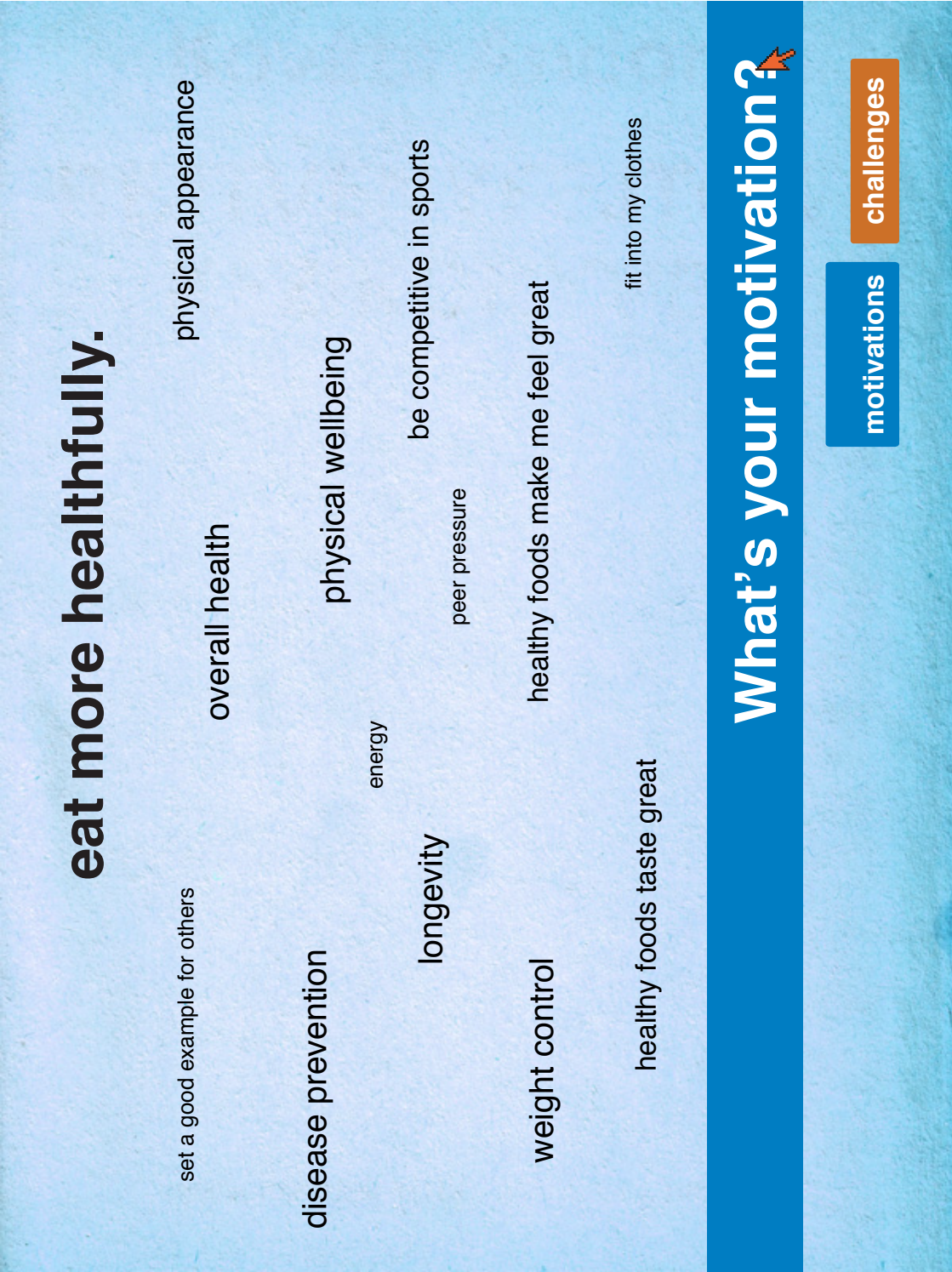
Make a plan

What's your motivation?

Icons: a person sitting, a person standing, a person with a star, a person with a star, a person with a star.











**We all want to
eat healthfully.
(in theory, anyway)**

Create your strategy for success.

What challenges do you face?

What motivates you?

challenges

actions

resources

goals

motivations

1.

Pick a category:

☒ Appearance
 ☐ Physical Wellbeing
 ☐ Performance
 ☐ Relationships
 ☐ Sensory Experience

2.

Select any speech bubble to add that motivation to your wellness strategy, or add one in your own words.

Add at least one, but you can include as many motivations as you like.

I want to look good

I want to fit into my clothes

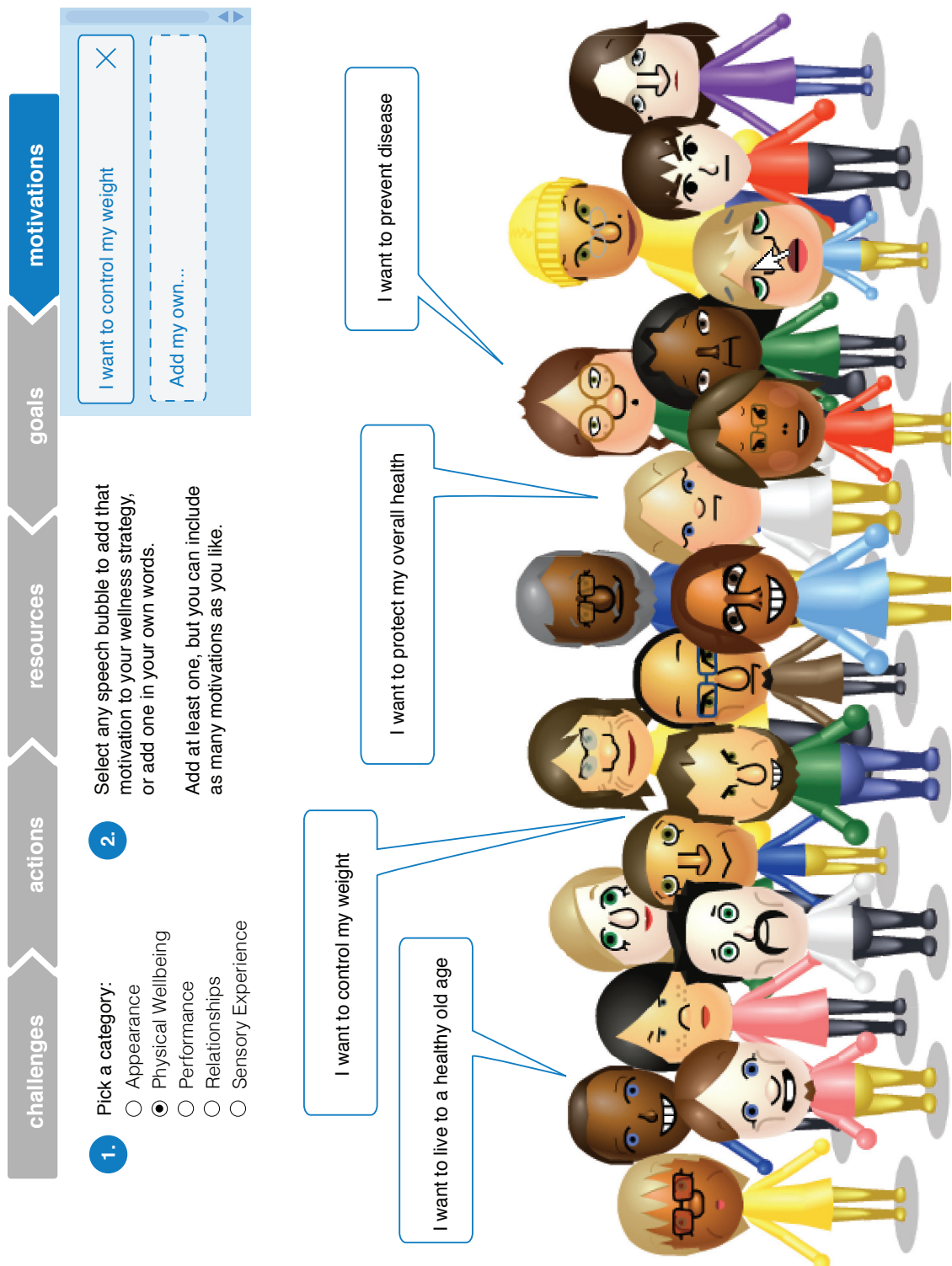
I want to control my weight

I want to control my weight

Add my own...

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Redesigning Our Personal Environments and Behaviors: A Systems Approach to Wellness



motivations

my strategy

1.

Pick a category:

☒ Appearance

☐ Physical Wellbeing

☐ Performance

☐ Relationships

☐ Sensory Experience

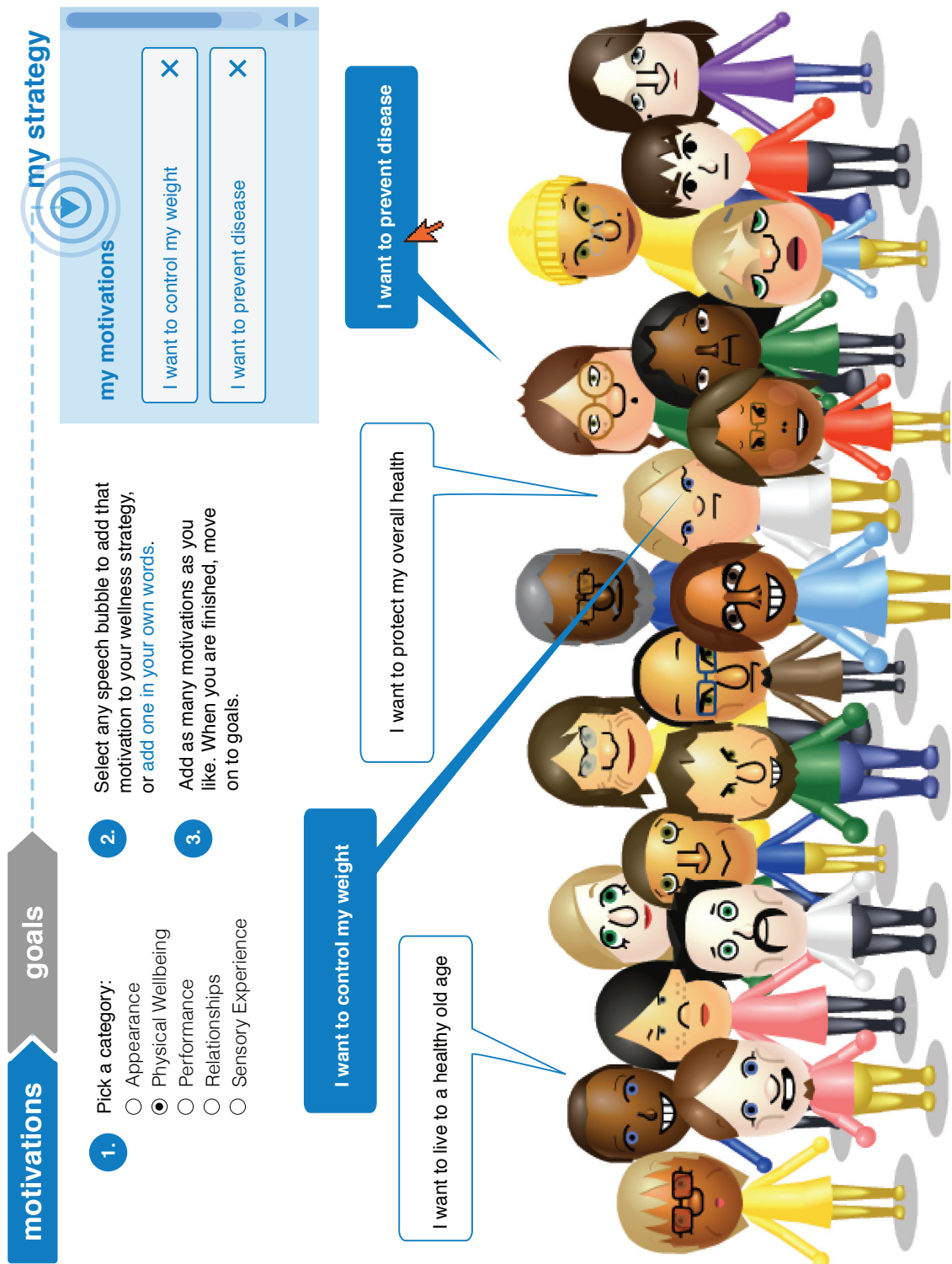
2.

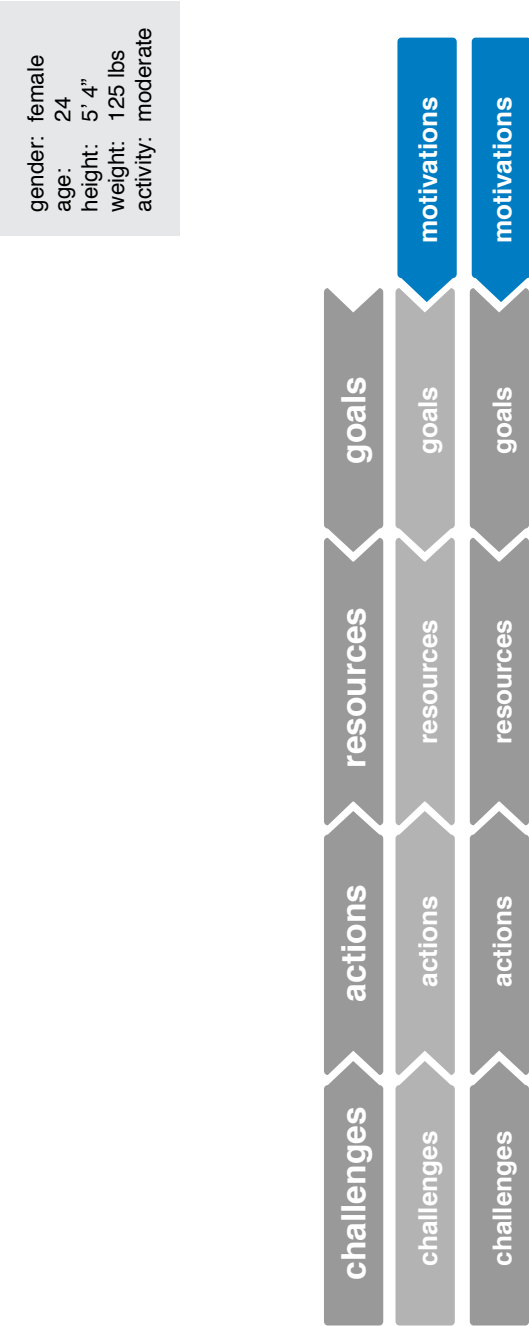
Select any speech bubble to add that motivation to your wellness strategy, or add one in your own words.

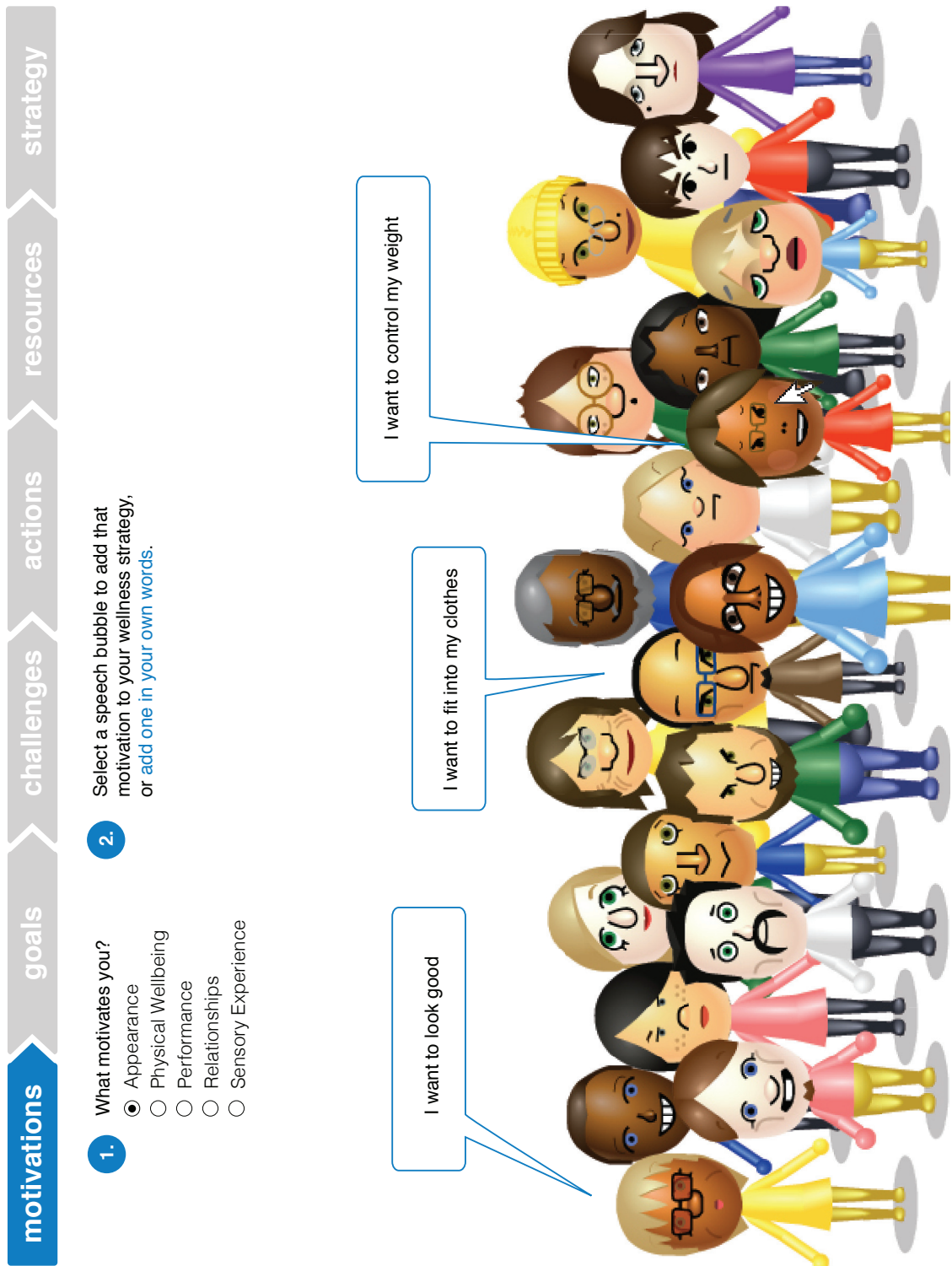
I want to look good

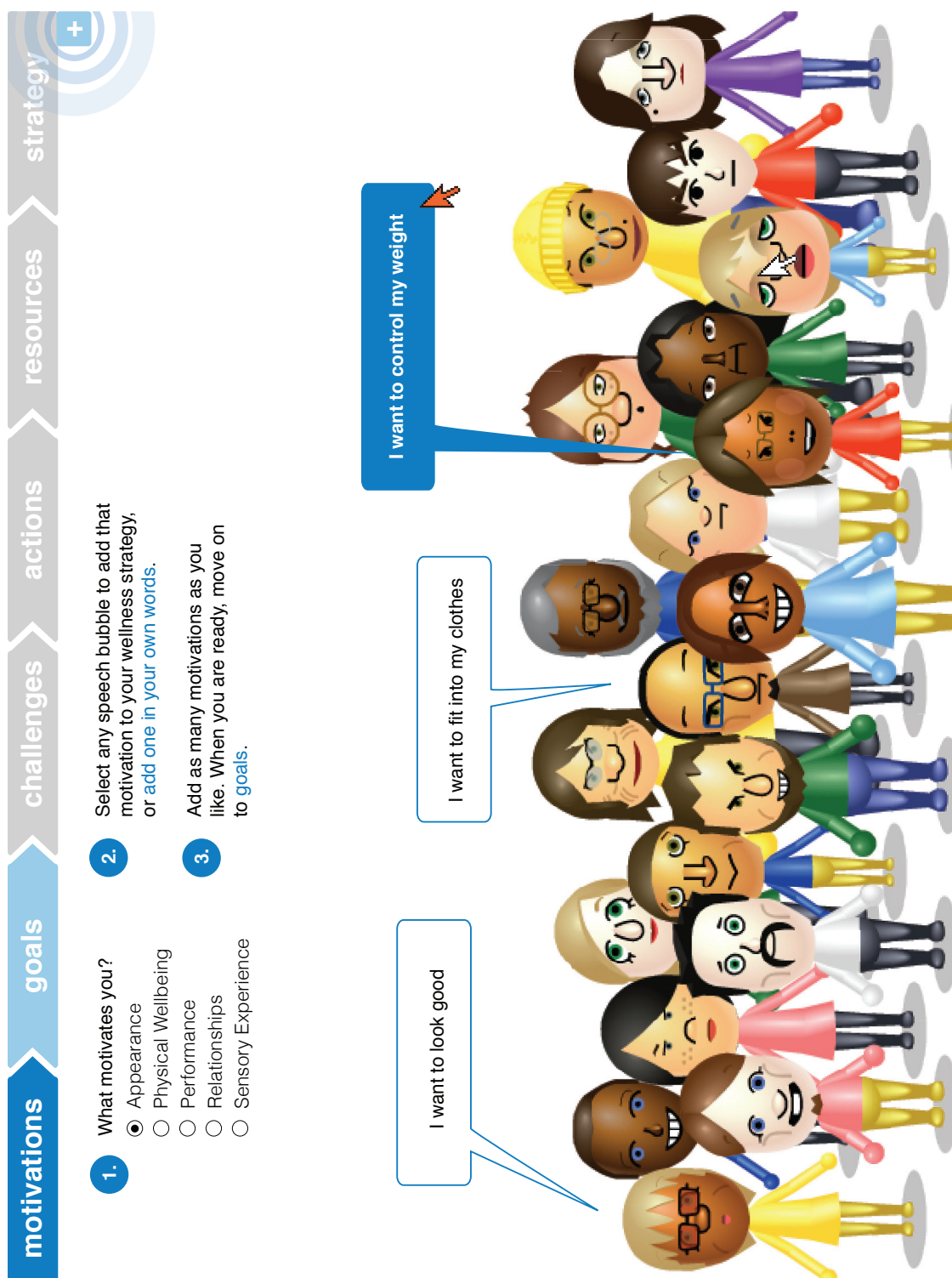
I want to fit into my clothes

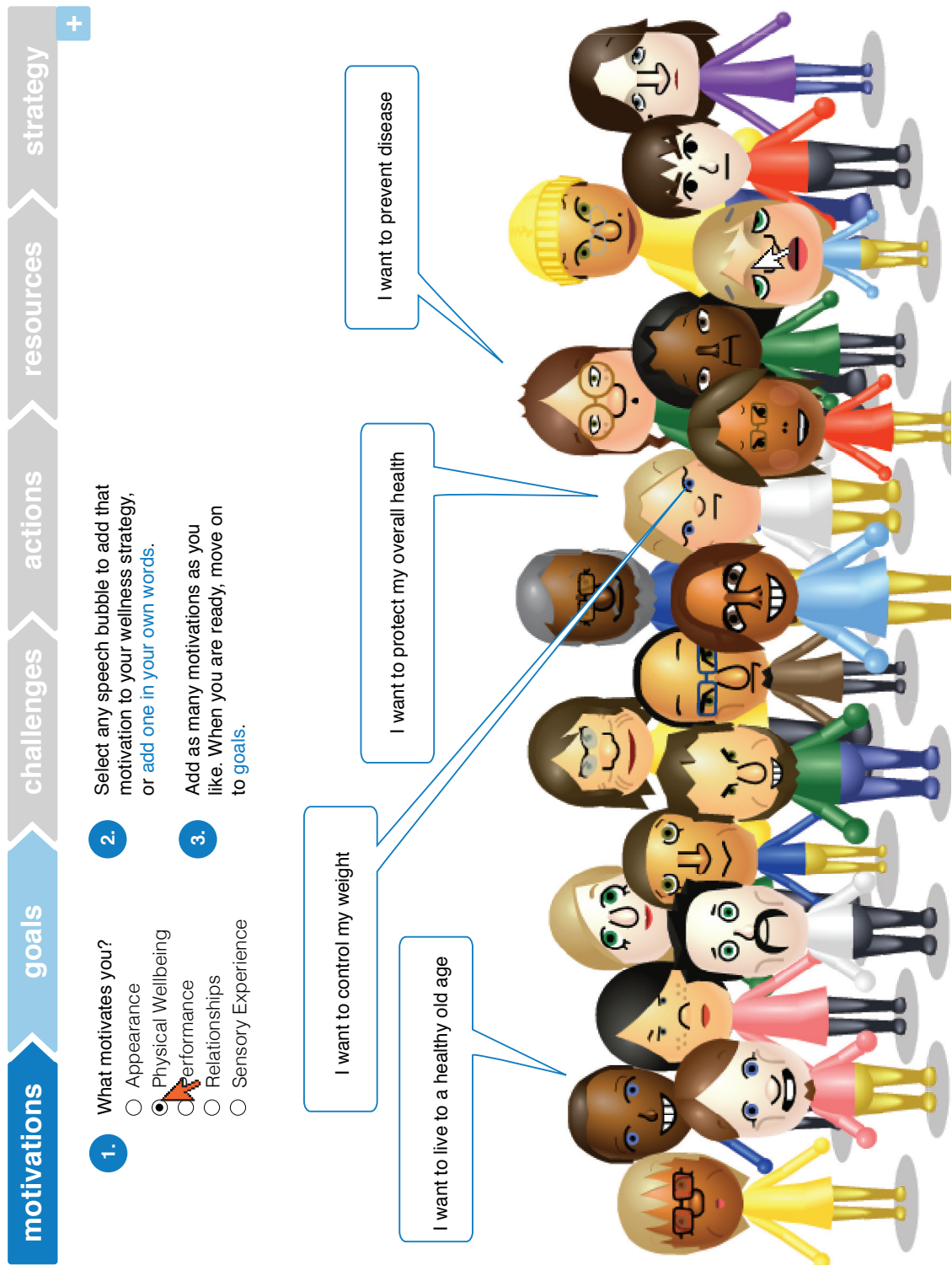
I want to control my weight

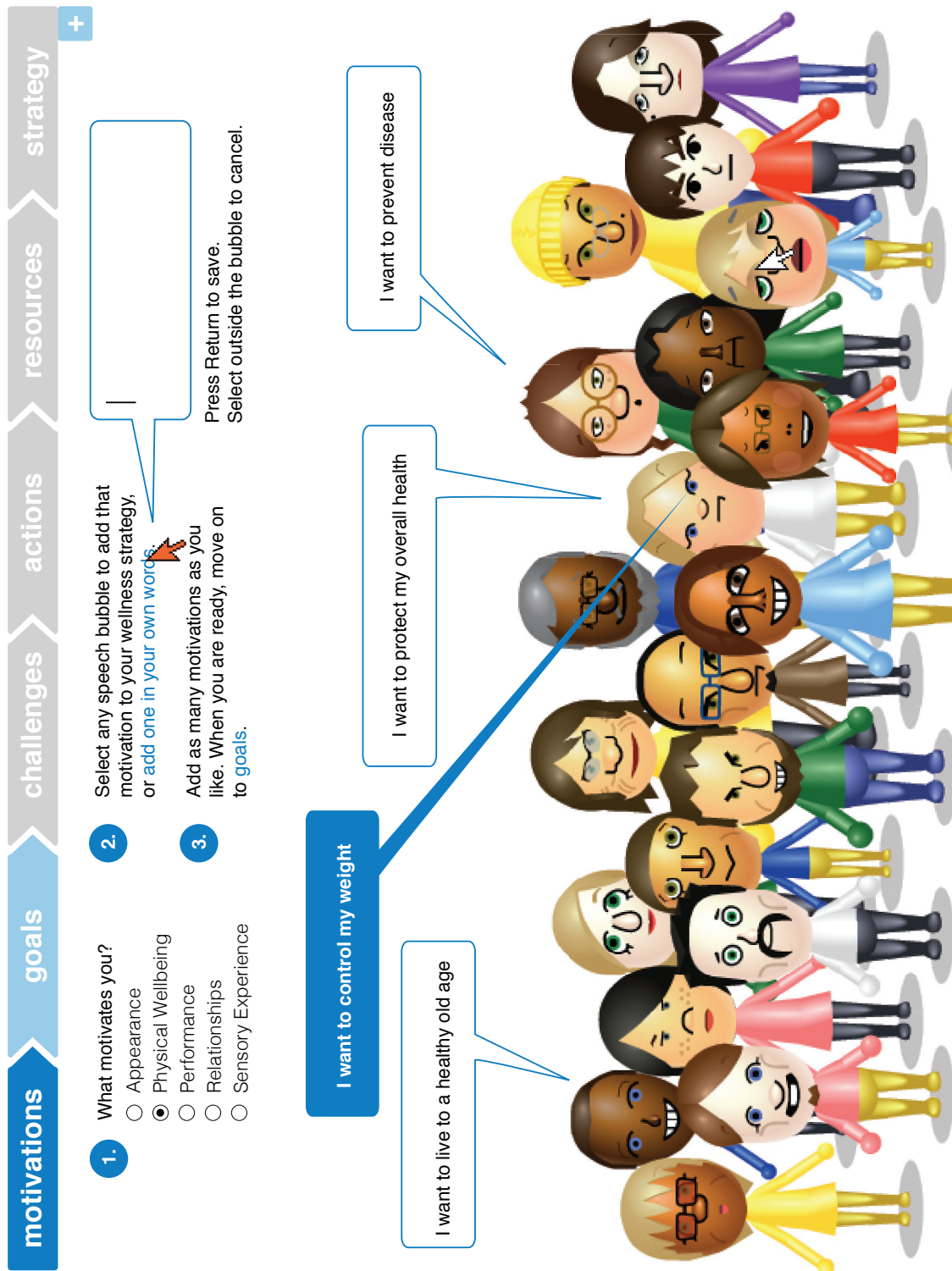


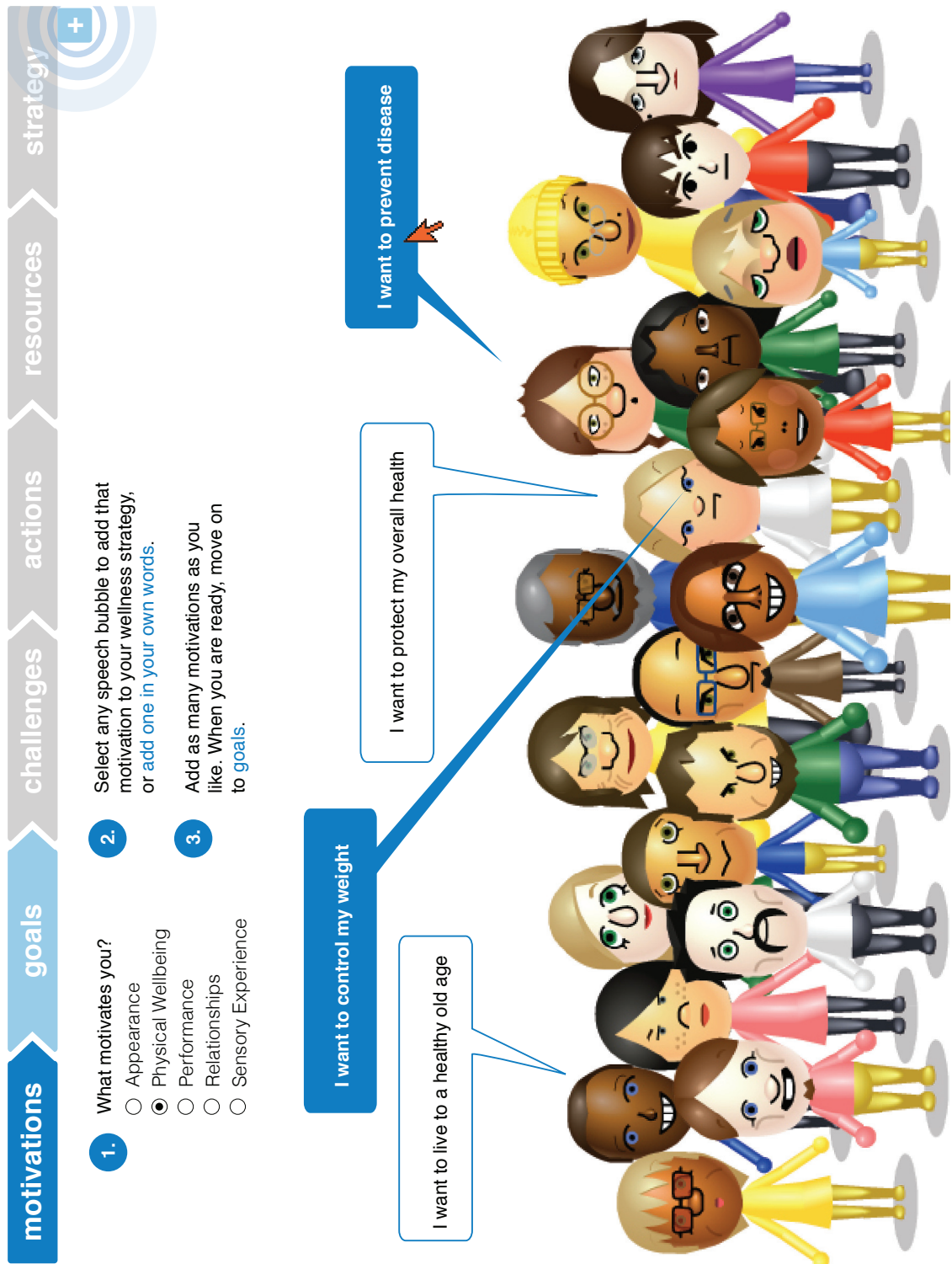












motivations

goals

challenges

actions

resources

strategy

1. What motivates you?

- ☐ Appearance
- ☒ Physical Wellbeing
- ☐ Performance
- ☐ Relationships
- ☐ Sensory Experience

2. Select any speech bubble to add that motivation to your wellness strategy, or add one in your own words.

3. Add as many motivations as you like. When you are ready, move on to goals.

my motivations

I want to control my weight

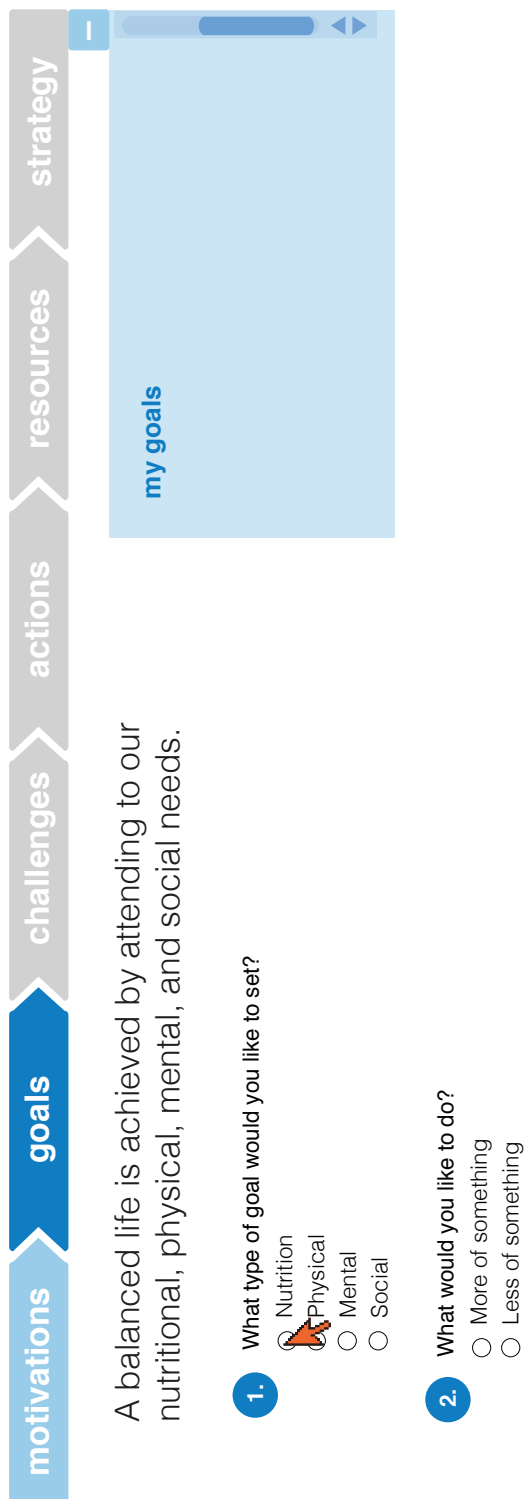
I want to prevent disease

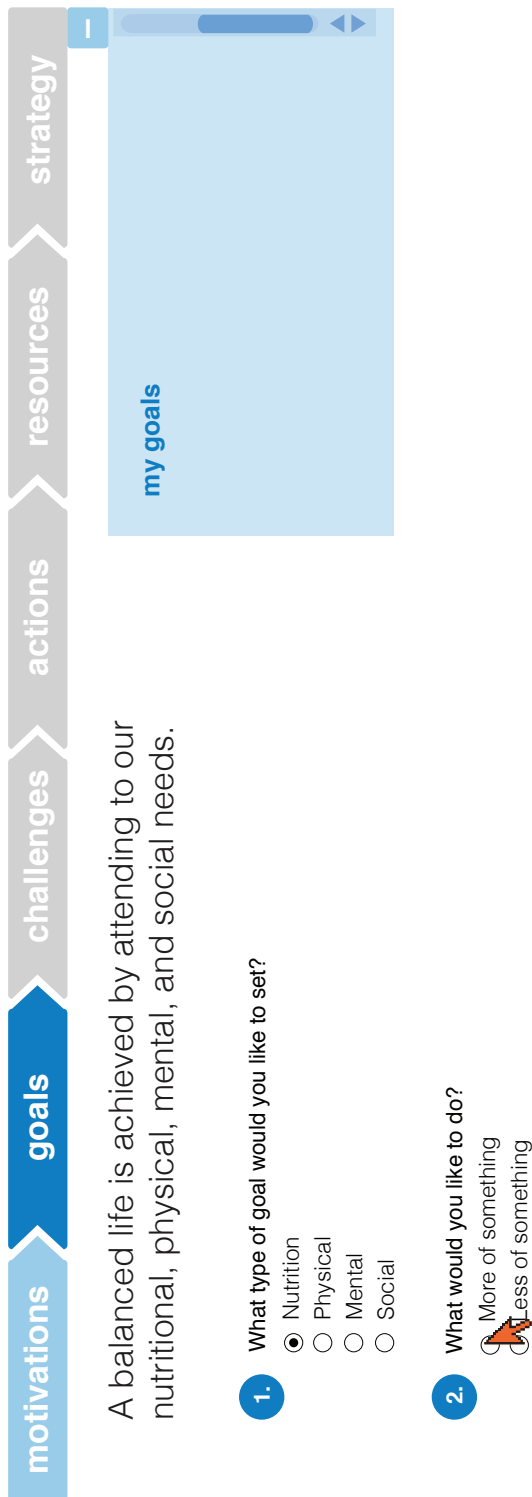
I want to control my weight

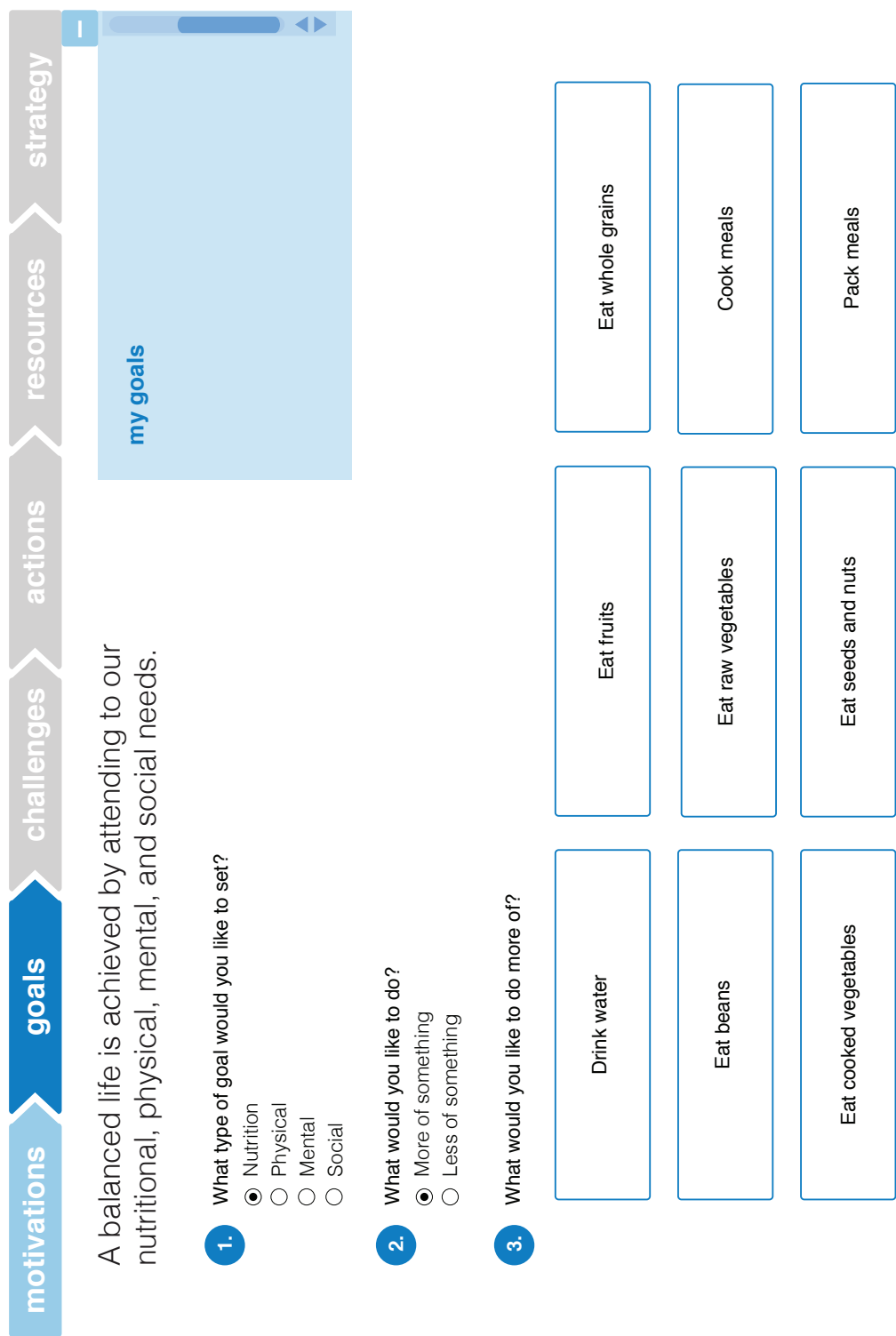
I want to live to a healthy old age

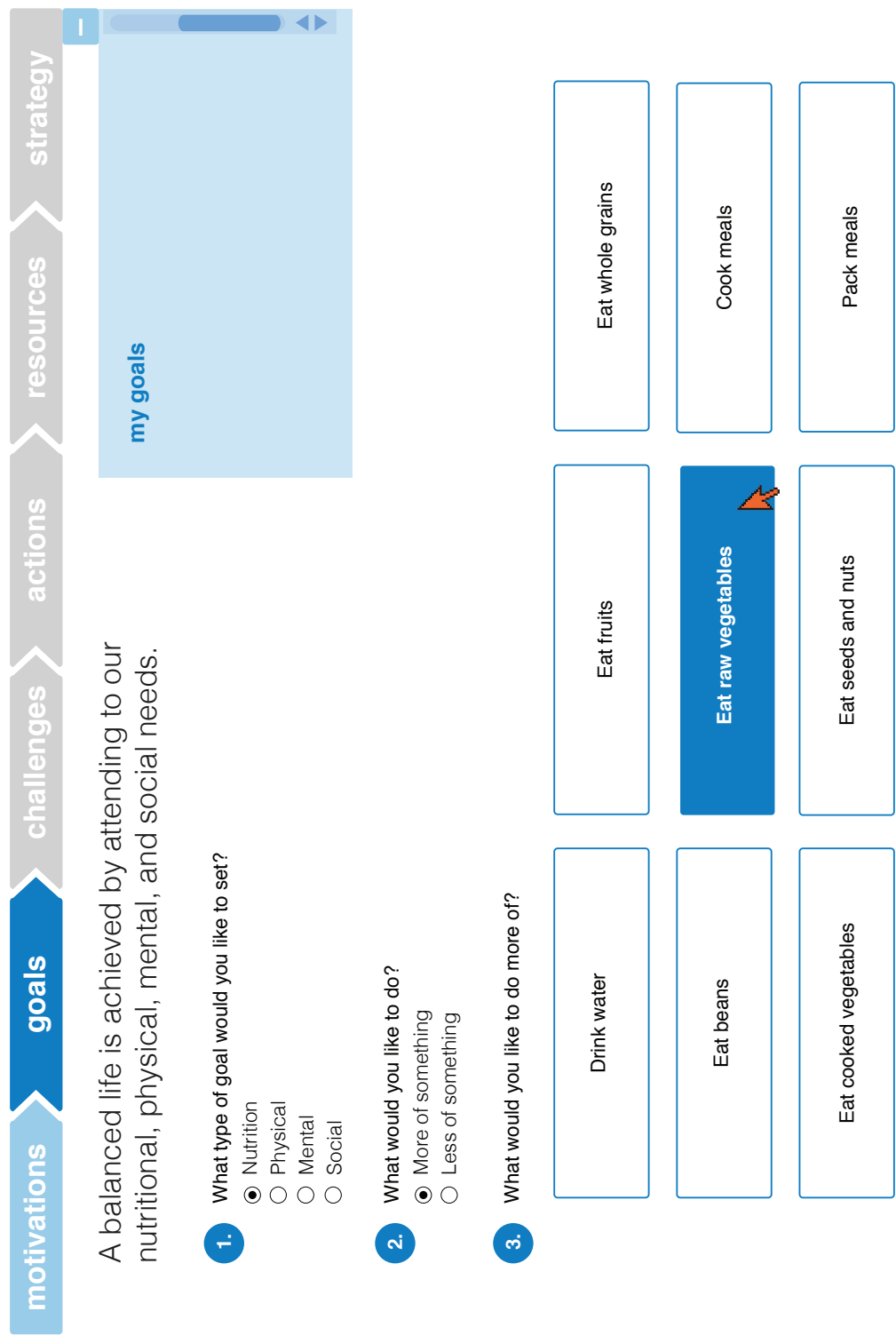
I want to protect my overall health

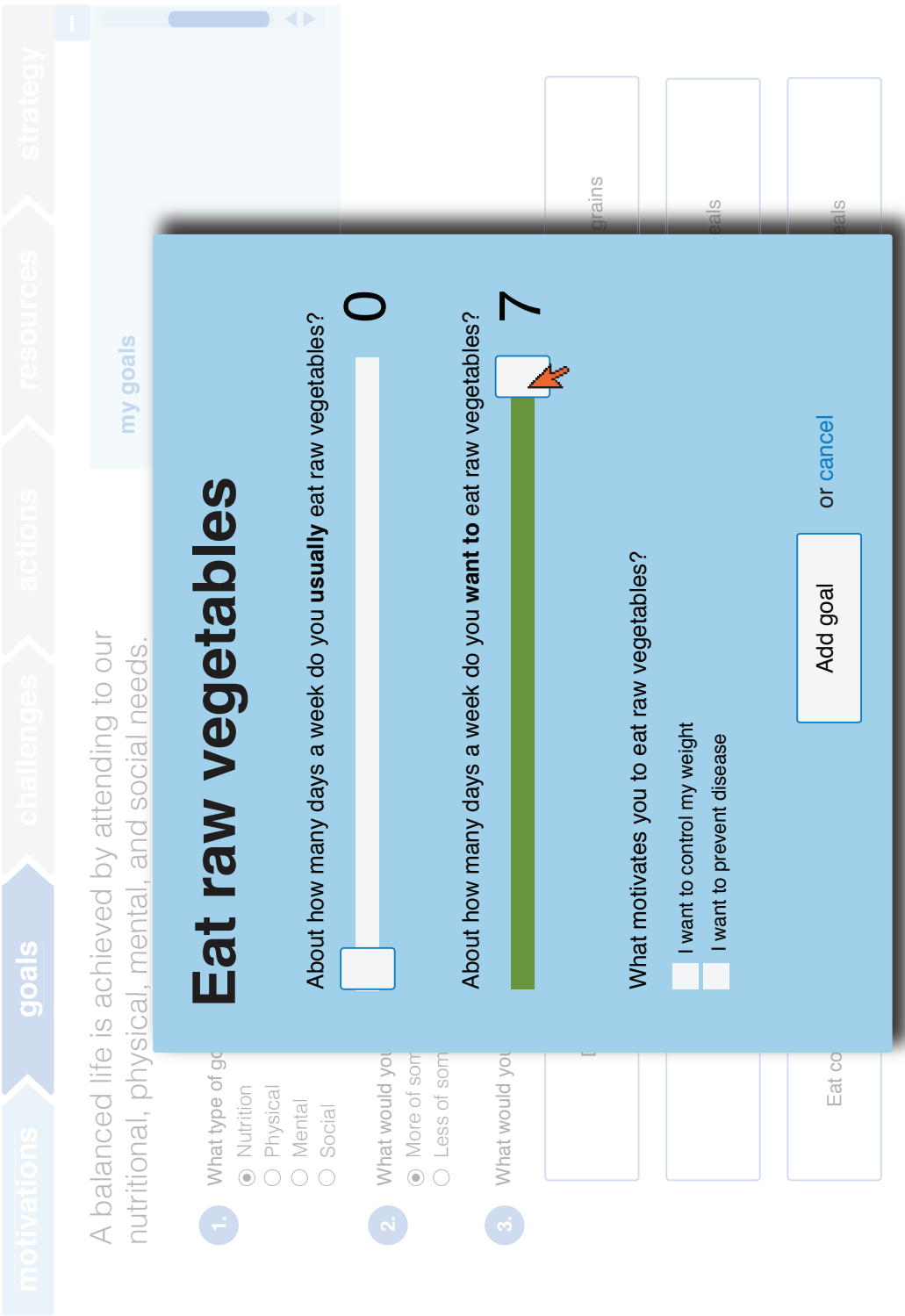
I want to prevent disease











motivations

goals

challenges

actions

resources

strategy

A balanced life is achieved by attending to our nutritional, physical, mental, and social needs.

1. What type of goal would you like to set?

☒ Nutrition

☐ Physical

☐ Mental

☐ Social

2. What would you like to do?

☒ More of something

☐ Less of something

3. What would you like to do more of?

Drink water

Eat beans

Eat cooked vegetables

4. Add as many goals as you like. When you are ready, move on to challenges

Eat fruits

Eat raw vegetables

Eat seeds and nuts

Eat whole grains

Cook meals

Pack meals

my goals

Eat raw vegetables 7 days per week

Eat beans 5 days per week

motivations goals challenges actions resources strategy

my challenges

Eat raw vegetables 7 days per week

1. Select a goal

- ☒ Eat raw vegetables 7 days per week
- ☐ Eat beans 5 days per week

2. What are your biggest challenges in reaching this goal?

Challenge 1

- ☐ Not enough time
- ☐ Not enough money
- ☐ Too much physical effort
- ☐ Too much mental effort
- ☐ Too different from other people
- ☐ Not part of my current routine

Challenge 2

- ☐ Not enough time
- ☐ Not enough money
- ☐ Too much physical effort
- ☐ Too much mental effort
- ☐ Too different from other people
- ☐ Not part of my current routine

Challenge 3

- ☐ Not enough time
- ☐ Not enough money
- ☐ Too much physical effort
- ☐ Too much mental effort
- ☐ Too different from other people
- ☐ Not part of my current routine

3. When you have specified your challenges for each goal, move on to actions.

motivations

goals

challenges

actions

resources

strategy

1.

Select a goal

☒ Eat raw vegetables 7 days per week

☐ Eat beans 5 days per week

2.

What are your biggest challenges in reaching this goal?

Challenge 1

☒ Not enough time

☐ Not enough money

☐ Too much physical effort

☐ Too much mental effort

☐ Too different from other people

☐ Not part of my current routine

Challenge 2

☐ Not enough time

☐ Not enough money

☒ Too much physical effort

☐ Too much mental effort

☐ Too different from other people

☐ Not part of my current routine

Challenge 3

☐ Not enough time

☐ Not enough money

☐ Too much physical effort

☒ Too much mental effort

☐ Too different from other people

☐ Not part of my current routine

3.

When you have specified your challenges for each goal, move on to actions.

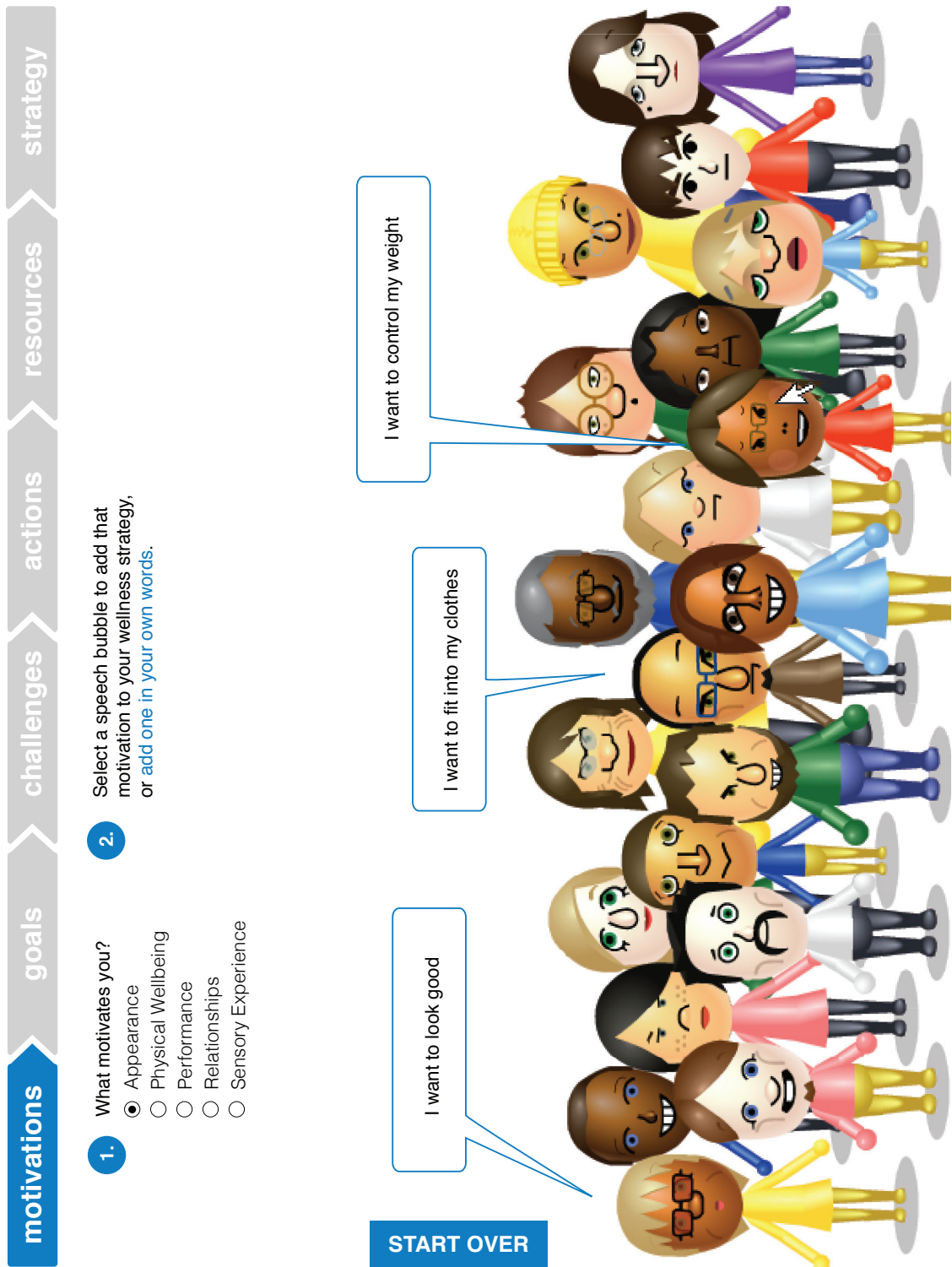
my challenges

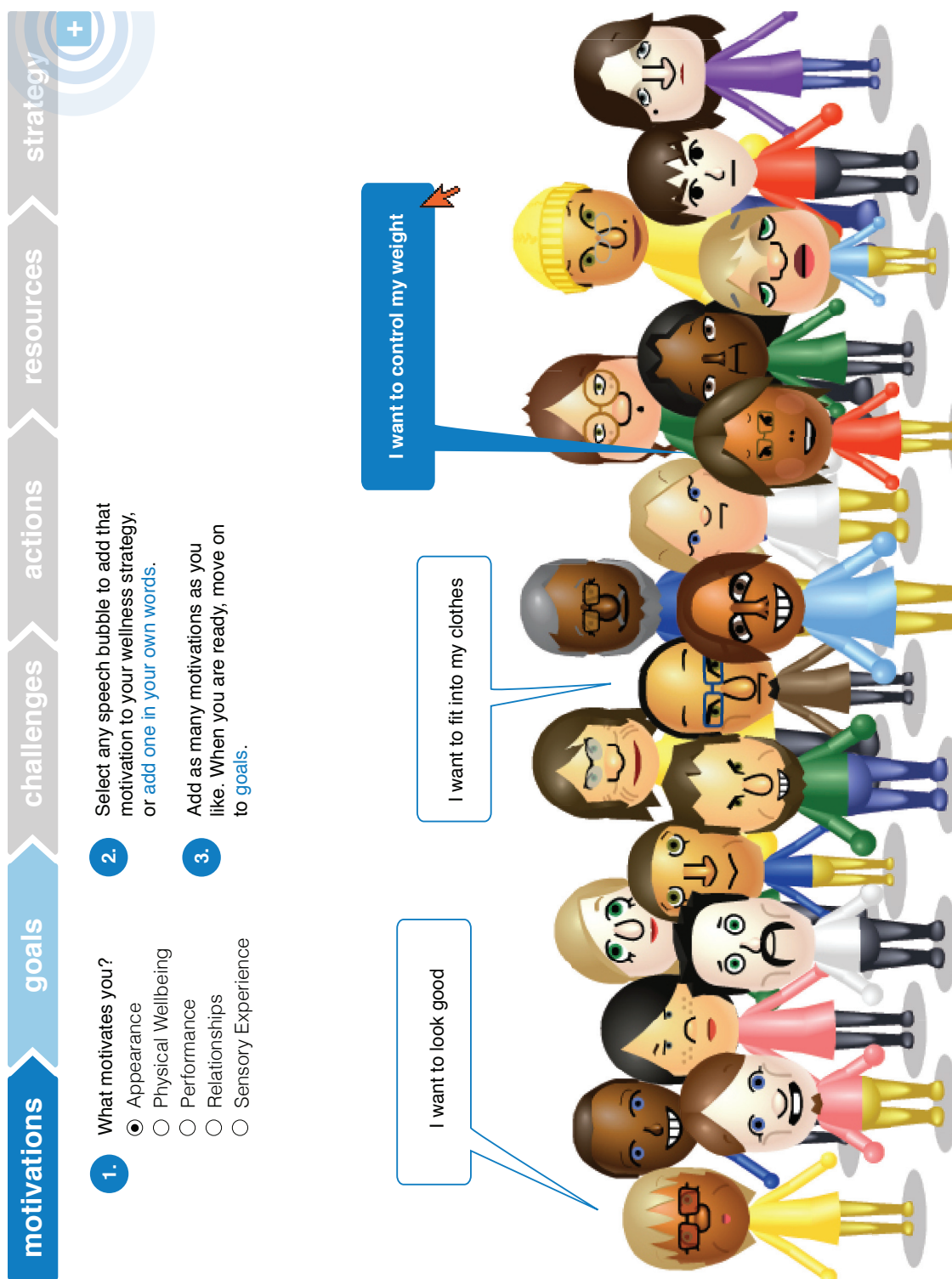
Eat raw vegetables 7 days per week

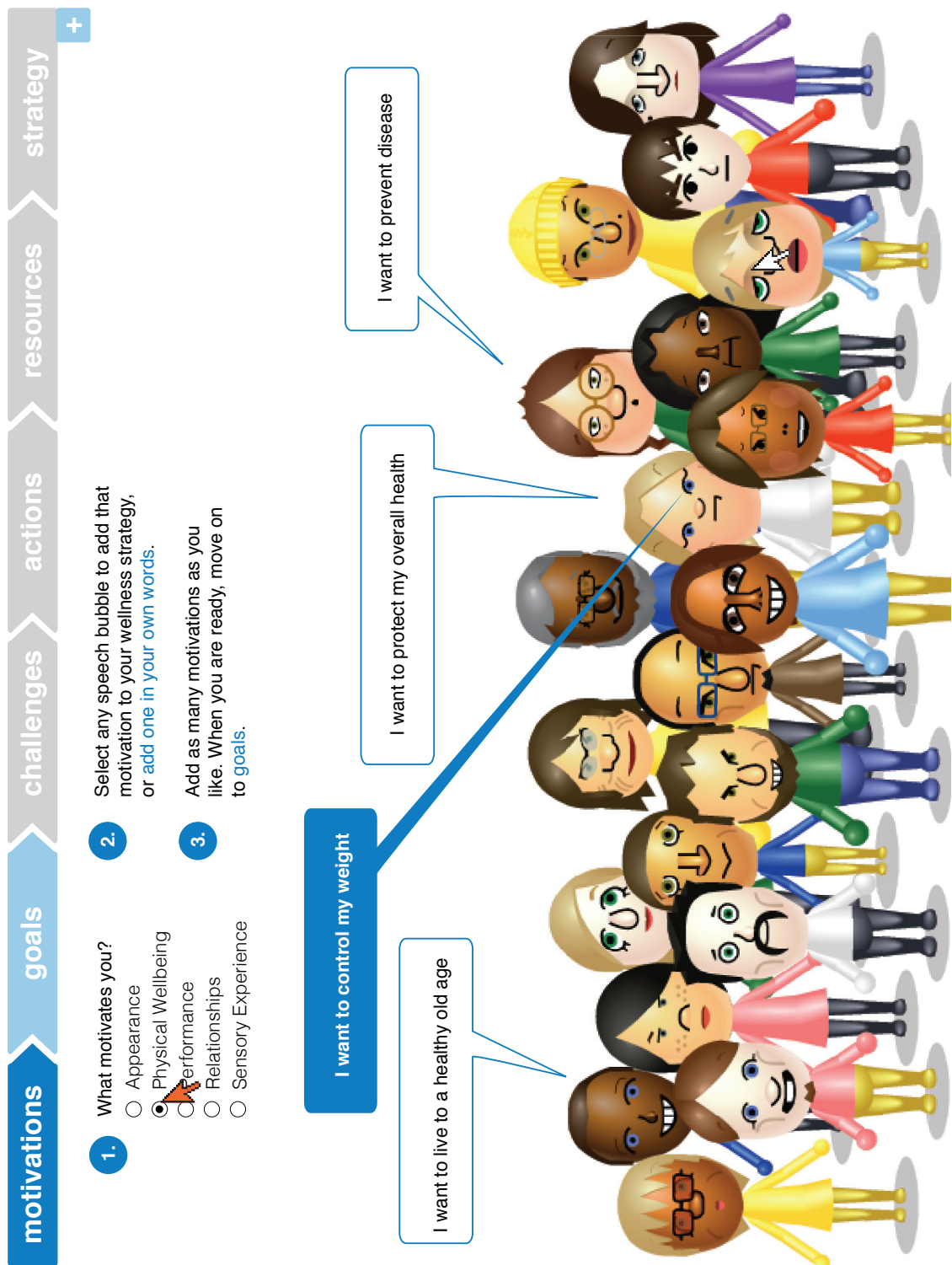
Not enough time

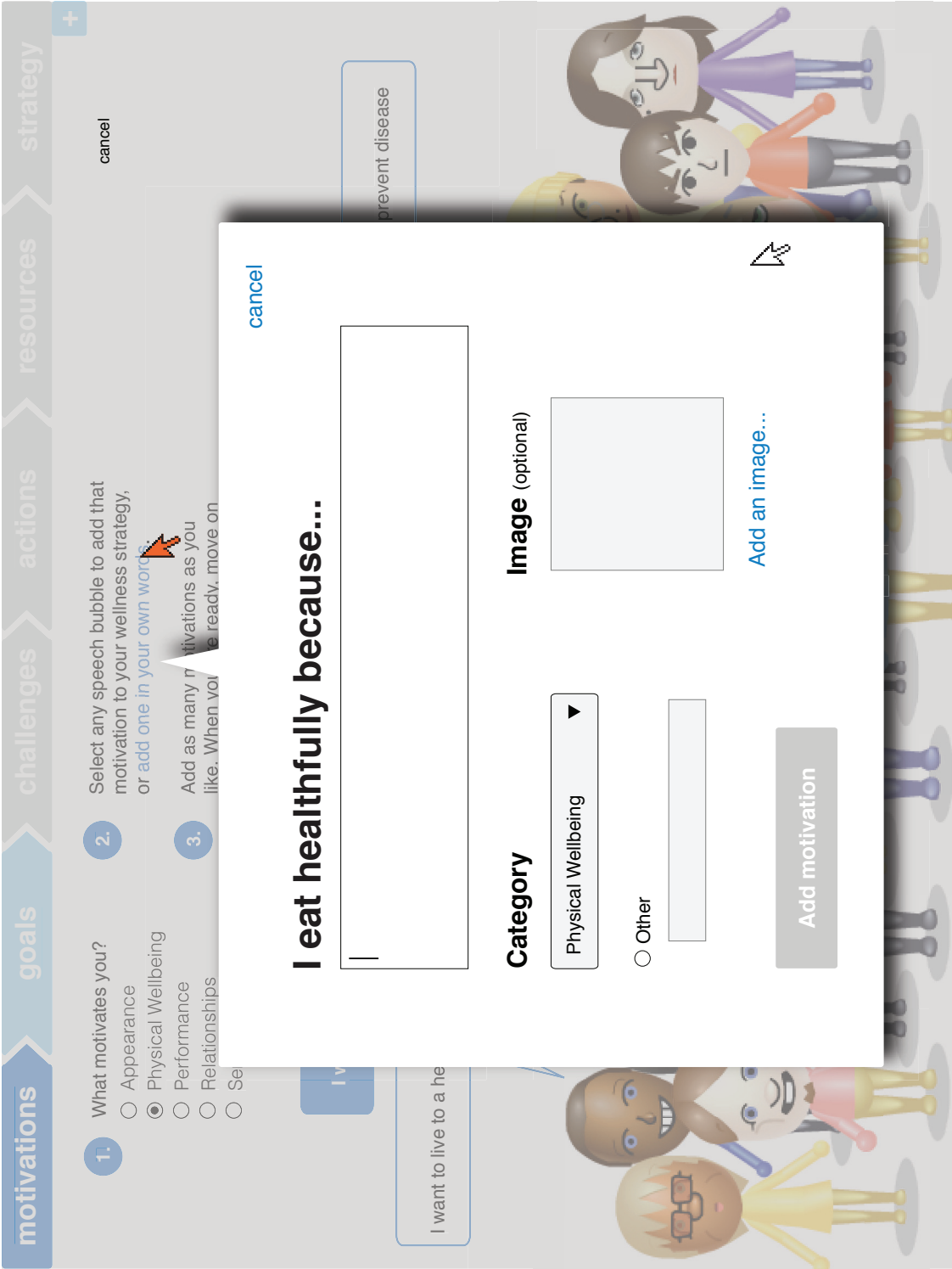
Too much physical effort

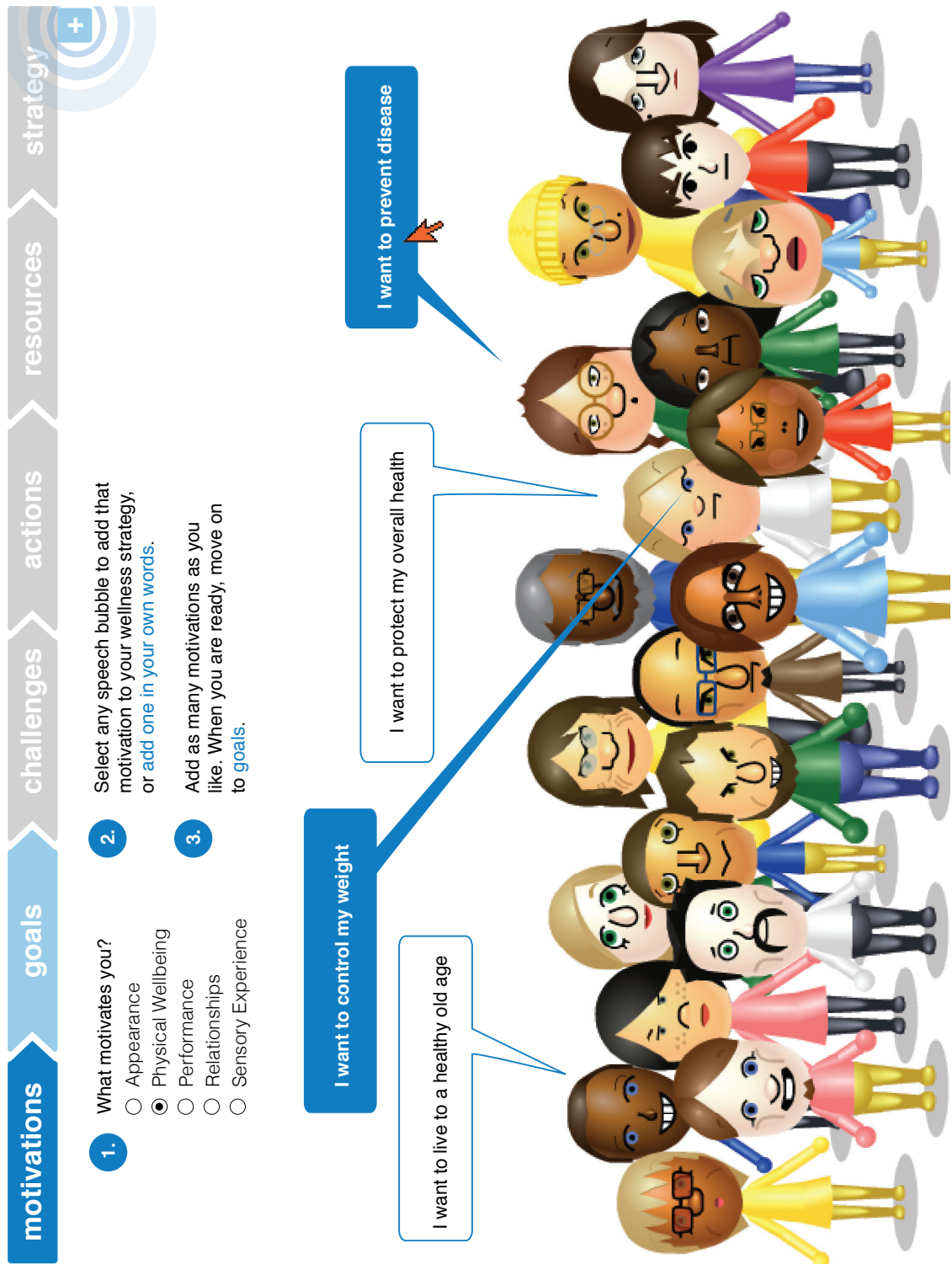
Too much mental effort











motivations

goals

challenges

actions

resources

strategy

1. What motivates you?

- ☐ Appearance
- ☒ Physical Wellbeing
- ☐ Performance
- ☐ Relationships
- ☐ Sensory Experience

2. Select any speech bubble to add that motivation to your wellness strategy, or add one in your own words.

3. Add as many motivations as you like. When you are ready, move on to goals.

my motivations

I want to control my weight

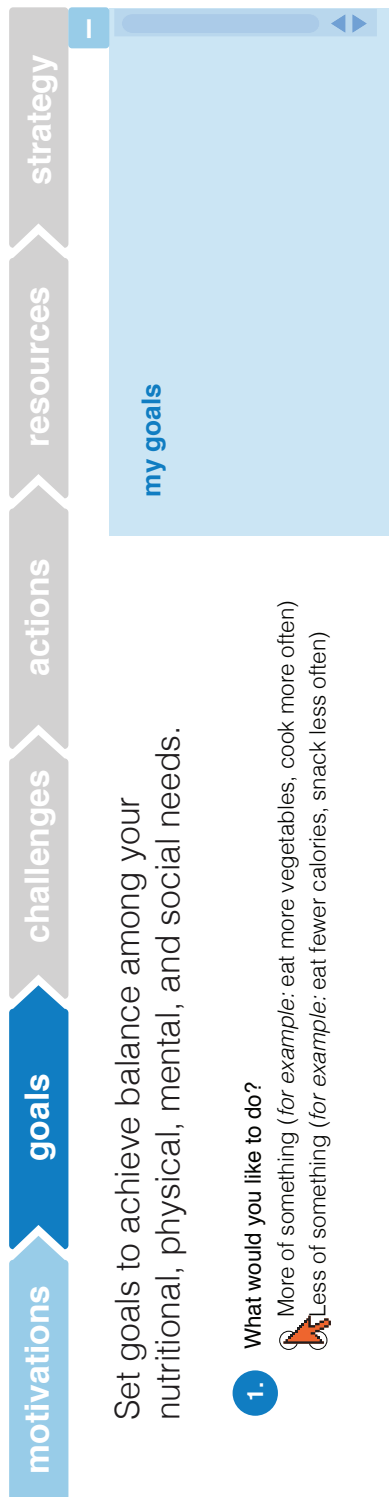
I want to prevent disease

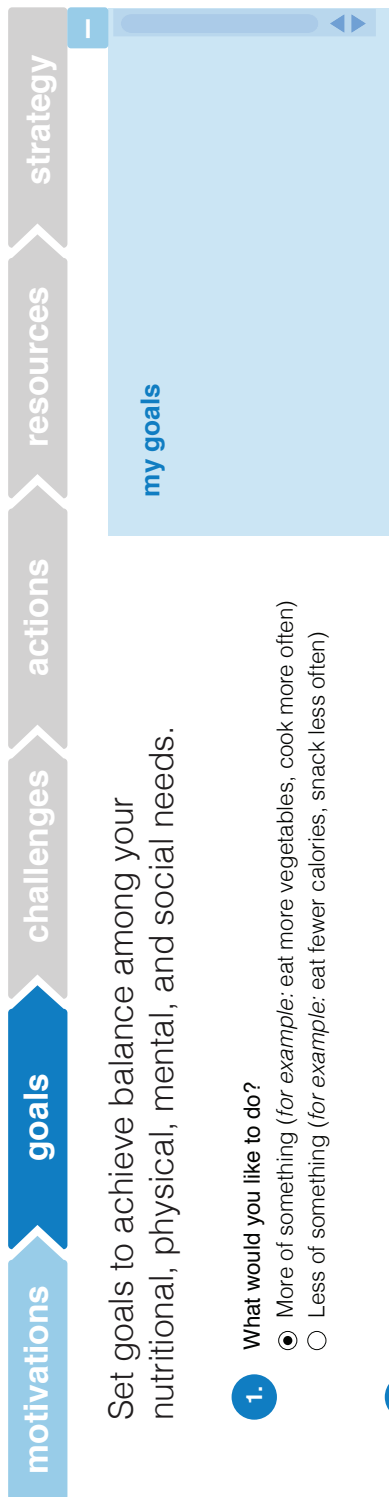
I want to control my weight

I want to live to a healthy old age

I want to protect my overall health

I want to prevent disease





motivations

goals

challenges

actions

resources

strategy

my goals

Set goals to achieve balance among your nutritional, physical, mental, and social needs.

1.

What would you like to do?

☒ More of something (for example: eat more vegetables, cook more often)

☐ Less of something (for example: eat fewer calories, snack less often)

2.

What type of goal do you have in mind?

☒ Nutritional

☐ Physical

☐ Mental

☐ Social

3.

What would you like to do more of?

Drink water

Eat fruits

Eat whole grains

Eat beans

Eat raw vegetables

Cook meals

Eat cooked vegetables

Eat seeds and nuts

Bring meals from home

motivations

goals

challenges

actions

resources

strategy

my goals

Set goals to achieve balance among your nutritional, physical, mental, and social needs.

1.

What would you like to do?

☒ More of something (for example: eat more vegetables, cook more often)

☐ Less of something (for example: eat fewer calories, snack less often)

2.

What type of goal do you have in mind?

☒ Nutritional

☐ Physical

☐ Mental

☐ Social

3.

What would you like to do more of?

Drink water

Eat fruits

Eat whole grains

Eat beans

Eat raw vegetables

Cook meals

Eat cooked vegetables

Eat seeds and nuts

Bring meals from home

The sketch shows a mobile app interface with a top navigation bar containing the following tabs: **motivations**, **goals**, **challenges**, **actions**, **resources**, and **strategy**. The **goals** tab is currently selected. Below the navigation bar, the main content area displays a goal titled **Eat more raw vegetables**. The goal is represented by two horizontal progress bars. The first bar is green and shows a slider at 2, with the text "About how many days a week do you **usually** eat raw vegetables?" and "2 days per week". The second bar is also green and shows a slider at 7, with the text "About how many days a week do you **want to** eat raw vegetables?" and "7 days per week". A mouse cursor is pointing at the slider for the second bar. Below the progress bars is a text input field labeled "Notes for this goal:". At the bottom right of the goal card is a blue button labeled "Add goal". A "cancel" link is located at the top left of the goal card. The background of the app shows a list of goals under the heading "Set goals to achieve balance among your nutritional, physical, mental, and social health". The list includes three items, each with a numbered circle and a title: "1. What would you like to achieve?", "2. What type of health goal do you want to achieve?", and "3. What would you like to achieve?". Each item has a "More" button and a "Less" button.

cancel

Eat more raw vegetables

About how many days a week do you **usually** eat raw vegetables?

2 days per week

About how many days a week do you **want to** eat raw vegetables?

7 days per week

Notes for this goal:

Add goal

motivations

goals

challenges

actions

resources

strategy

my goals

Eat raw vegetables 7 days per week

Add as many goals as you like.
When you are ready, move on to challenges.

1.

What would you like to do?

☒ More of something (for example: eat more vegetables, cook more often)

☐ Less of something (for example: eat fewer calories, snack less often)

2.

What type of goal do you have in mind?

☒ Nutritional

☐ Physical

☐ Mental

☐ Social

3.

What would you like to do more of?

Drink water

Eat fruits

Eat whole grains

Eat beans

Eat raw vegetables

Cook meals

Eat cooked vegetables

Eat seeds and nuts

Bring meals from home

motivations

goals

challenges

actions

resources

strategy

Tailor your wellness strategy according to the specific types of challenges you face.

1. Select a goal

☒ Eat raw vegetables 7 days per week

☐ Eat beans 5 days per week

2. Select up to three of your biggest challenges in reaching this goal.

Too different from other people

Too expensive

Not enough time

Not part of my current routine

Too much physical effort

Not an enjoyable experience

Too much mental effort

Other

3. When you are ready, move on to actions.

my challenges

Eat raw vegetables 7 days per week:

Eat beans 5 days per week:

Redesigning Our Personal Environments and Behaviors: A Systems Approach to Wellness

179

motivations

goals

challenges

actions

resources

strategy

Tailor your wellness strategy according to the specific types of challenges you face.

1.

Select a goal:

- ☒ Eat raw vegetables 7 days per week
- ☐ Eat beans 5 days per week

2.

What are your biggest challenges in reaching this goal?

Challenge 1

☒ Not enough time

☐ Not enough money

☐ Too much physical effort

☐ Too much mental effort

☐ Too different from other people

☐ Not part of my current routine

☐ Not an enjoyable experience

Challenge 2

☐ Not enough time

☐ Not enough money

☒ Too much physical effort

☐ Too much mental effort

☐ Too different from other people

☐ Not part of my current routine

☐ Not an enjoyable experience

Challenge 3

☐ Not enough time

☐ Not enough money

☐ Too much physical effort

☒ Too much mental effort

☐ Too different from other people

☐ Not part of my current routine

☐ Not an enjoyable experience

3.

You can specify a maximum of three challenges for each goal. When you are ready, move on to [actions](#).

my challenges

Eat raw vegetables 7 days per week:

Not enough time

Too much physical effort

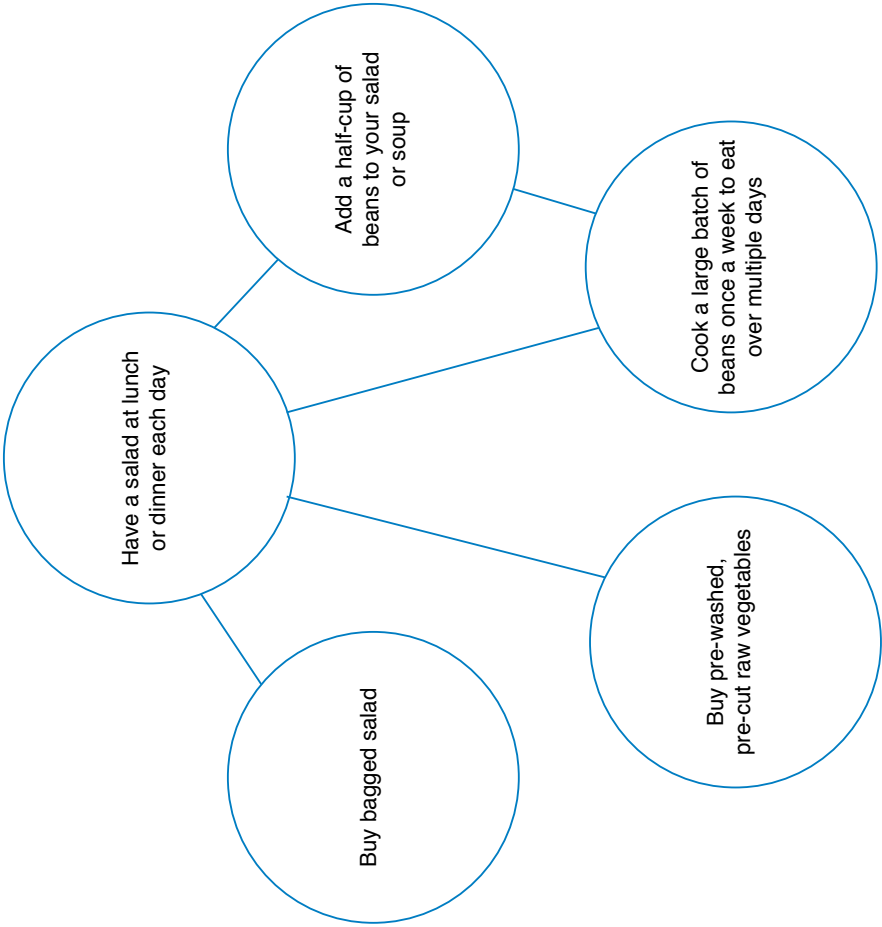
Too much mental effort

180

Redesigning Our Personal Environments and Behaviors: A Systems Approach to Wellness



Select suggestions that make sense to you to help you reach your wellness goals. Suggestions that may work well together are shown as linked.





Tailor your wellness strategy according to the specific types of challenges you face.

1.

Select a goal

- ☒ Eat raw vegetables 7 days per week
- ☐ Eat beans 5 days per week

2.

What are your biggest challenges in reaching this goal?

Challenge 1

- ☒ Not enough time
- ☐ Not enough money
- ☐ Too much physical effort
- ☐ Too much mental effort
- ☐ Too different from other people
- ☐ Not part of my current routine
- ☐ Not an enjoyable experience

Challenge 2

- ☐ Not enough time
- ☐ Not enough money
- ☒ Too much physical effort
- ☐ Too much mental effort
- ☐ Too different from other people
- ☐ Not part of my current routine
- ☐ Not an enjoyable experience

Challenge 3

- ☐ Not enough time
- ☐ Not enough money
- ☐ Too much physical effort
- ☒ Too much mental effort
- ☐ Too different from other people
- ☐ Not part of my current routine
- ☐ Not an enjoyable experience

3.

You can specify a maximum of three challenges for each goal. When you are ready, move on to [actions](#).

motivations

goals

challenges

actions

resources

strategy

Add as many goals as you like.
When you are ready, move on to challenges.

1.

What would you like to do?

☒ More of something (for example: eat more vegetables, cook more often)

☐ Less of something (for example: eat fewer calories, snack less often)

2.

What type of goal do you have in mind?

☒ Nutritional

☐ Physical

☐ Mental

☐ Social

3.

What would you like to do more of?

Drink water

Eat beans

Eat cooked vegetables

Eat fruits

Eat raw vegetables

Eat seeds and nuts

Eat whole grains

Cook meals

Pack meals

my goals

Eat raw vegetables 7 days per week

Eat beans 5 days per week

motivations goals challenges actions resources strategy

Set goals to achieve nutritional, balance among your

1. What would you like to achieve?
☒ More
☐ Less
☐ Same

2. What type of goal?
☒ Nutritional
☐ Physical
☐ Mental
☐ Social

3. What would you like to achieve?
☒ More
☐ Less
☐ Same

Eat more raw vegetables

cancel

About how many days a week do you **usually** eat raw vegetables?

0 days per week

About how many days a week do you **want to** eat raw vegetables?

0 days per week

Notes for this goal:

Add goal

motivations

goals

challenges

actions

resources

strategy

Tailor your wellness strategy according to the specific types of challenges you face.

1.

Select a goal

- ☒ Eat raw vegetables 7 days per week
- ☐ Eat beans 5 days per week

2.

What are your biggest challenges in reaching this goal?

Challenge 1

- ☐ Not enough time
- ☐ Not enough money
- ☐ Too much physical effort
- ☐ Too much mental effort
- ☐ Too different from other people
- ☐ Not part of my current routine
- ☐ Not an enjoyable experience

Challenge 2

- ☐ Not enough time
- ☐ Not enough money
- ☐ Too much physical effort
- ☐ Too much mental effort
- ☐ Too different from other people
- ☐ Not part of my current routine
- ☐ Not an enjoyable experience

Challenge 3

- ☐ Not enough time
- ☐ Not enough money
- ☐ Too much physical effort
- ☐ Too much mental effort
- ☐ Too different from other people
- ☐ Not part of my current routine
- ☐ Not an enjoyable experience

3.

You can specify a maximum of three challenges for each goal. When you are ready, move on to [actions](#).

my challenges

Eat raw vegetables 7 days per week:

Eat beans 5 days per week:

motivations

goals

challenges

actions

resources

strategy

Tailor your wellness strategy according to the specific types of challenges you face.

1. Select a goal

☒ Eat raw vegetables 7 days per week

☐ Eat beans 5 days per week

2. Select up to three of your biggest challenges in reaching this goal.

Too different from other people

1
Not enough time

2
Too much physical effort

3
Too much mental effort

Too expensive

Not part of my current routine

Not an enjoyable experience

Other

3. Have you specified challenges for all your goals? When you are ready, move on to actions.

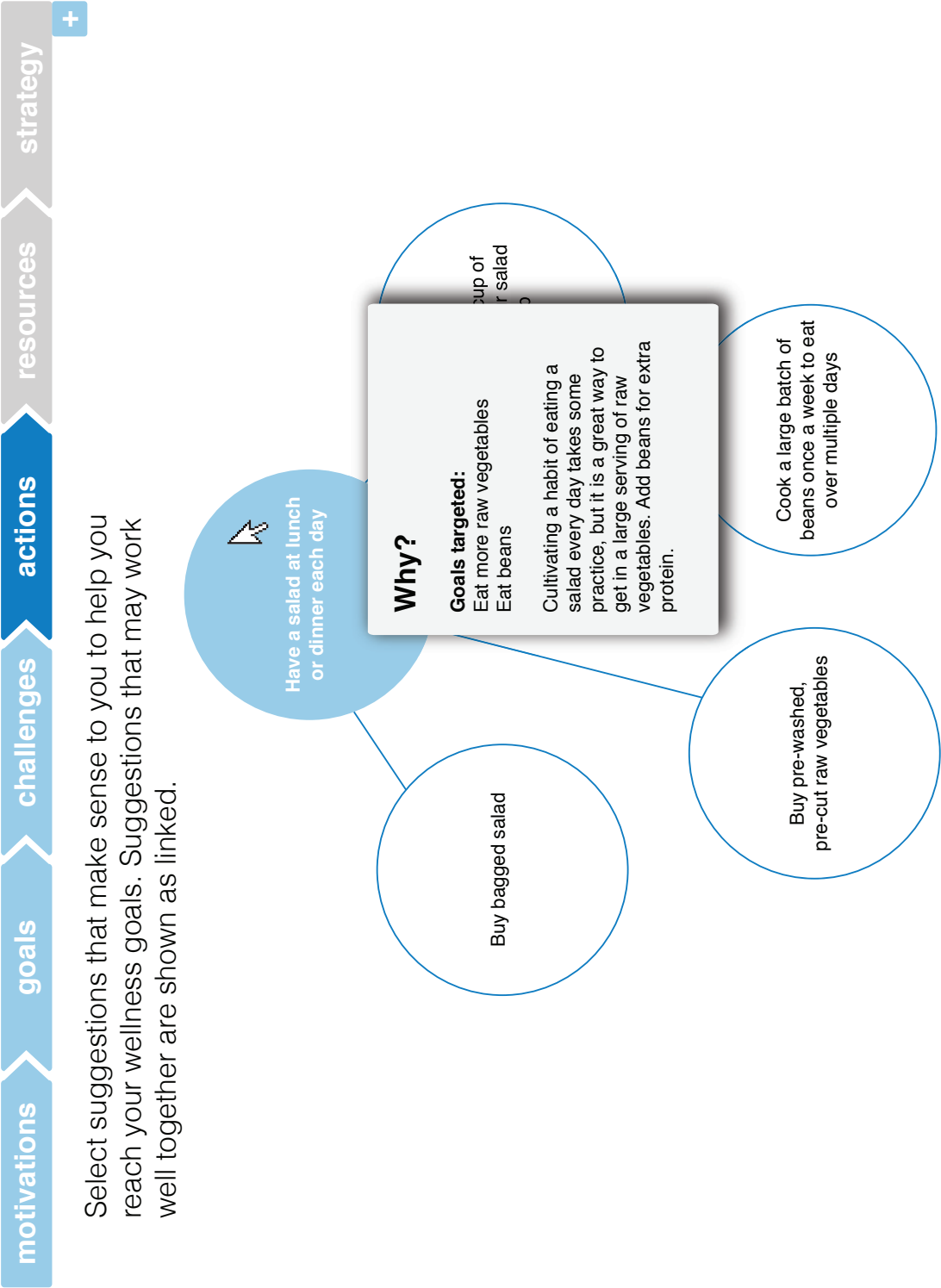
my challenges

Eat raw vegetables 7 days per week:

Not enough time

Too much physical effort

Too much mental effort





Print

My Wellness Strategy

motivations	I want to control my weight and I want to prevent disease				
goals	Eat raw vegetables 7 days per week	Eat beans 5 days per week			
challenges	Not enough time Too much physical effort Too much mental effort	What challenges do you face?			
actions	Have a salad at lunch or dinner each day	Add a half-cup of beans to your salad or soup			
resources	Salad recipes	How to cook beans Bean soup recipes			



Assess

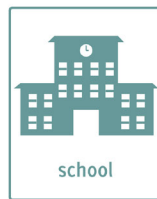
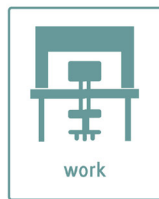
Plan

Log

Reflect

Profile | Log out

Where do you store your food?



1. storage

2. preparation

3. consumption

Environments

[About](#) | [FAQ](#) | [Privacy](#) | [Terms](#) | [Contact Us](#)

1. storage

2. preparation

3. consumption

Environments





Assess

Plan

Log

Reflect

Profile | Log out

Where do you store your food?



other

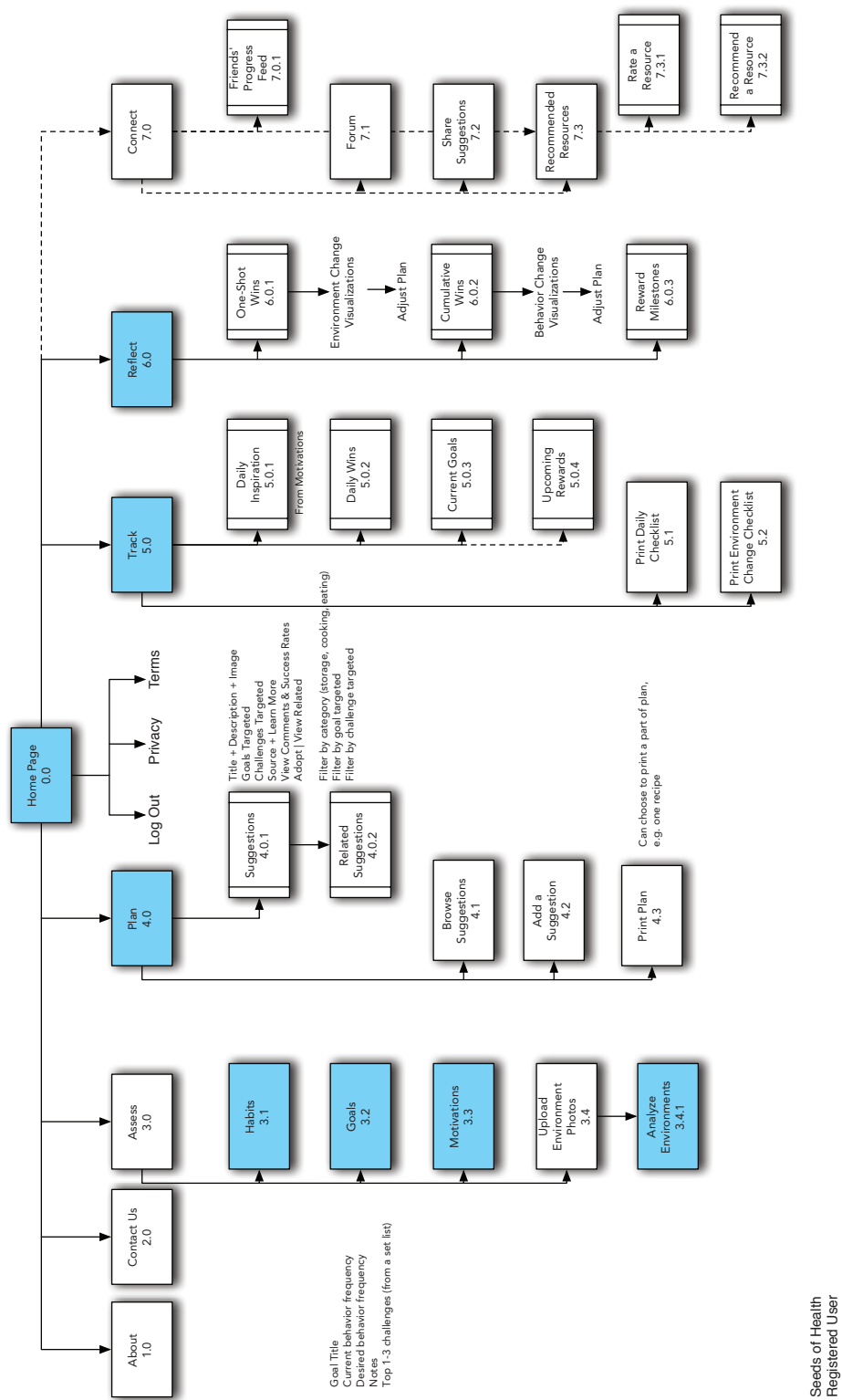
1. storage

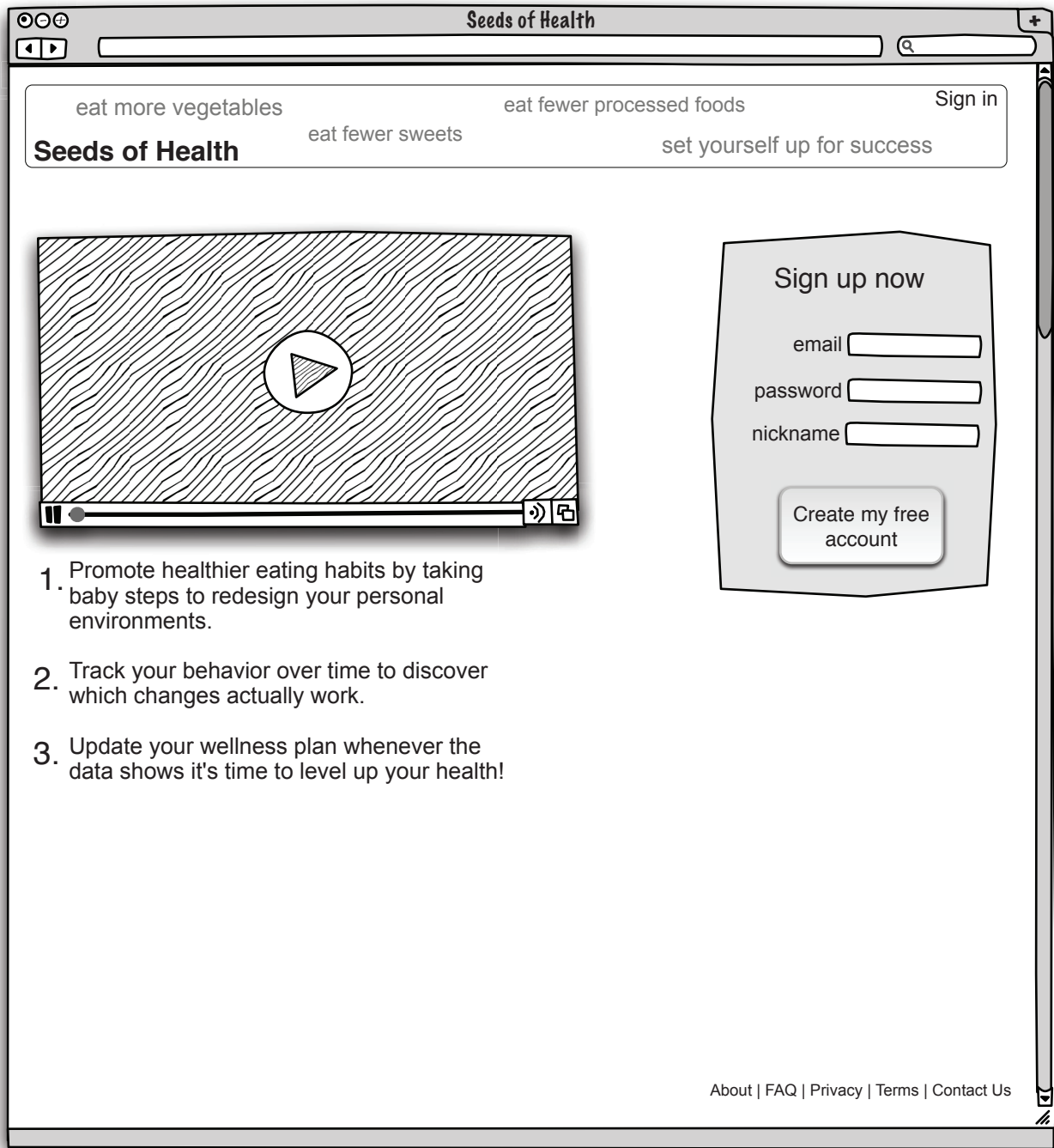
2. preparation

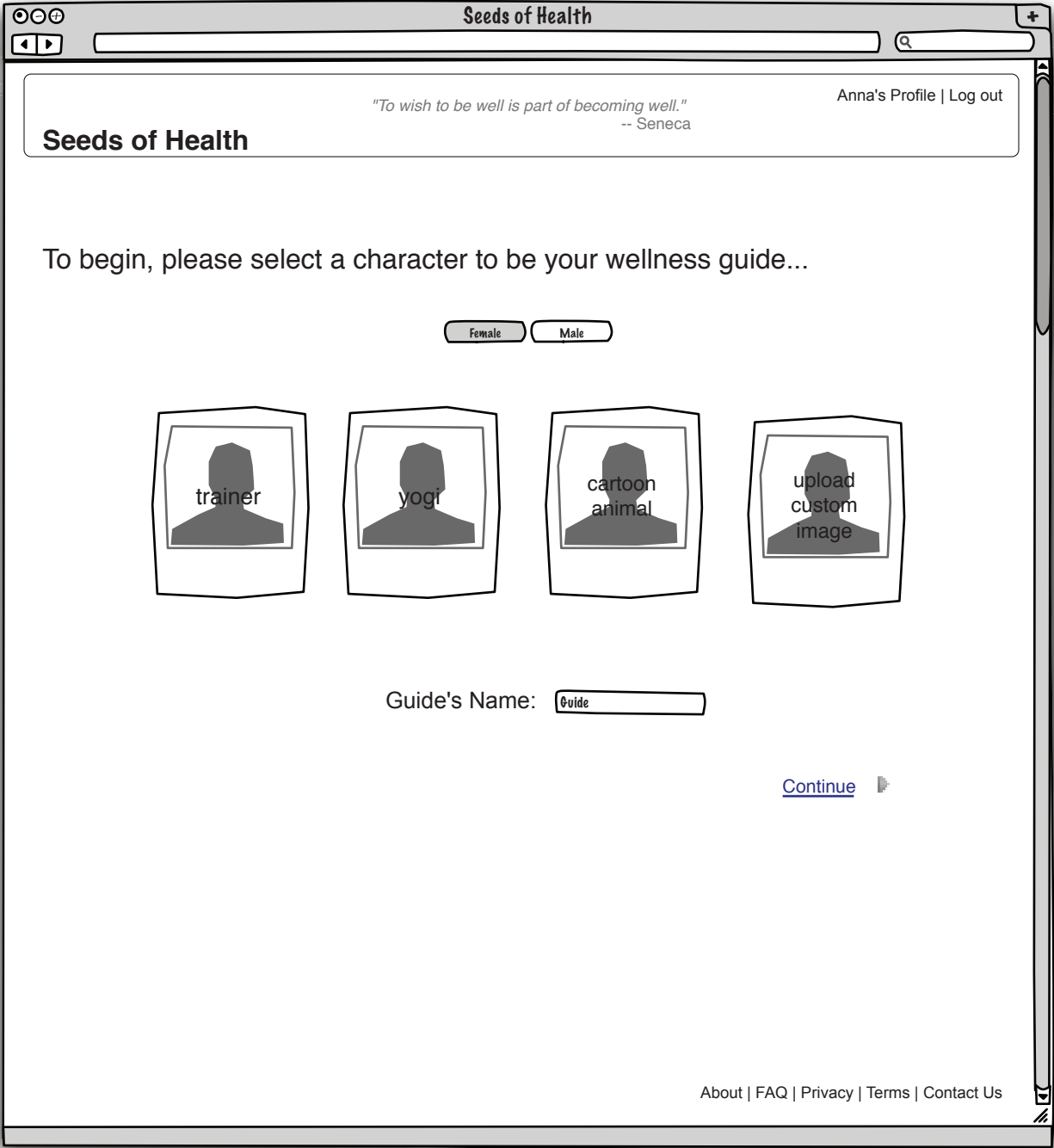
3. consumption

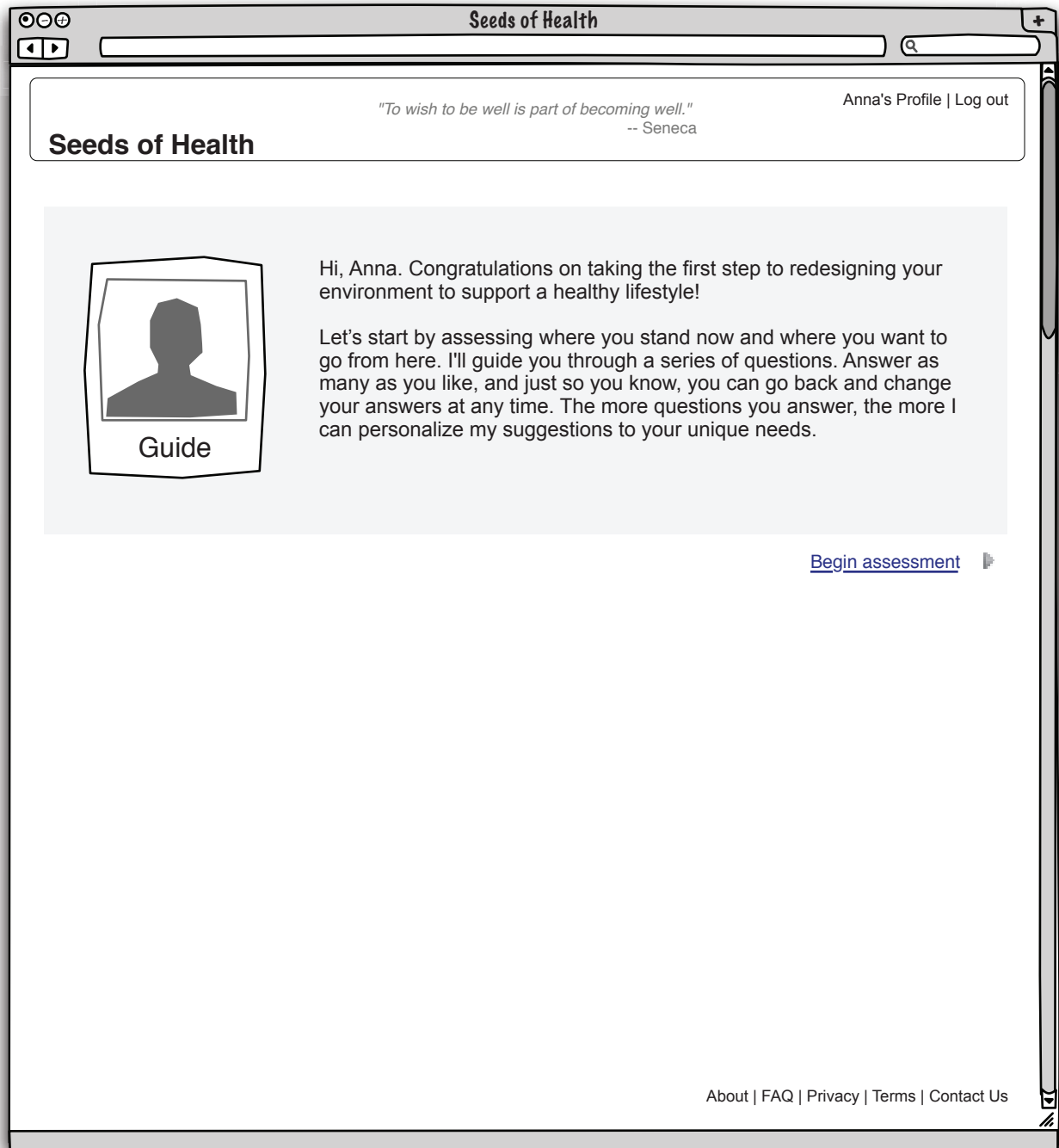
Environments

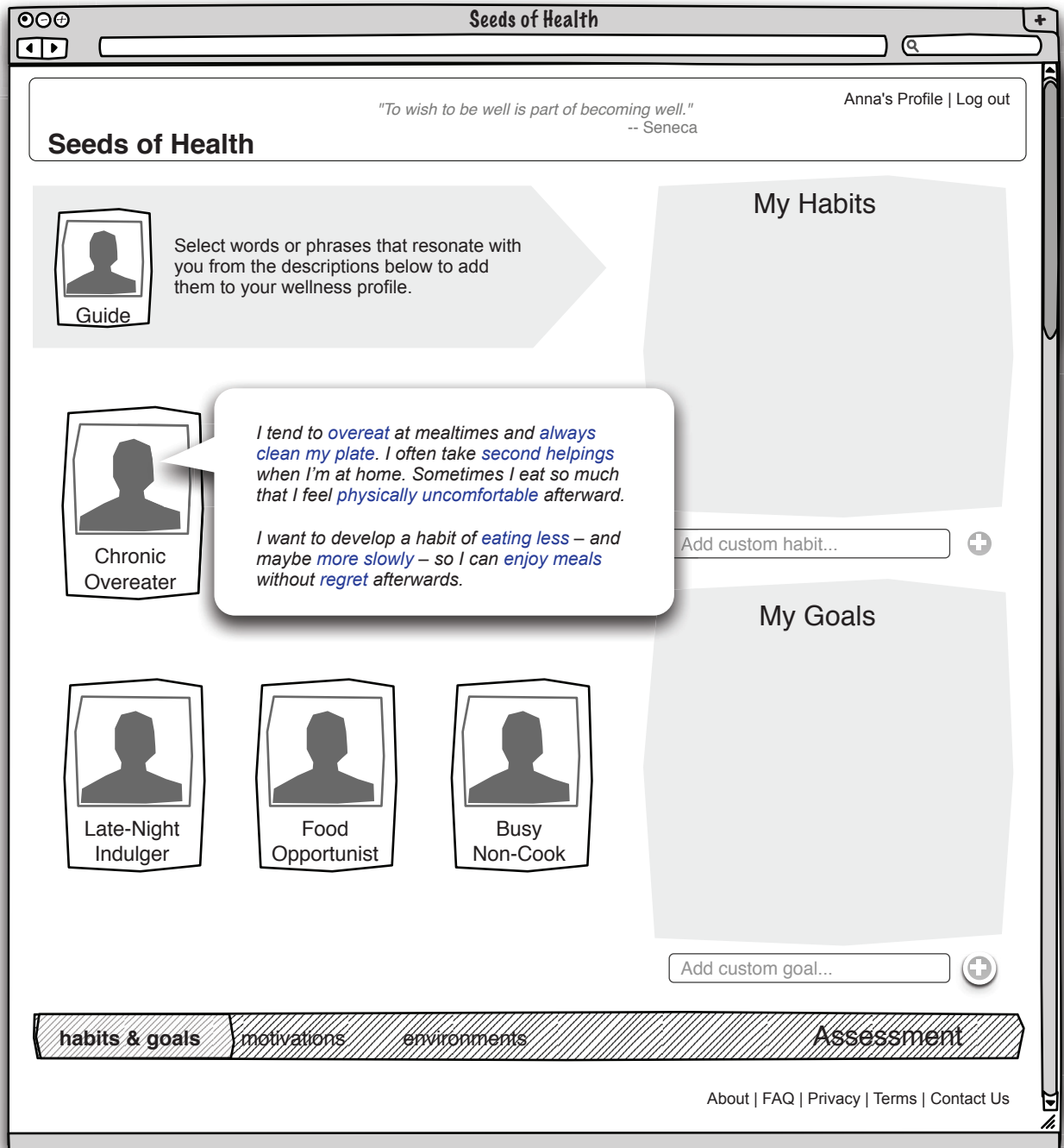
About | FAQ | Privacy | Terms | Contact Us

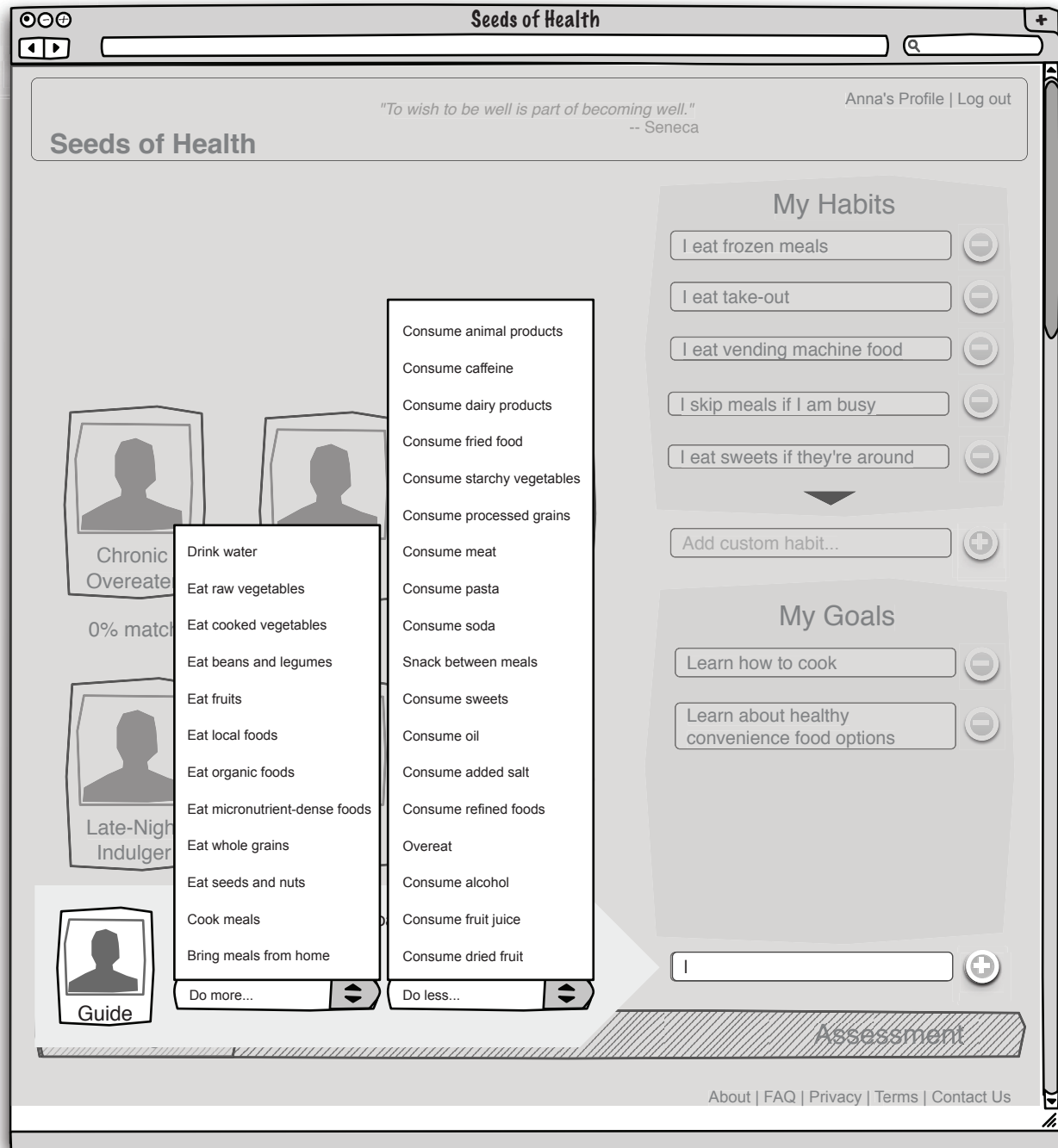


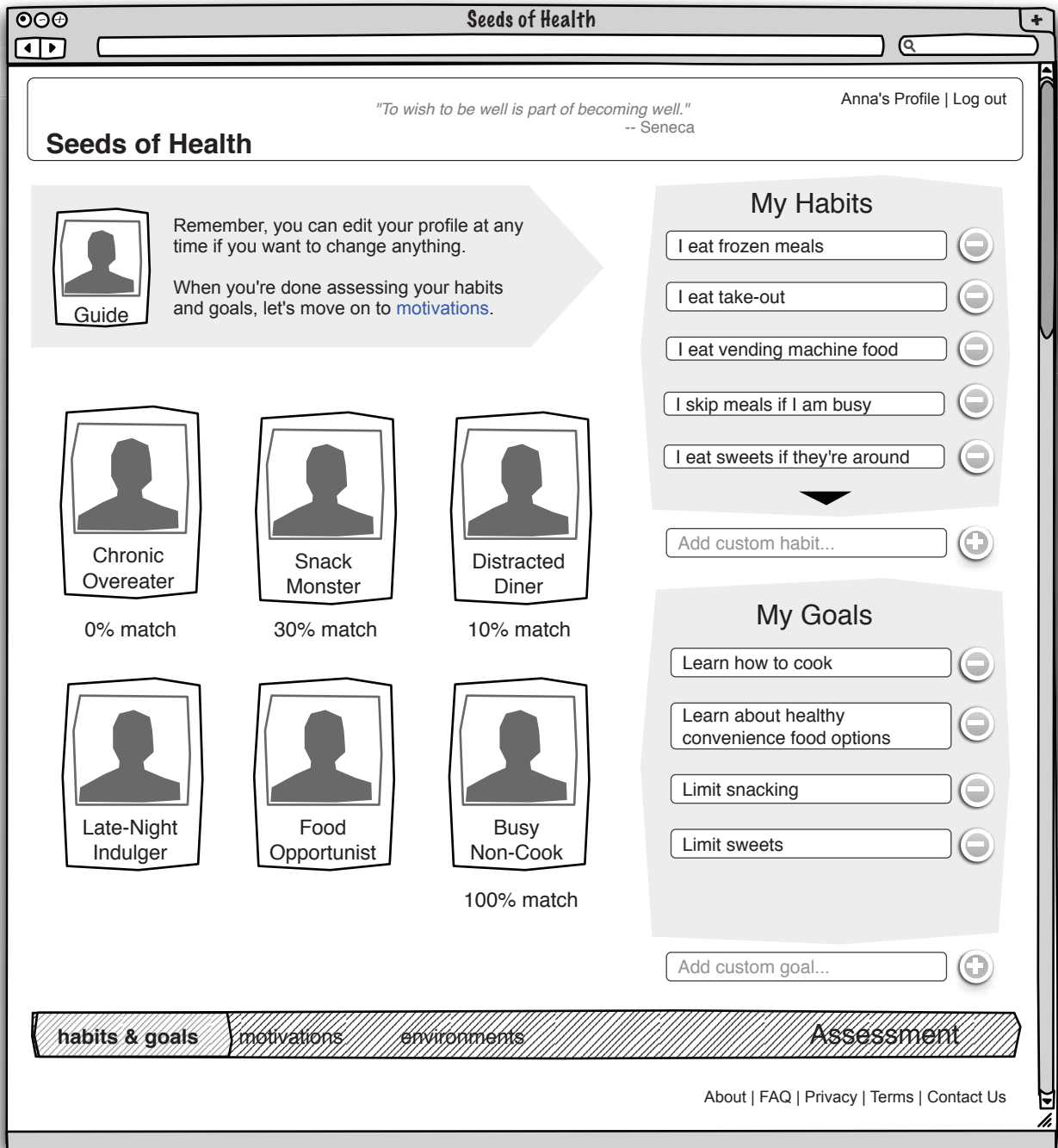












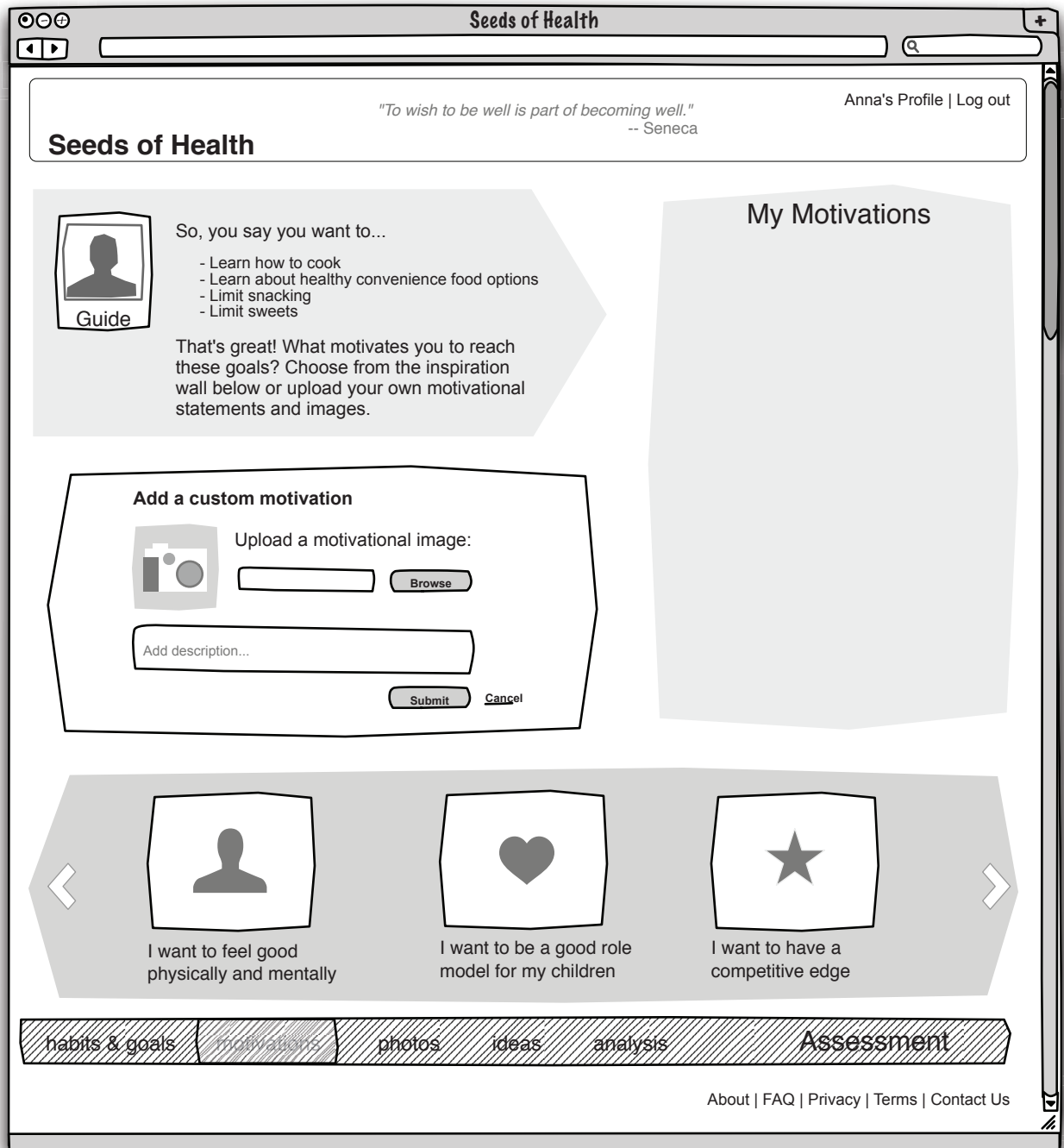
The wireframe depicts a web browser window titled "Seeds of Health". The browser's address bar is empty, and the page header includes a quote: "To wish to be well is part of becoming well." -- Seneca, and a user profile link: "Anna's Profile | Log out".

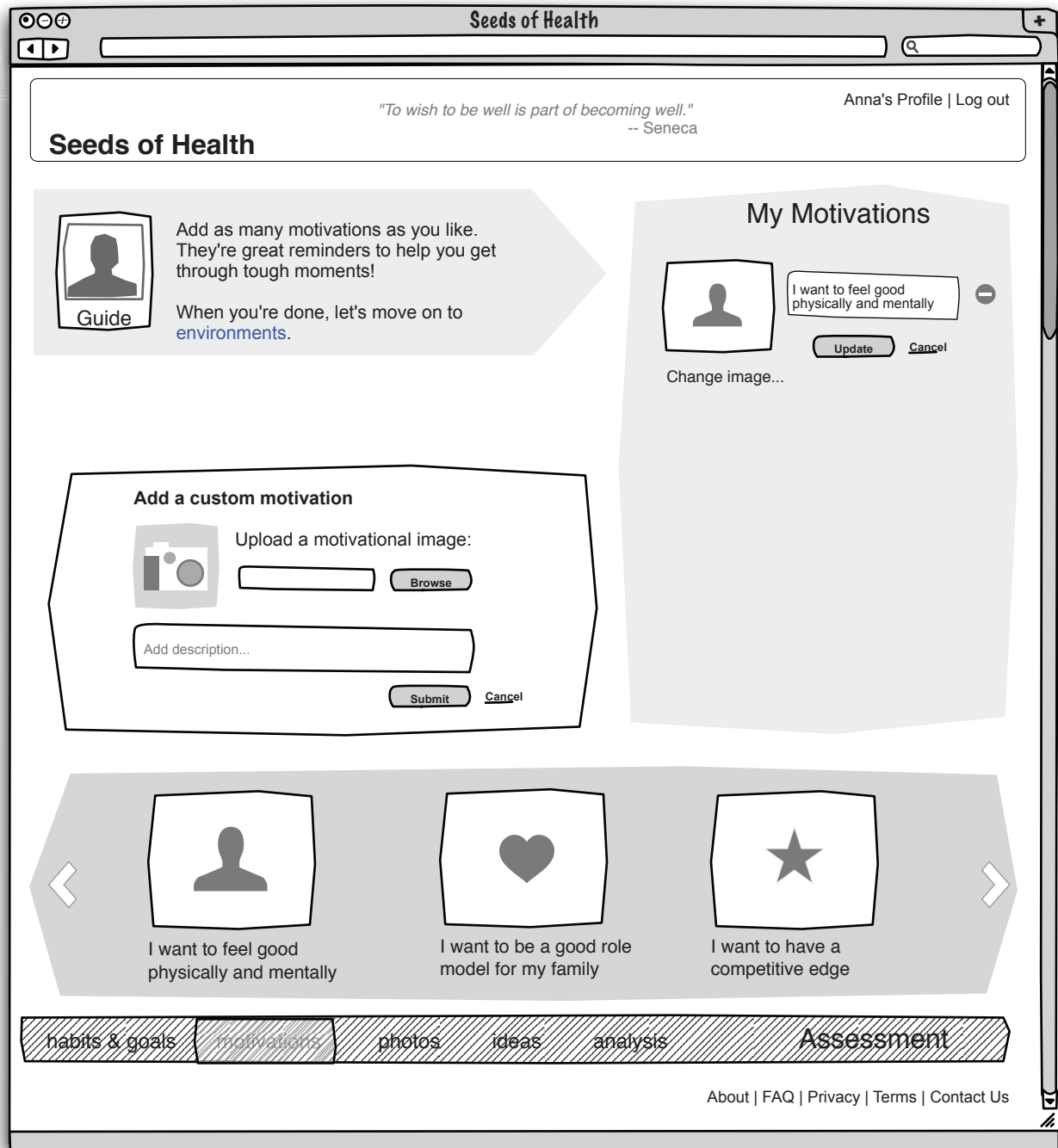
The main navigation bar contains five tabs: "habits", "goals", "motivations", "environments", and "Assessment". The "goals" tab is currently selected.

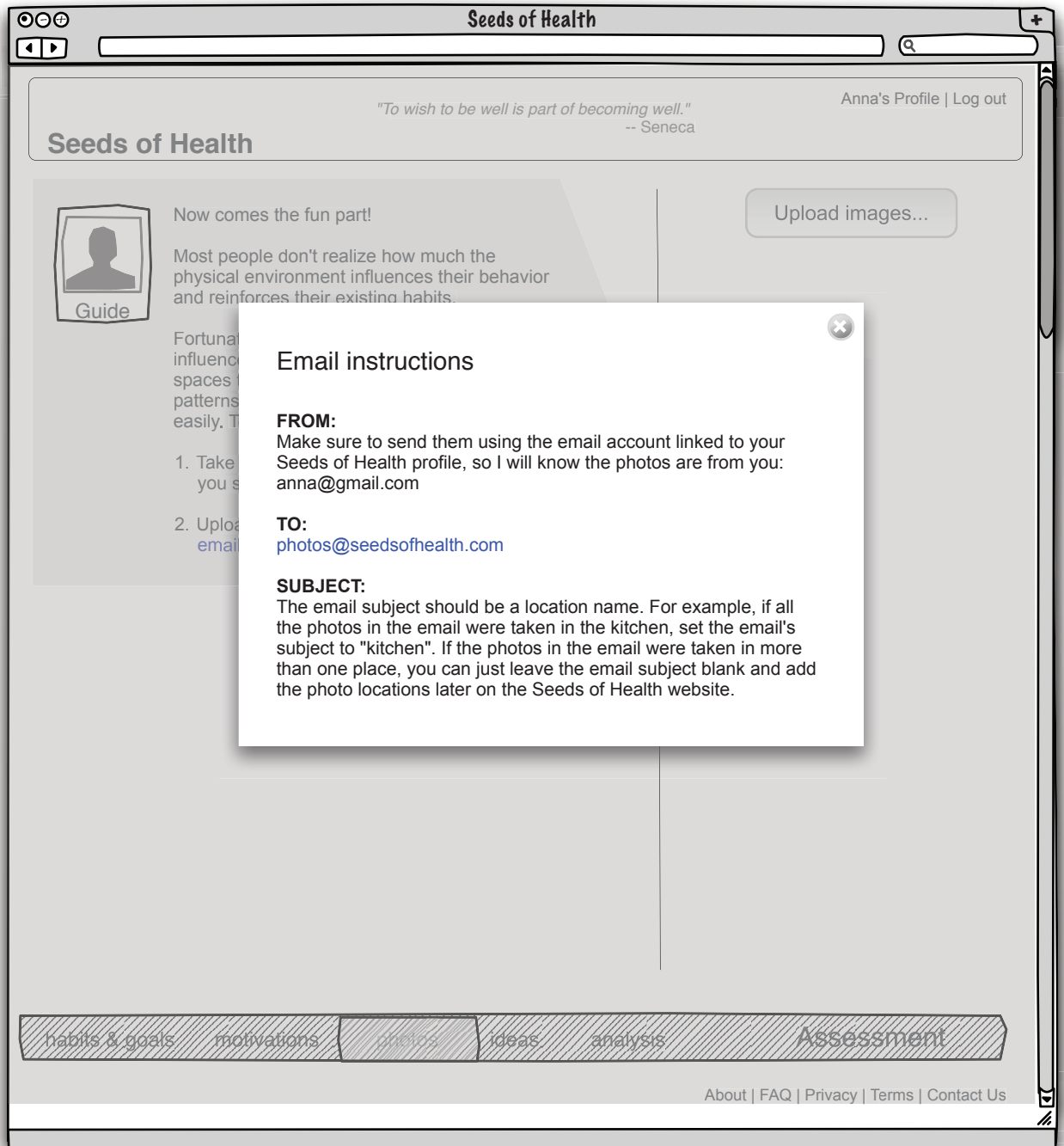
A modal window titled "Cook healthy meals" is open, featuring a "Cancel" link in the top right corner. The modal contains the following elements:

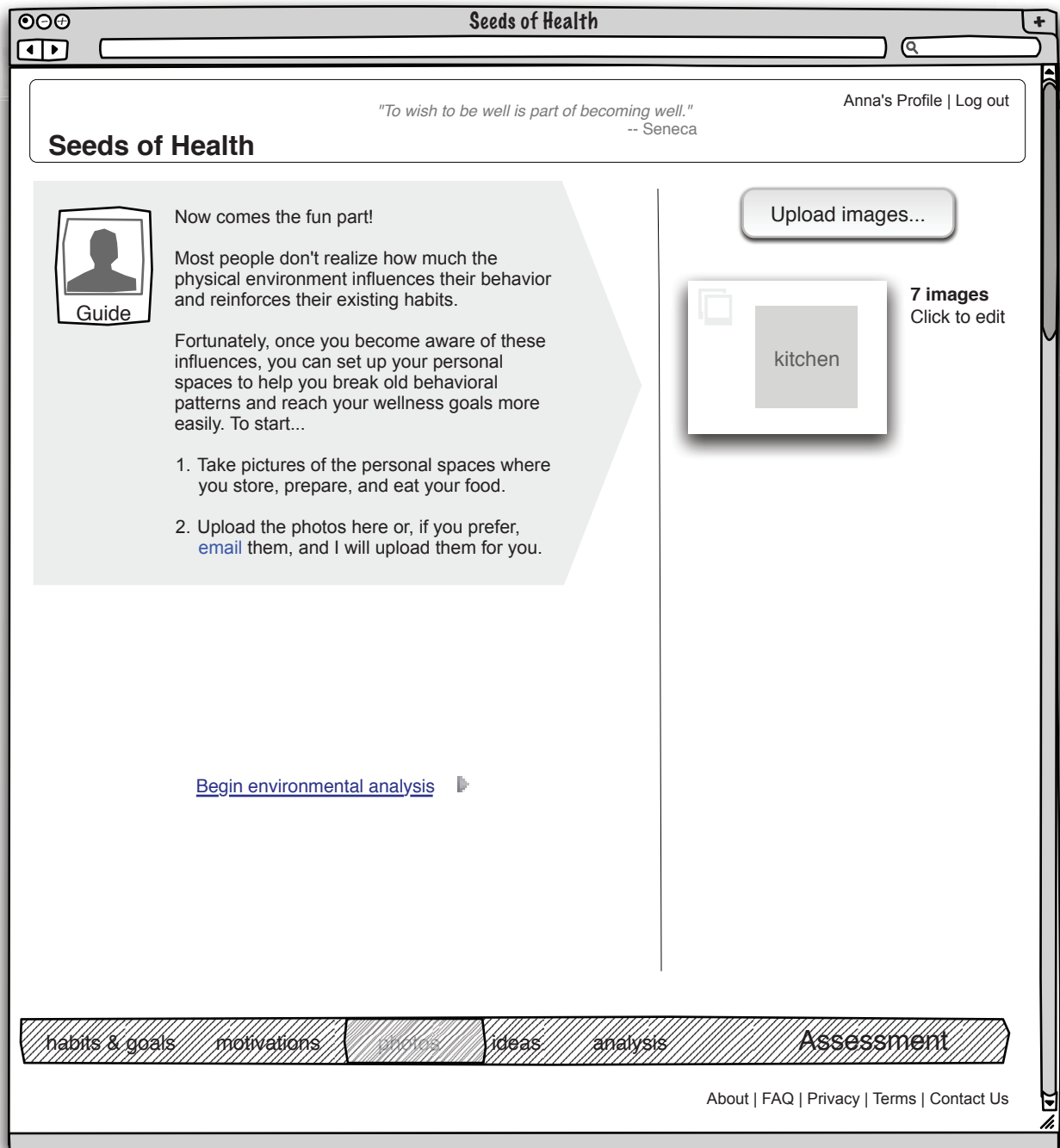
- A question: "About how often do you **usually** cook healthy meals?"
- A form field for frequency, currently set to "times per week".
- A second question: "About how often do you **want to** cook healthy meals?"
- A second form field for frequency, also set to "times per week".
- A prompt: "Select up to three of your biggest challenges in reaching this goal:"
- A grid of eight challenge buttons: "Not enough time" (selected with a green circle and number 1), "Too expensive", "Too much physical effort" (selected with a green circle and number 2), "Not part of my current routine", "Too much mental effort" (selected with a green circle and number 3), "Not an enjoyable experience", "Too different from other people", and "Addiction".
- A text area labeled "Notes..." for additional comments.
- A "Save" button at the bottom.

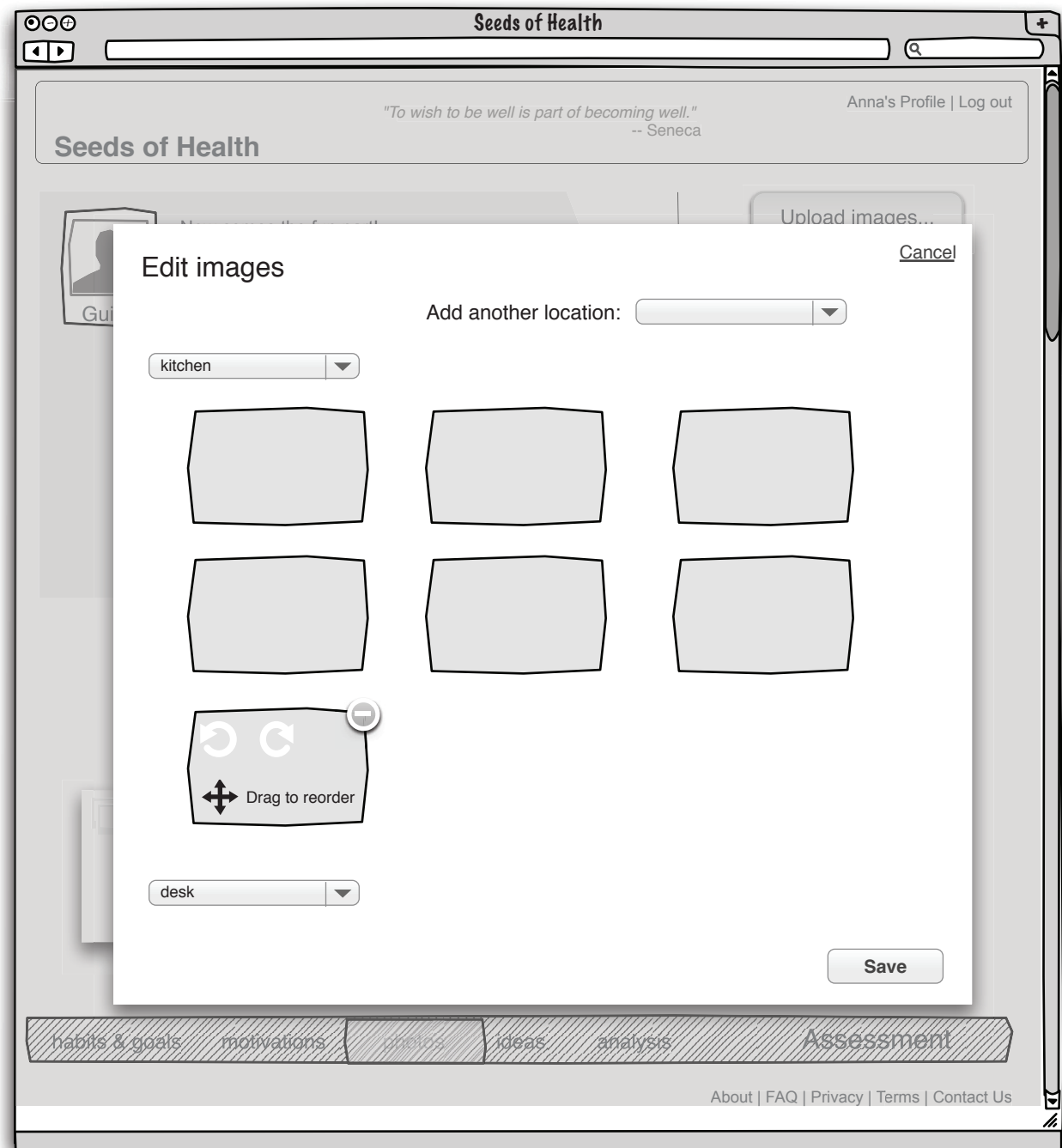
The background of the application shows a sidebar with a profile picture and a "Notes" section on the right. The footer contains links for "About", "FAQ", "Privacy", "Terms", and "Contact Us".

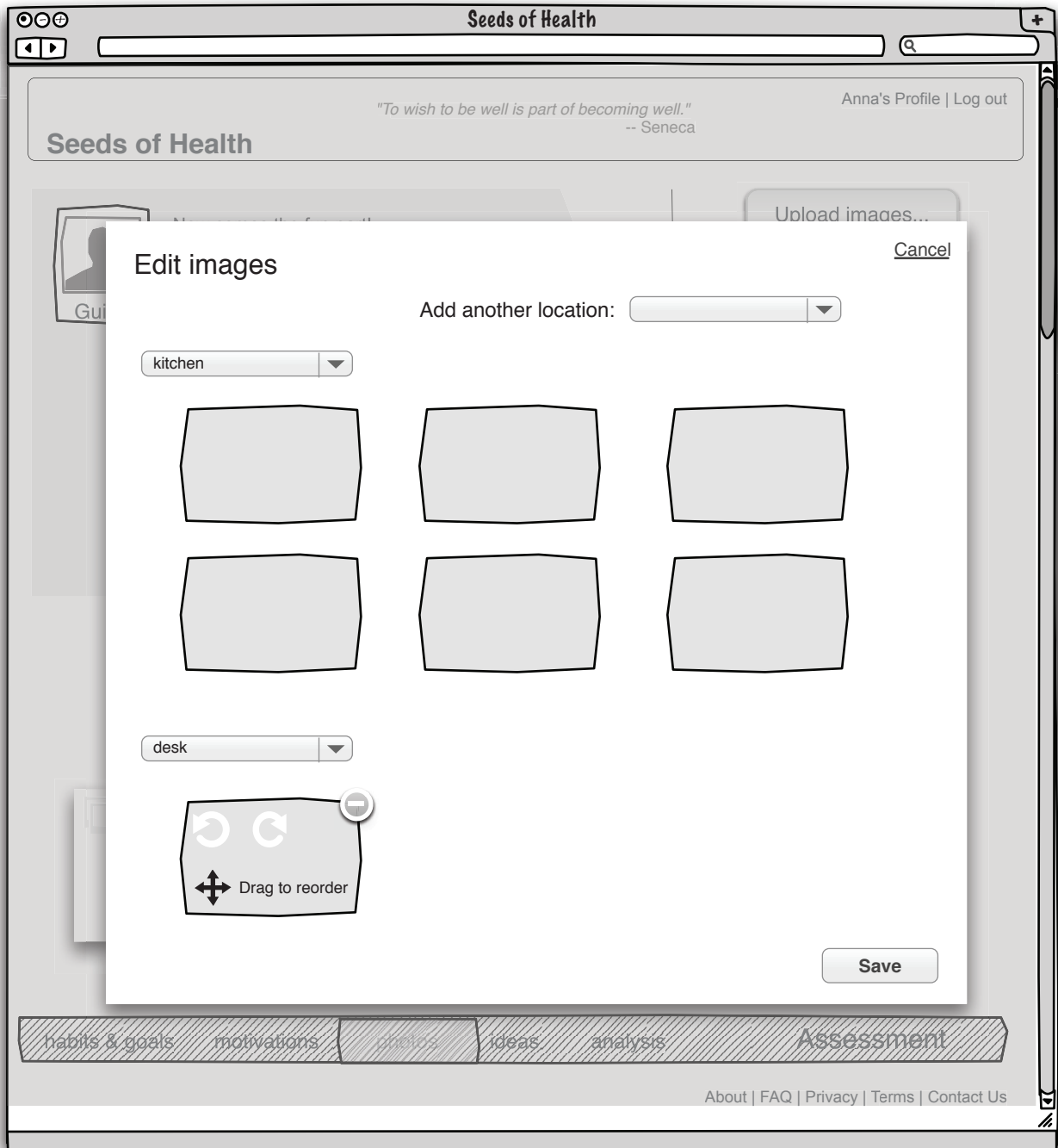




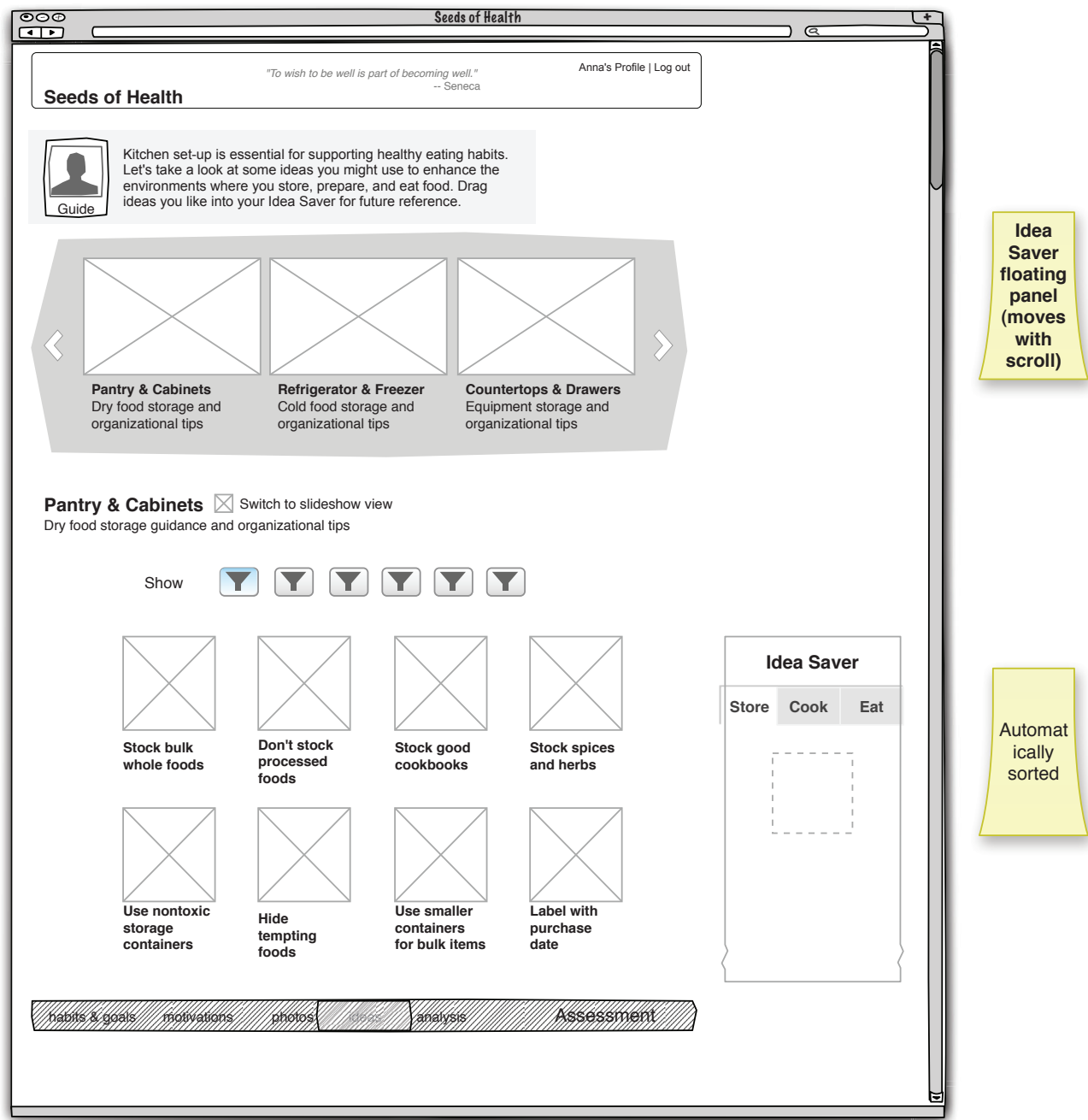


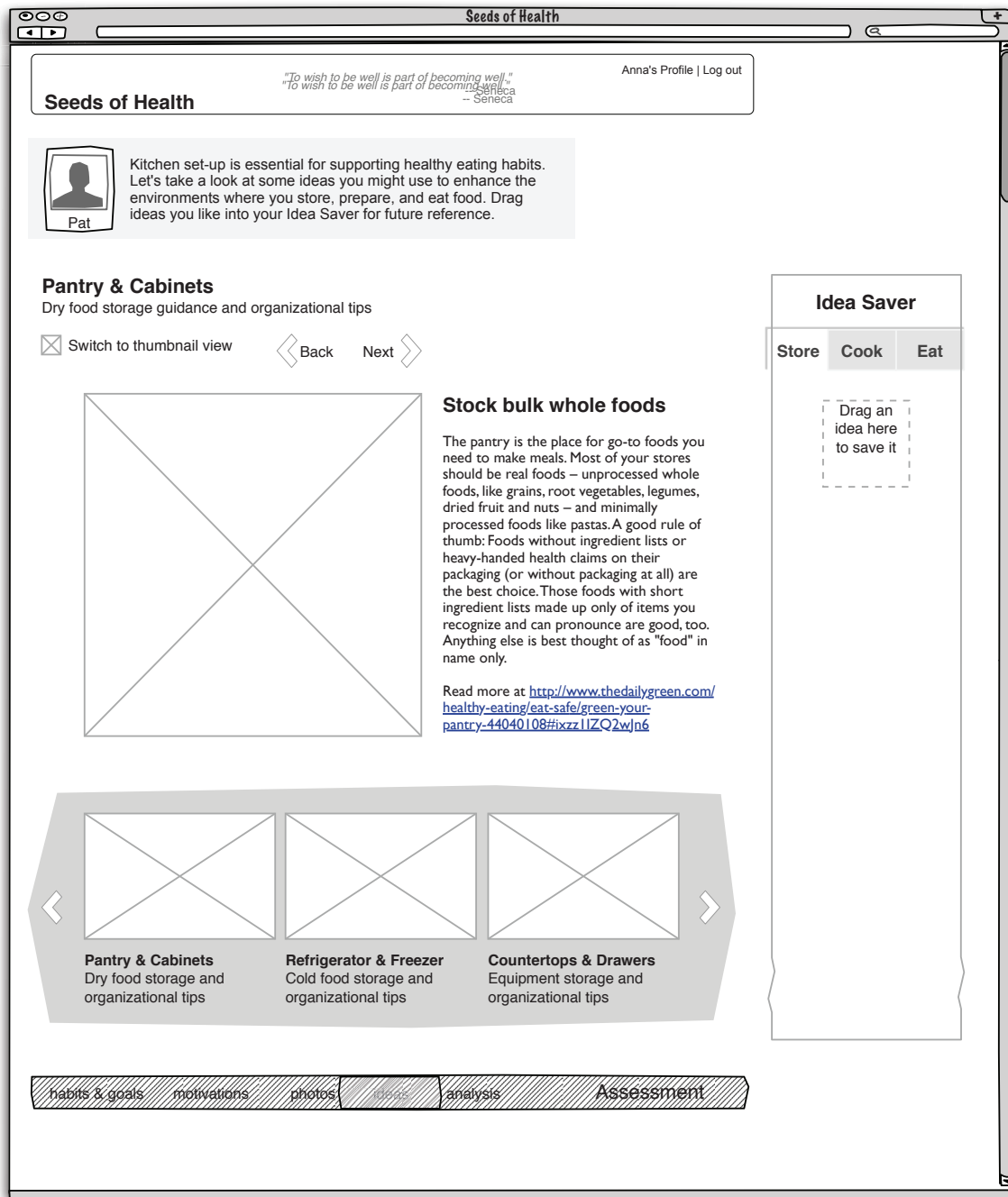


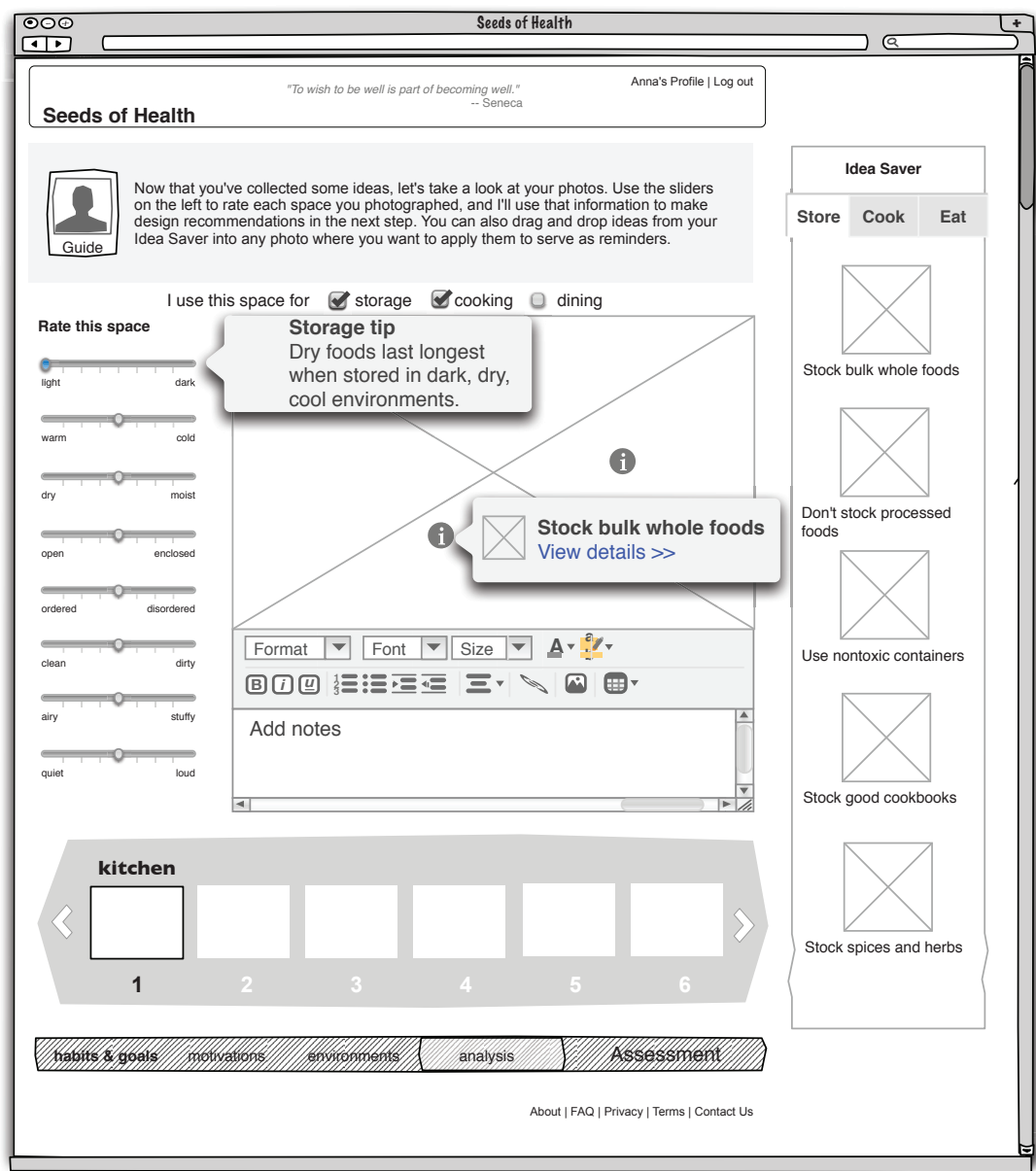


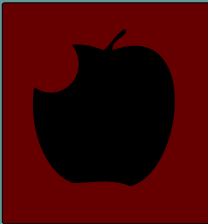

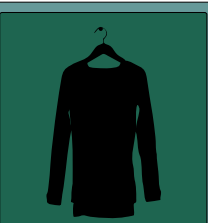
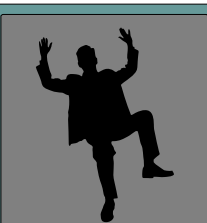
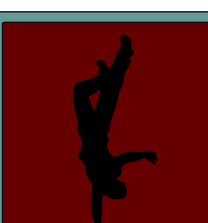
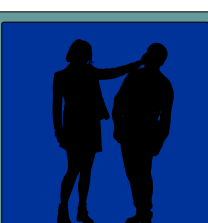
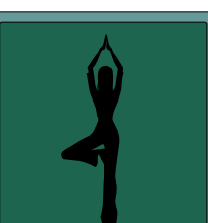


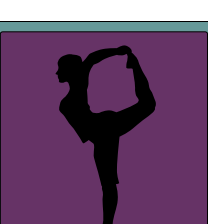
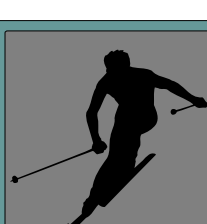


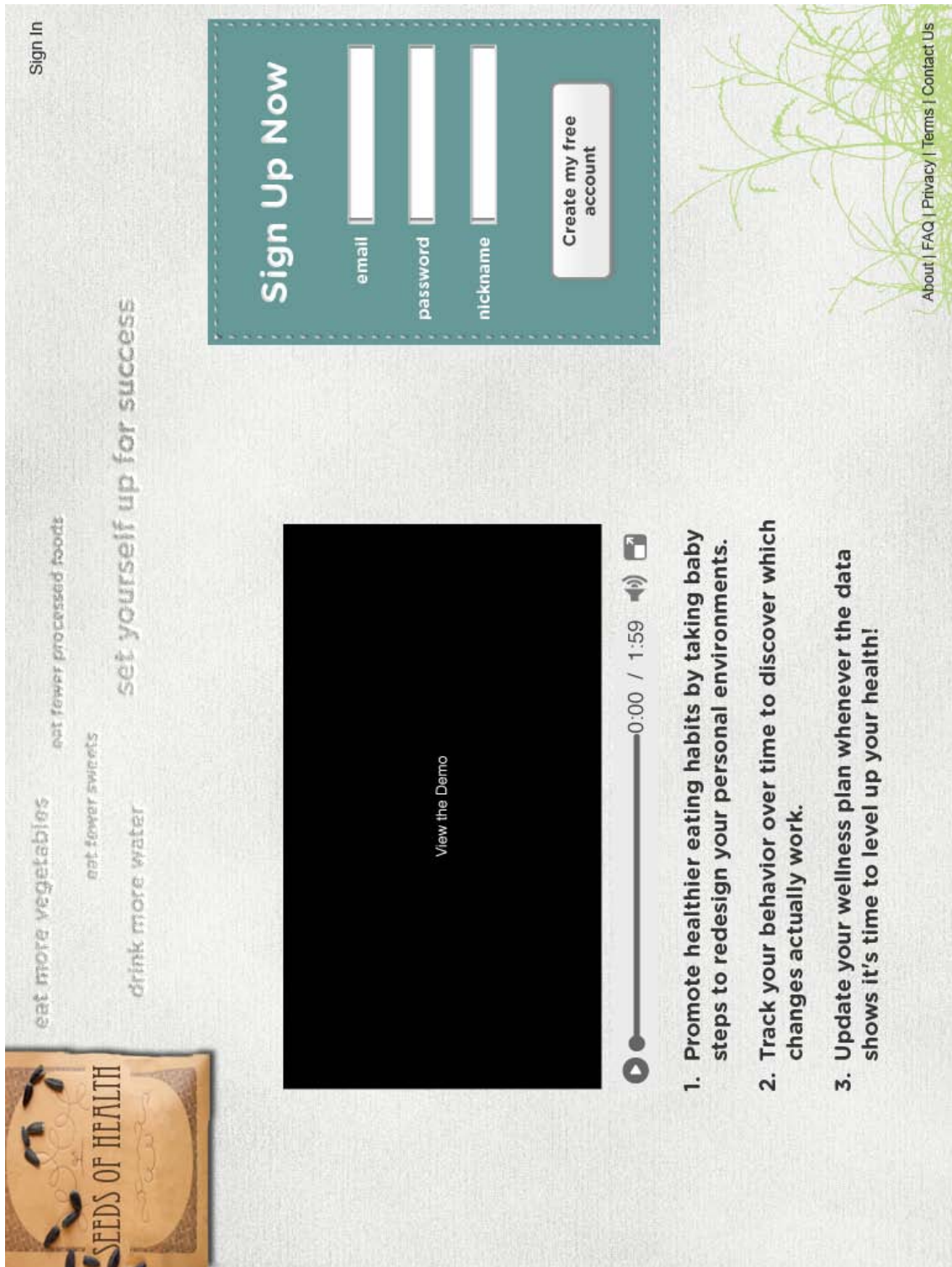


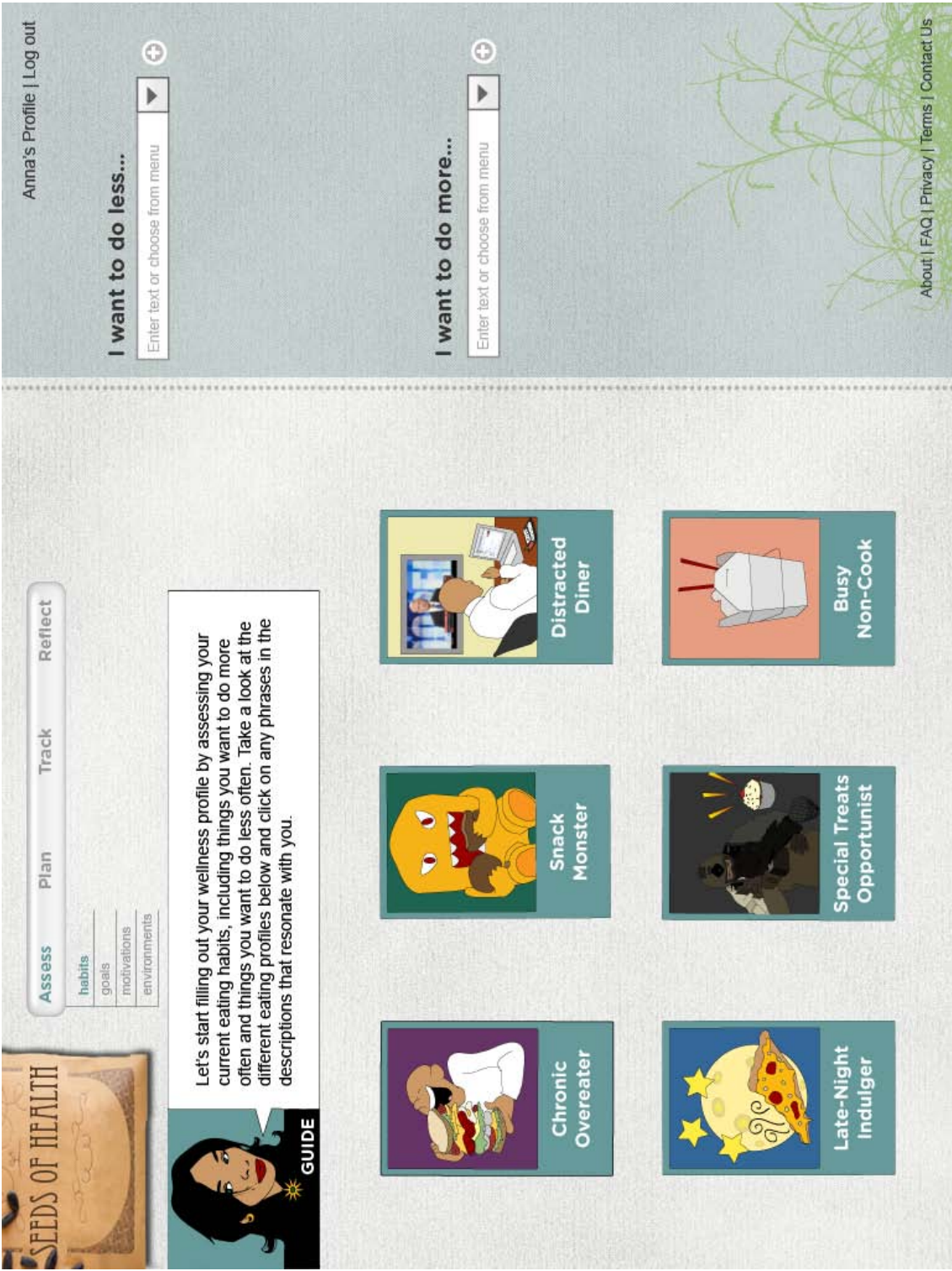


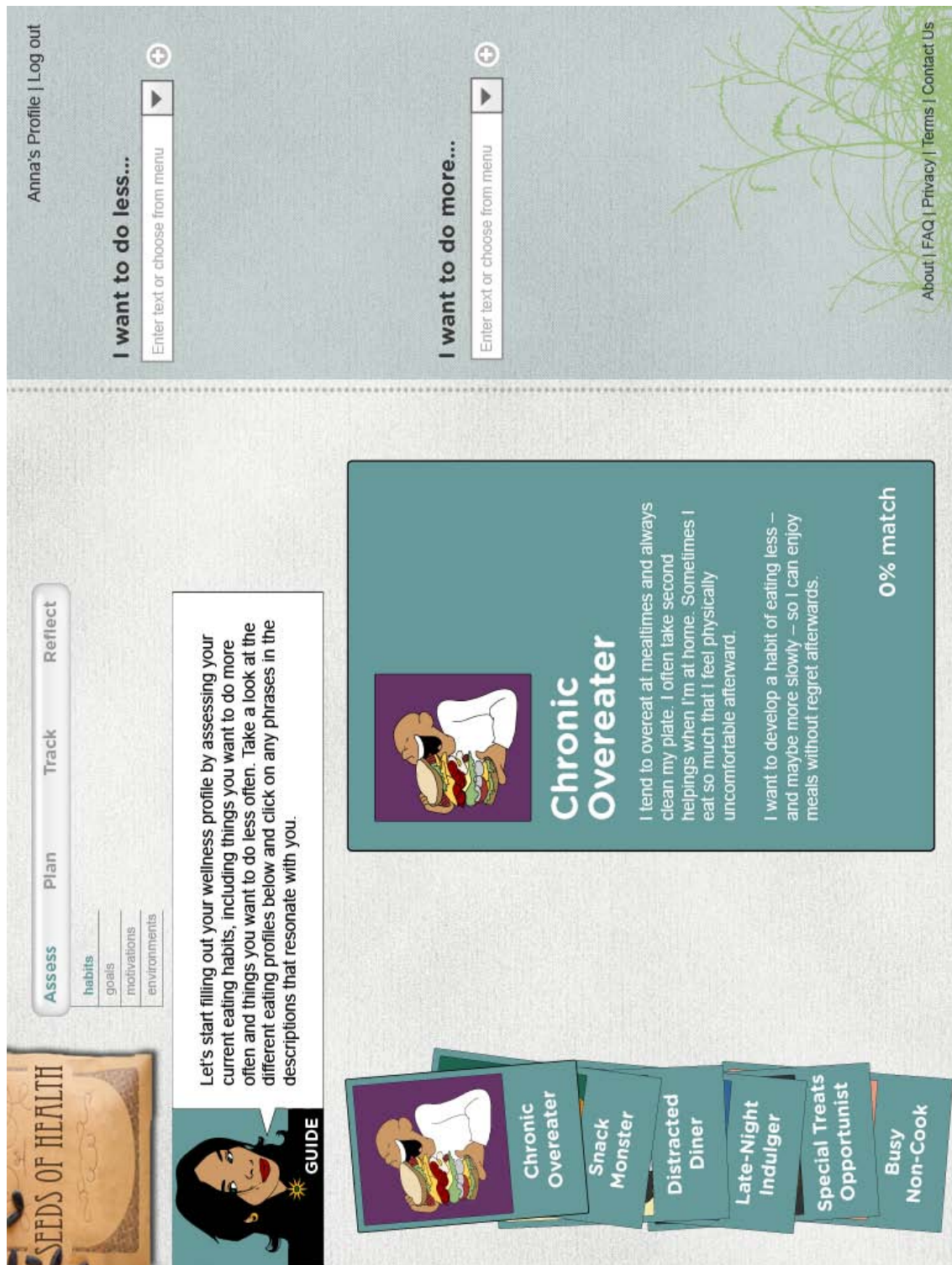


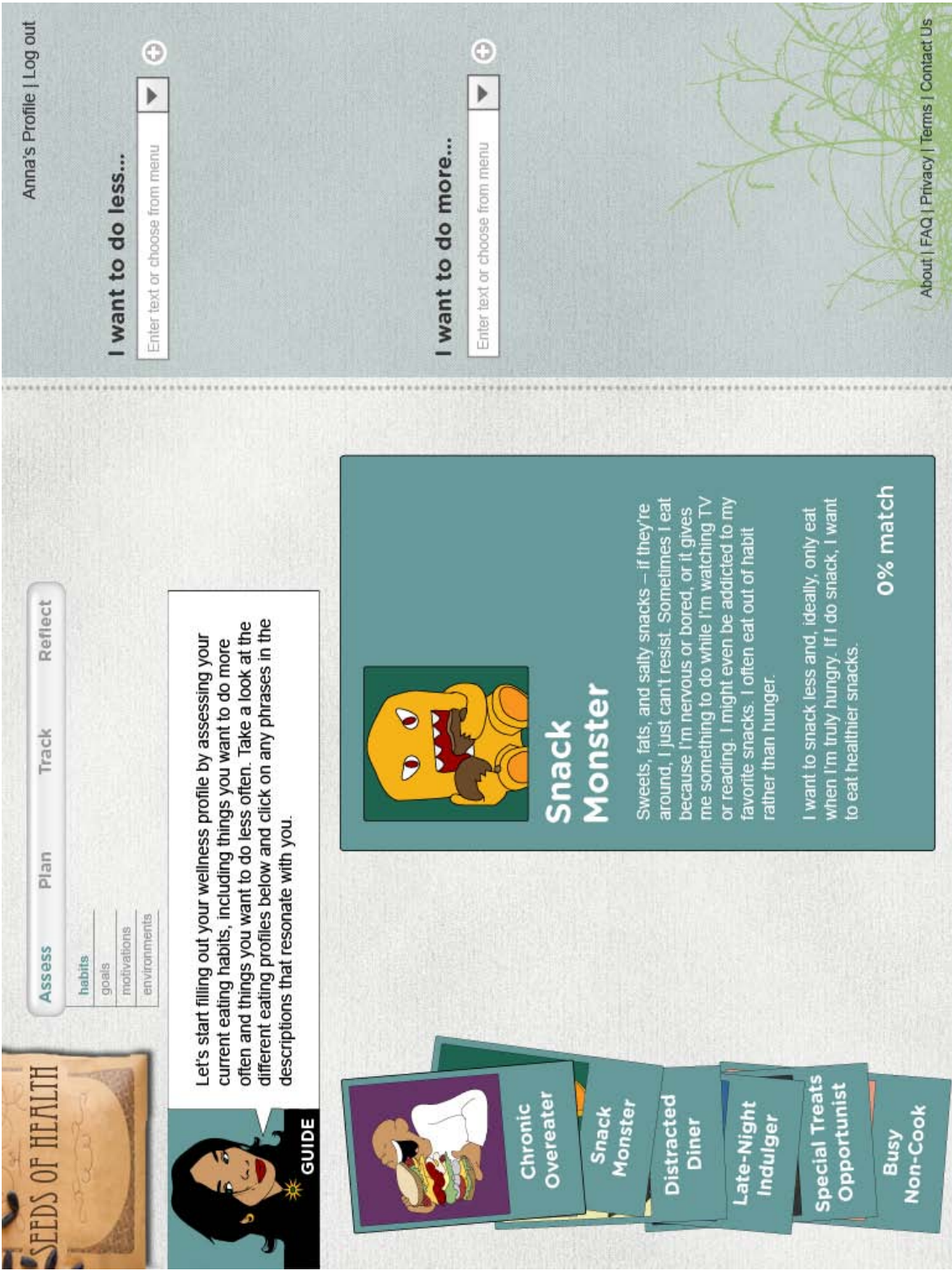


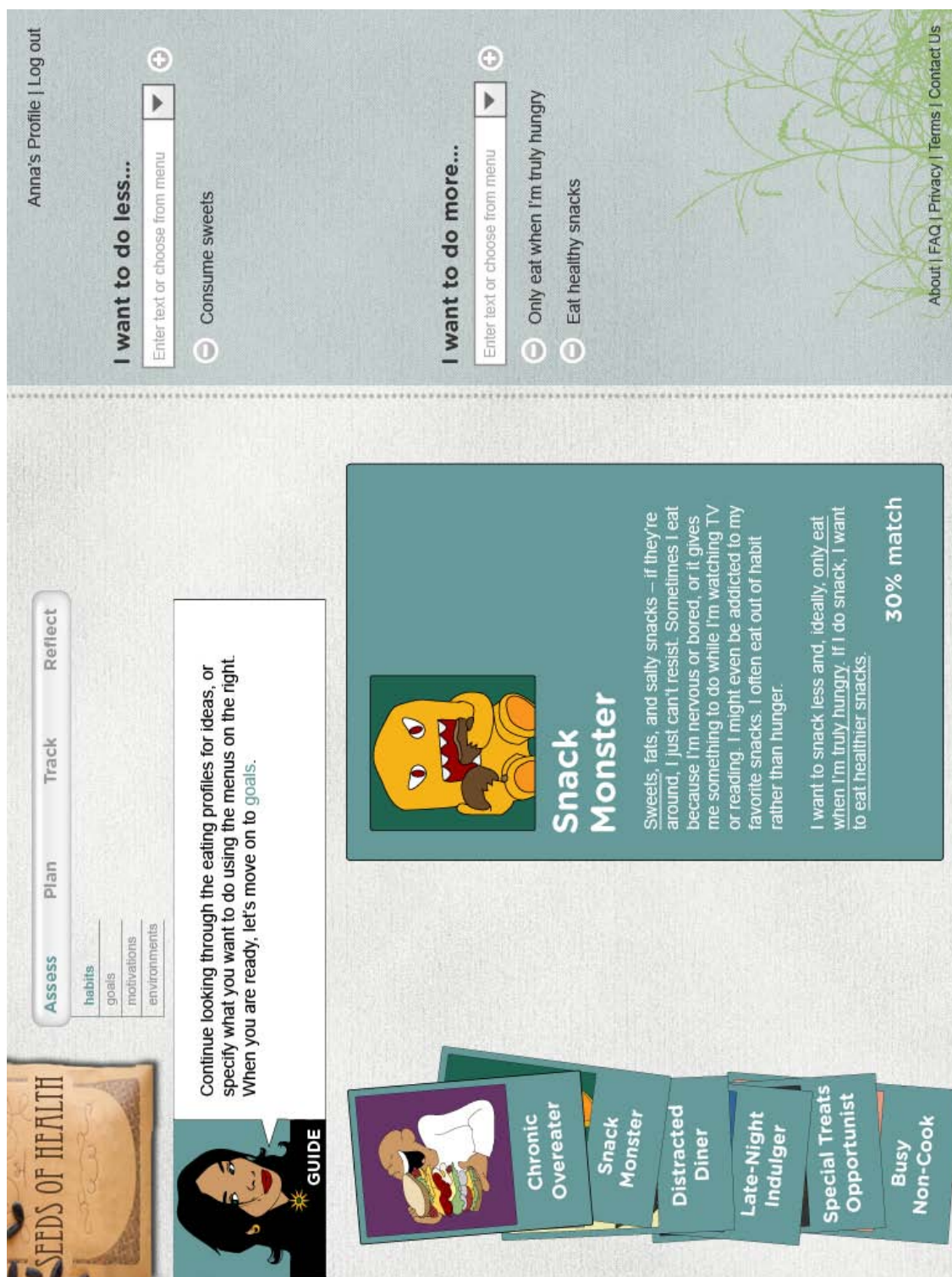
emotional experience	relationships	physical wellbeing	appearance	performance
 <p>I enjoy the taste of healthy foods</p>	 <p>I want to be a good role model for others</p>	 <p>I want to feel good physically and mentally</p>	 <p>I want to look good</p>	 <p>I want to have a competitive edge</p>
 <p>I want to avoid feelings of guilt</p>	 <p>I want to fit in with my peers</p>	 <p>I want to live to a healthy old age</p>	 <p>I want to fit into my clothes</p>	 <p>I want more energy</p>
 <p>I enjoy variety in life</p>	 <p>I want to avoid making others' health mistakes</p>	 <p>I want to prevent disease</p>	 <p>I want to control my weight</p>	 <p>I want to be active in my golden years</p>
 <p>I want to feel good about myself</p>	 <p>I want to be perceived as attractive</p>	 <p>I want to protect my overall health</p>	 <p>I want to have nice skin</p>	 <p>I want to be ready to face any challenge</p>

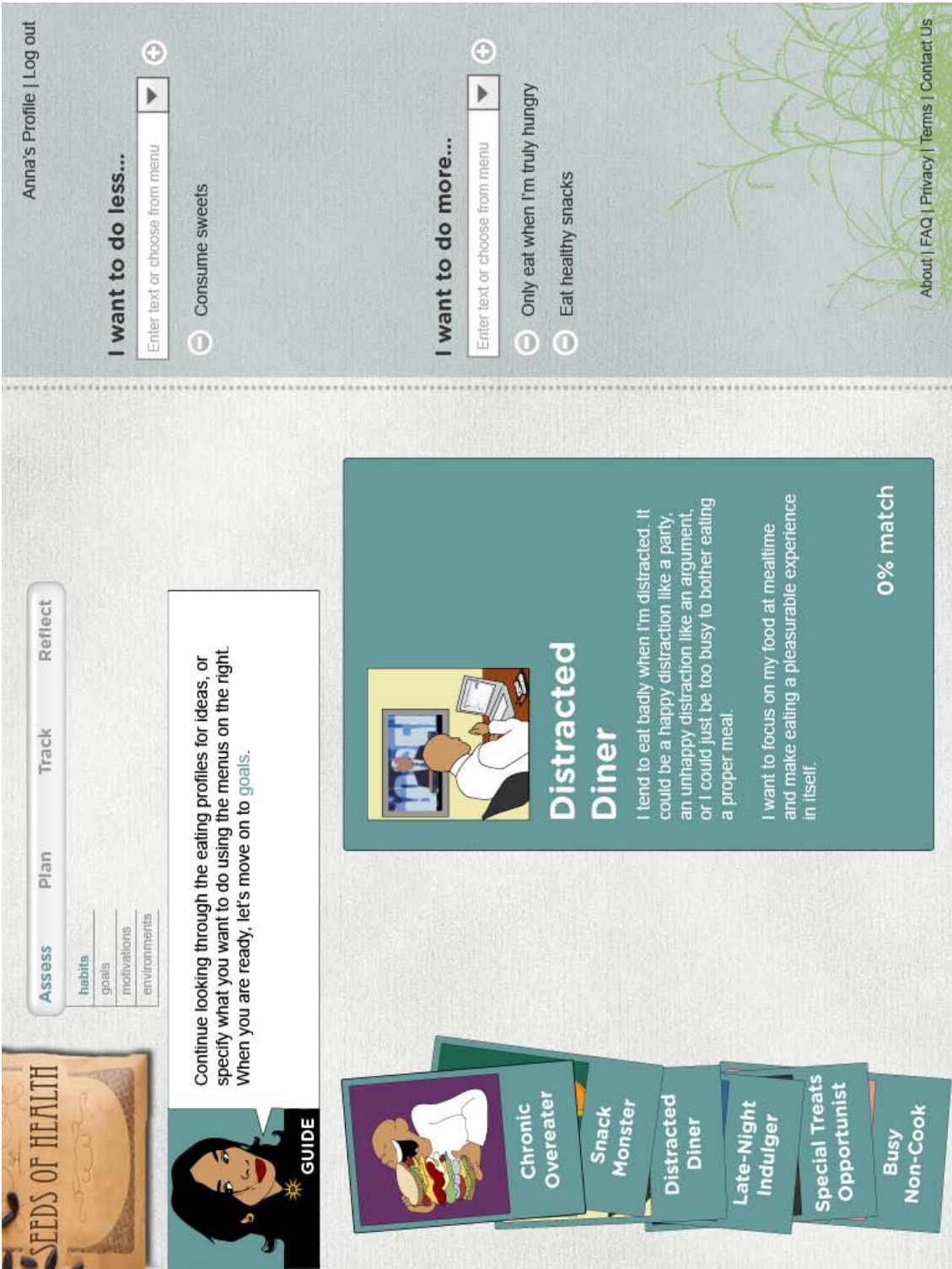


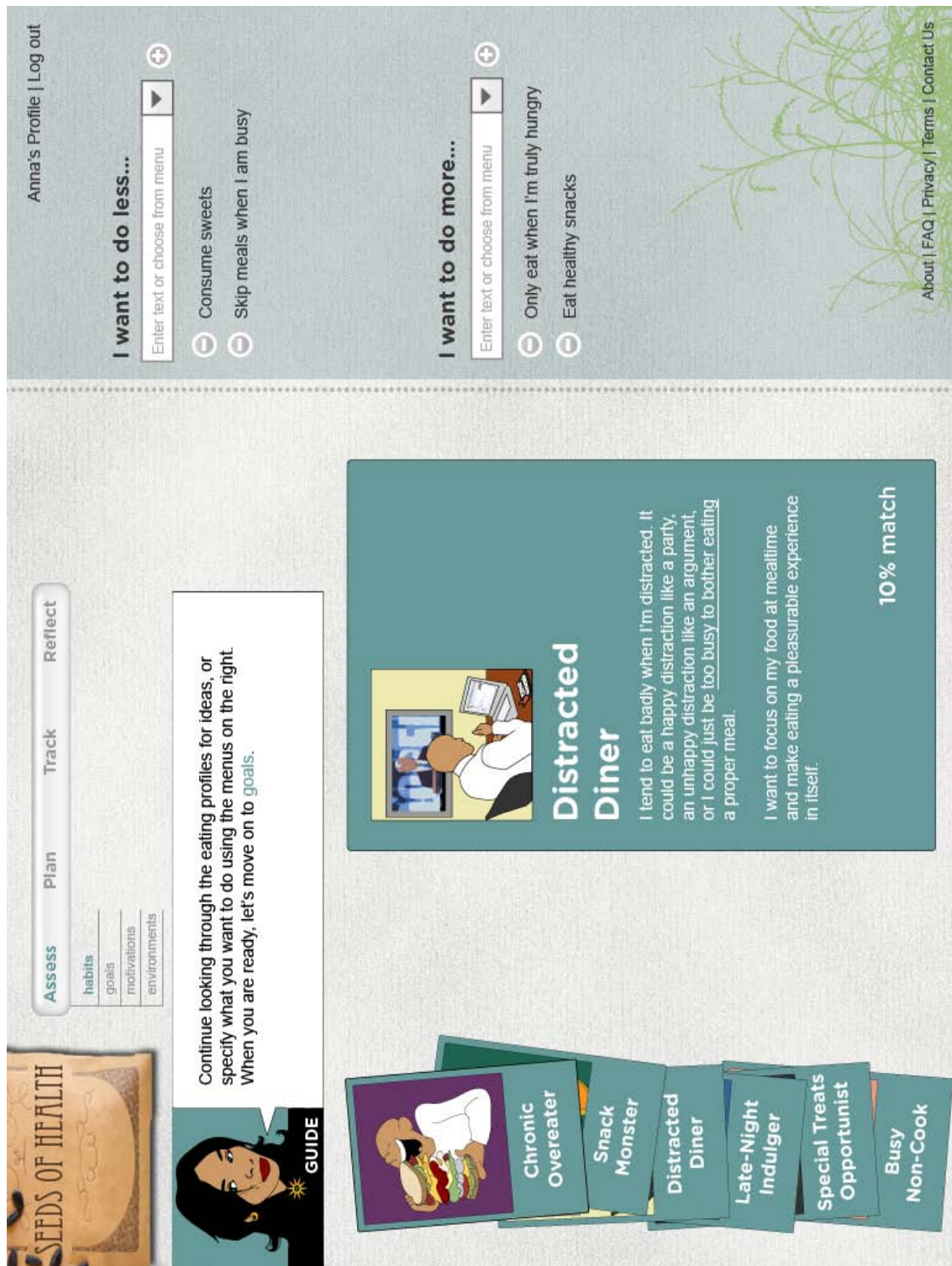


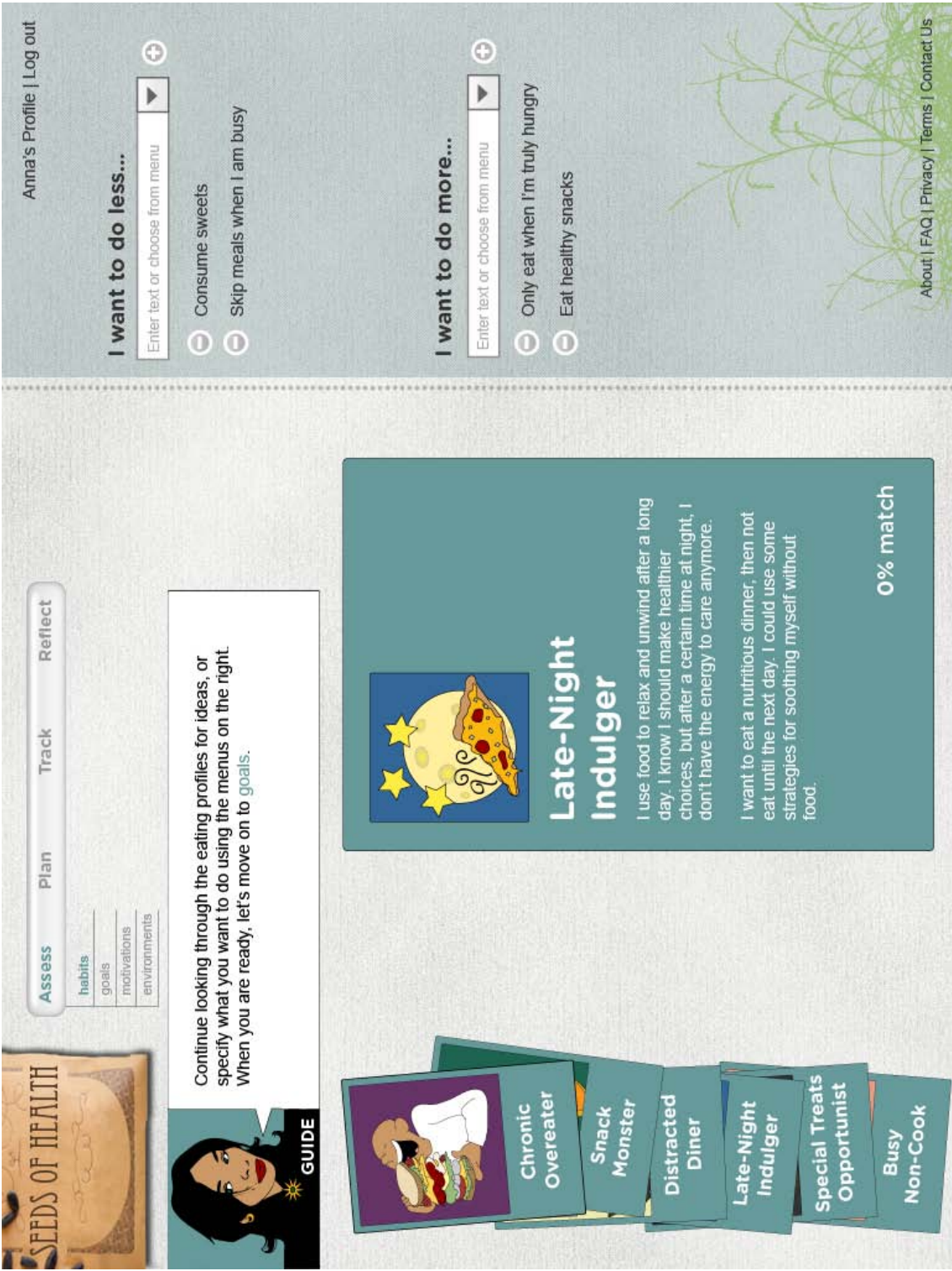


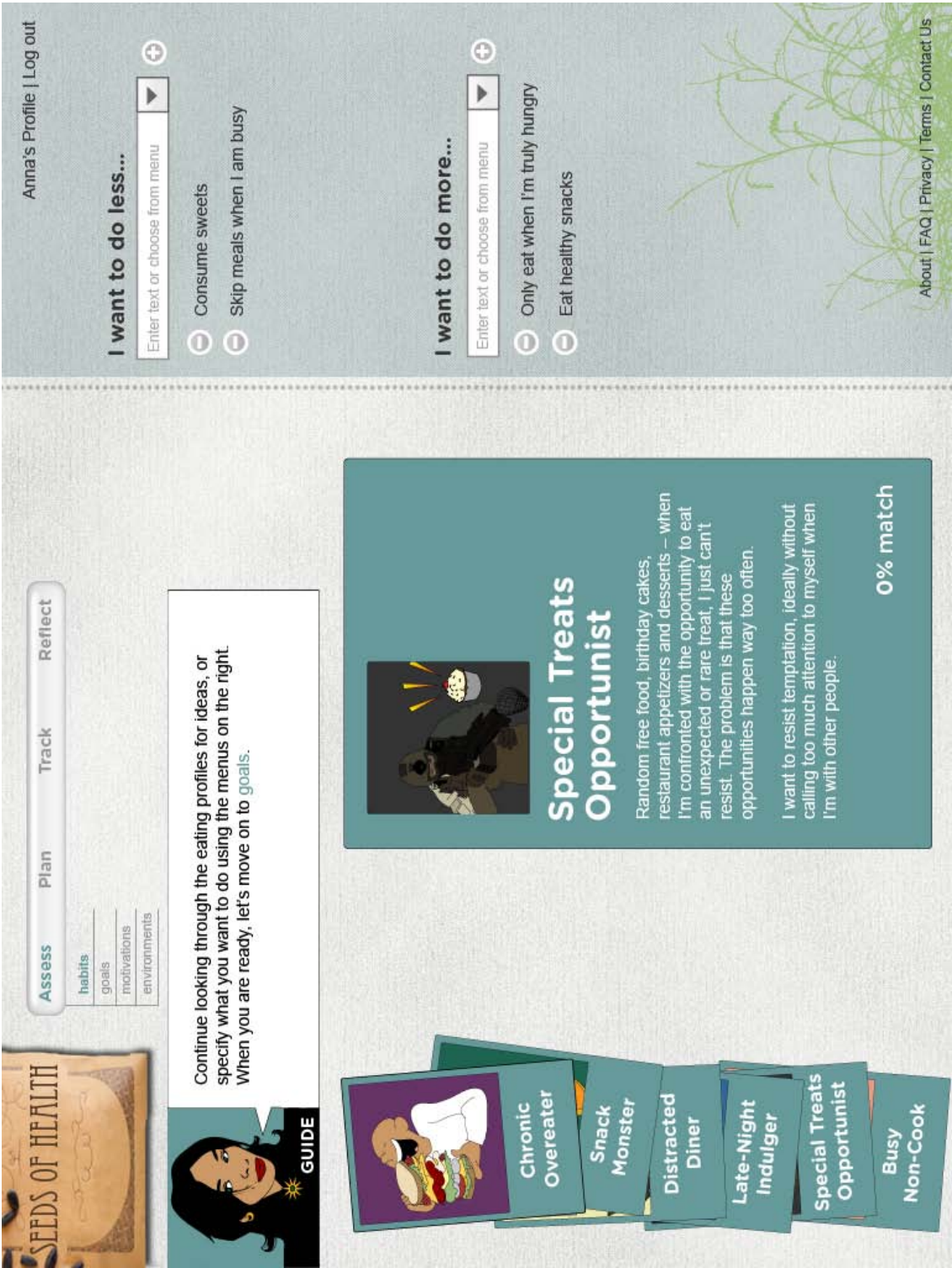
















SEEDS OF HEALTH

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AssessPlanTrackReflect

habits

goals

motivations

environments

To track your progress and celebrate milestones along the way, let's translate each of your current habits into a specific, measurable goal. Add details to a goal by clicking the edit button, then prioritize by dragging the most important goals to the top of the table.

GUIDE

– Eat sweets if they're around

– Skip meals if I am busy

– Eat vending machine snacks

– Eat take-out food

– Eat frozen meals

+ Only eat when I am truly hungry

+ Eat healthy snacks

+ Cook healthy meals

+ Stock healthy convenient foods

Behavior	Current Frequency	Desired Frequency	Challenges	Notes

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SEEDS OF HEALTH

Assess

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Track

Reflect

habits

goals

motivations

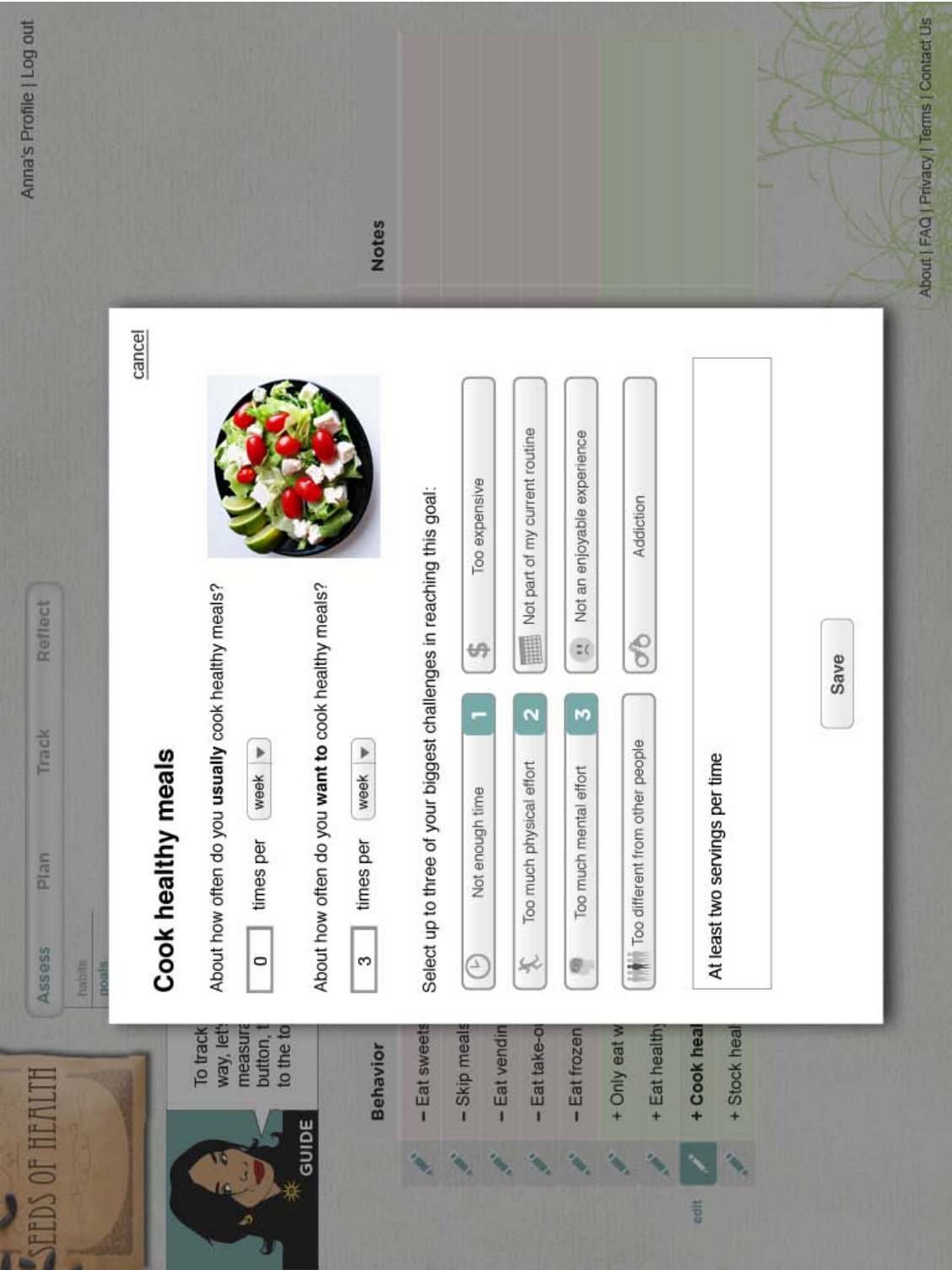
environments

Anna's Profile | Log out

To track your progress and celebrate milestones along the way, let's translate each of your current habits into a specific, measurable goal. Add details to a goal by clicking the edit button, then prioritize by dragging the most important goals to the top of the table.

Behavior	Current Frequency	Desired Frequency	Challenges	Notes
- Eat sweets if they're around				
- Skip meals if I am busy				
- Eat vending machine snacks				
- Eat take-out food				
- Eat frozen meals				
+ Only eat when I am truly hungry				
+ Eat healthy snacks				
+ Cook healthy meals				
+ Stock healthy convenient foods				

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Stock photo from <http://www.sxc.hu/>

SEEDS OF HEALTH

habitats

goals

motivations

environments


Assess

Plan

Track












Reflect

Anna's Profile | Log out

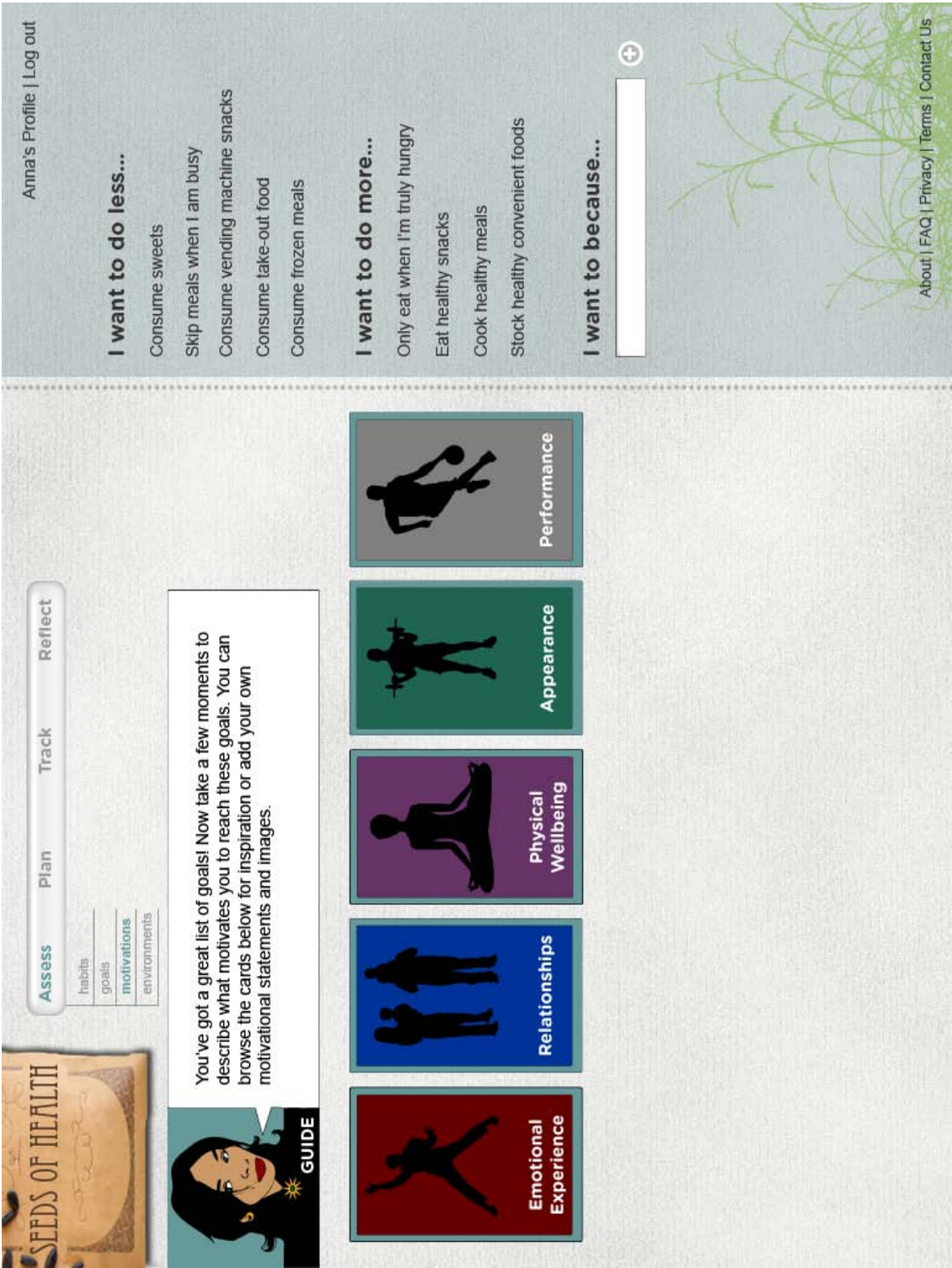


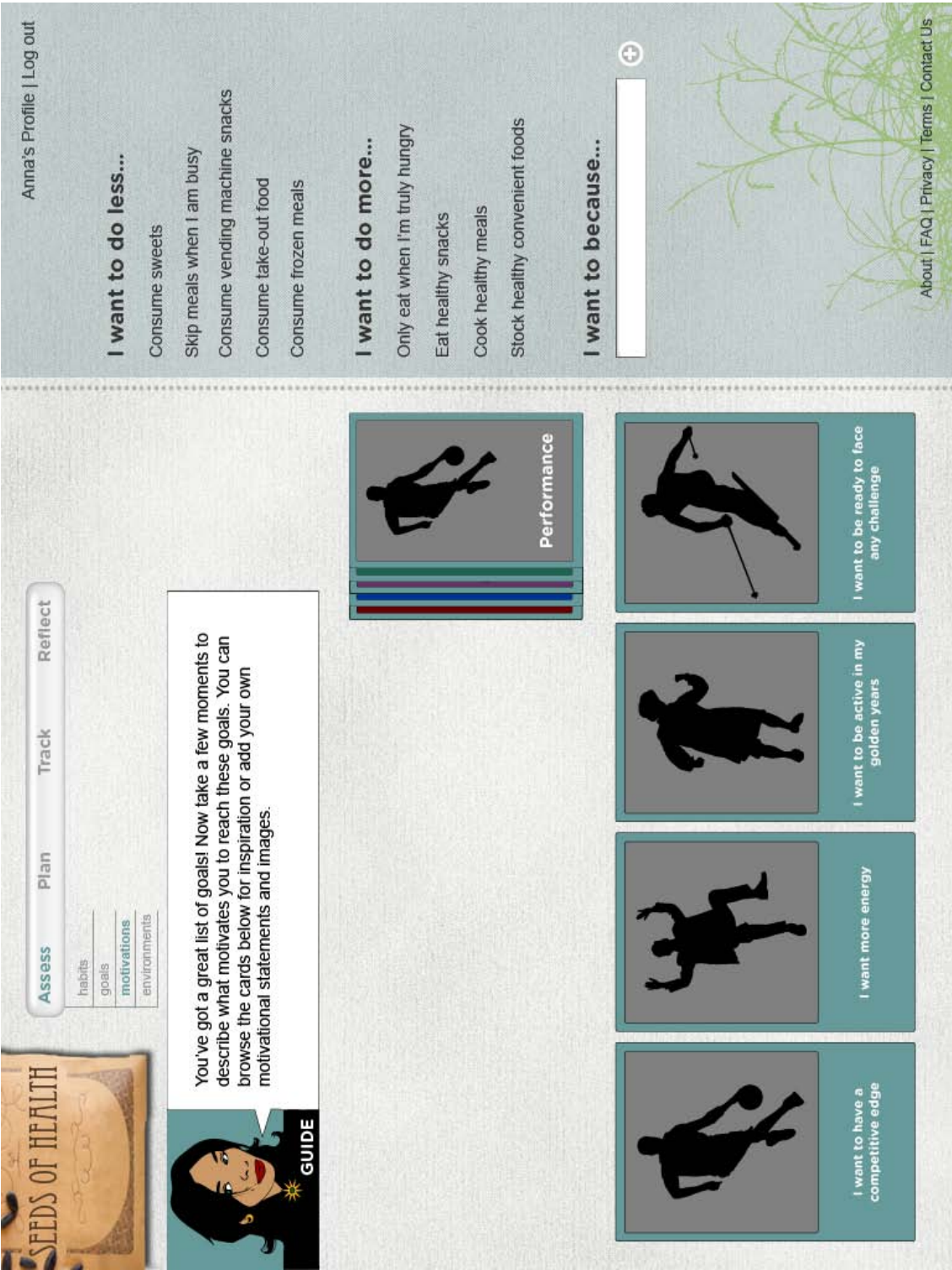
GUIDE

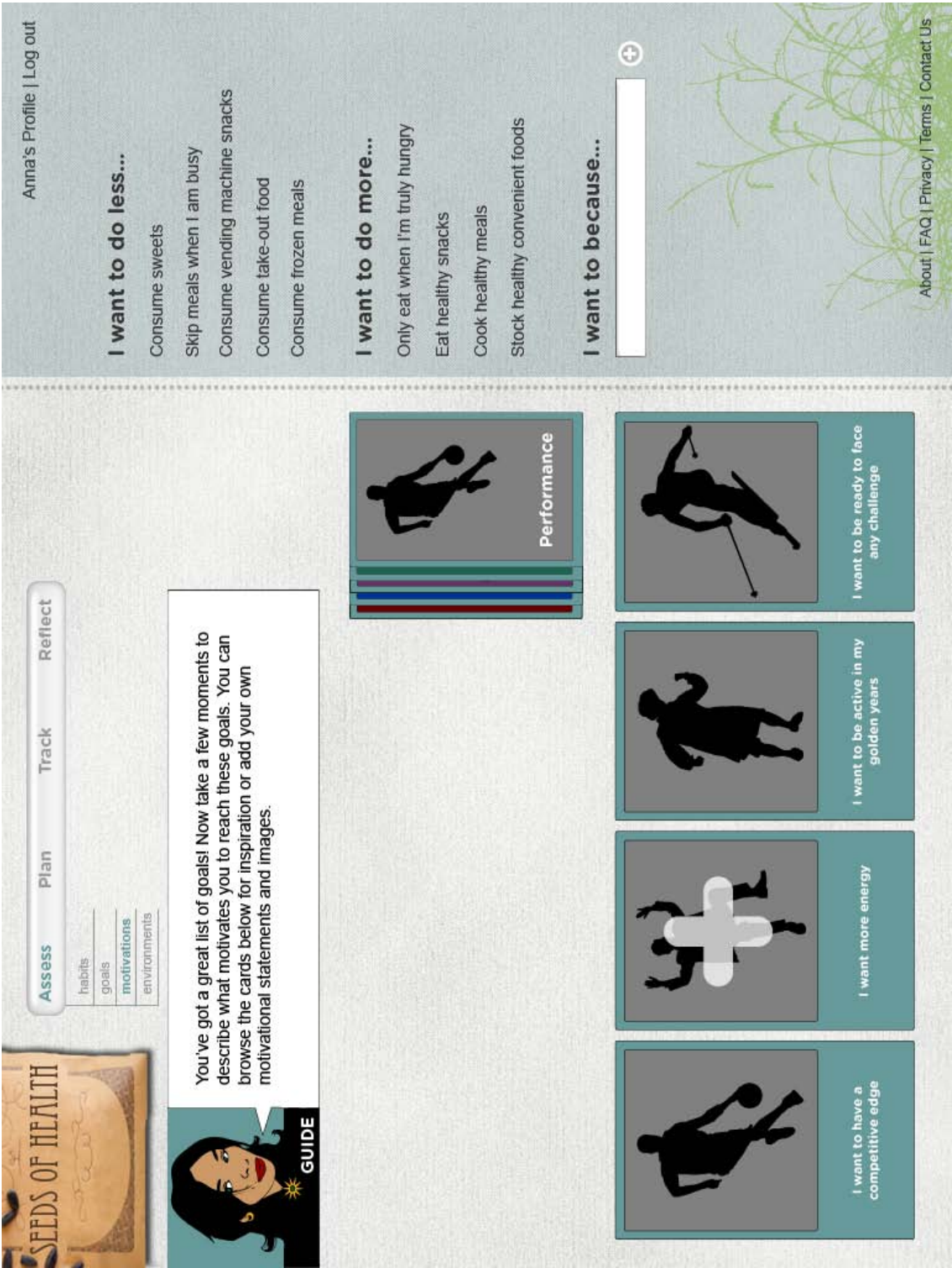
You can edit your habits and goals at any time. When you are ready, let's move on to motivations.

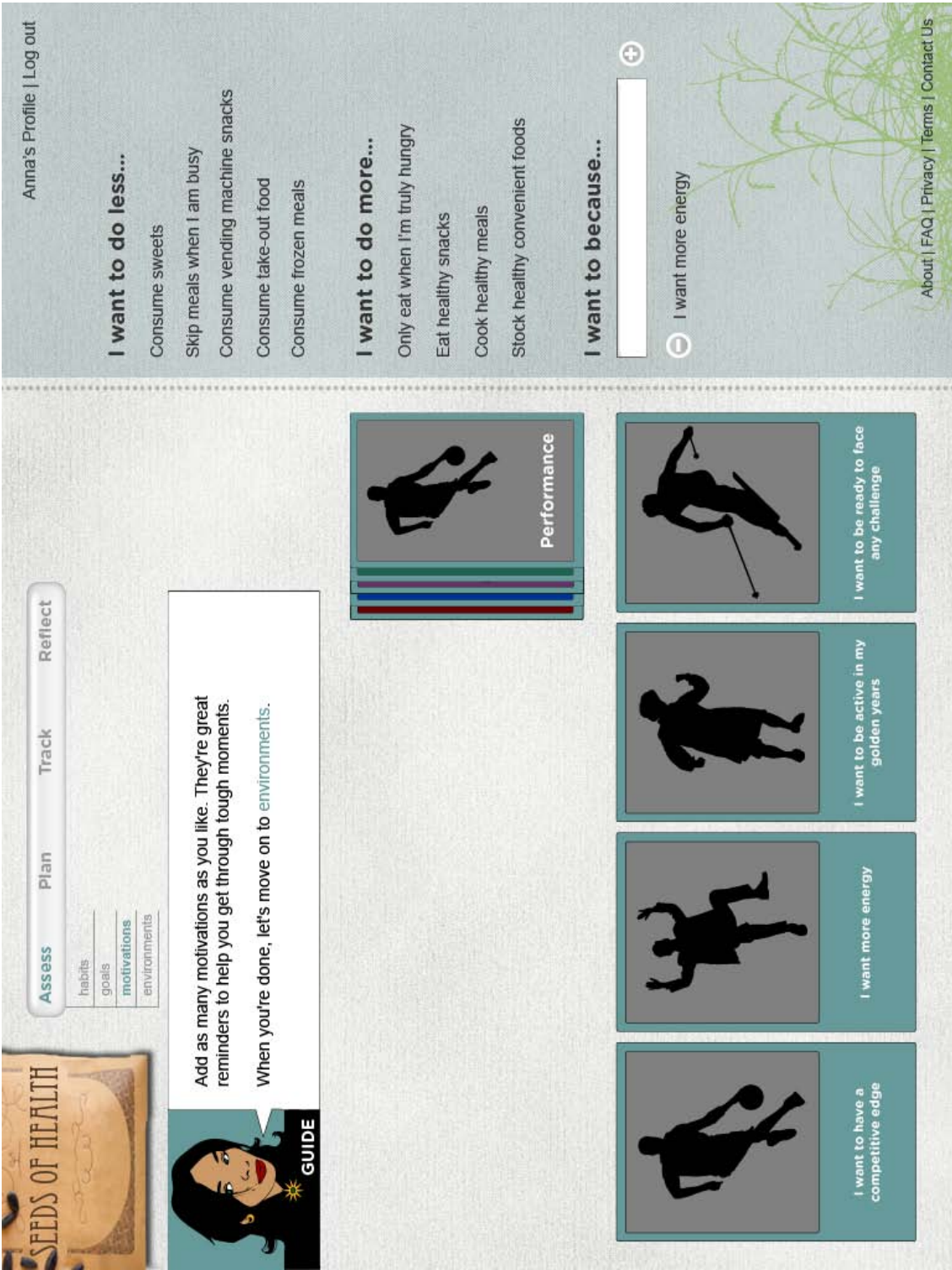
Behavior	Current Frequency	Desired Frequency	Challenges	Notes
 - Eat sweets if they're around				
 - Skip meals if I am busy				
 - Eat vending machine snacks				
 - Eat take-out food				
 - Eat frozen meals				
 + Only eat when I am truly hungry				
 + Eat healthy snacks				
 + Cook healthy meals	0 times per week	3 times per week	 	At least two servings per time
 + Stock healthy convenient foods				

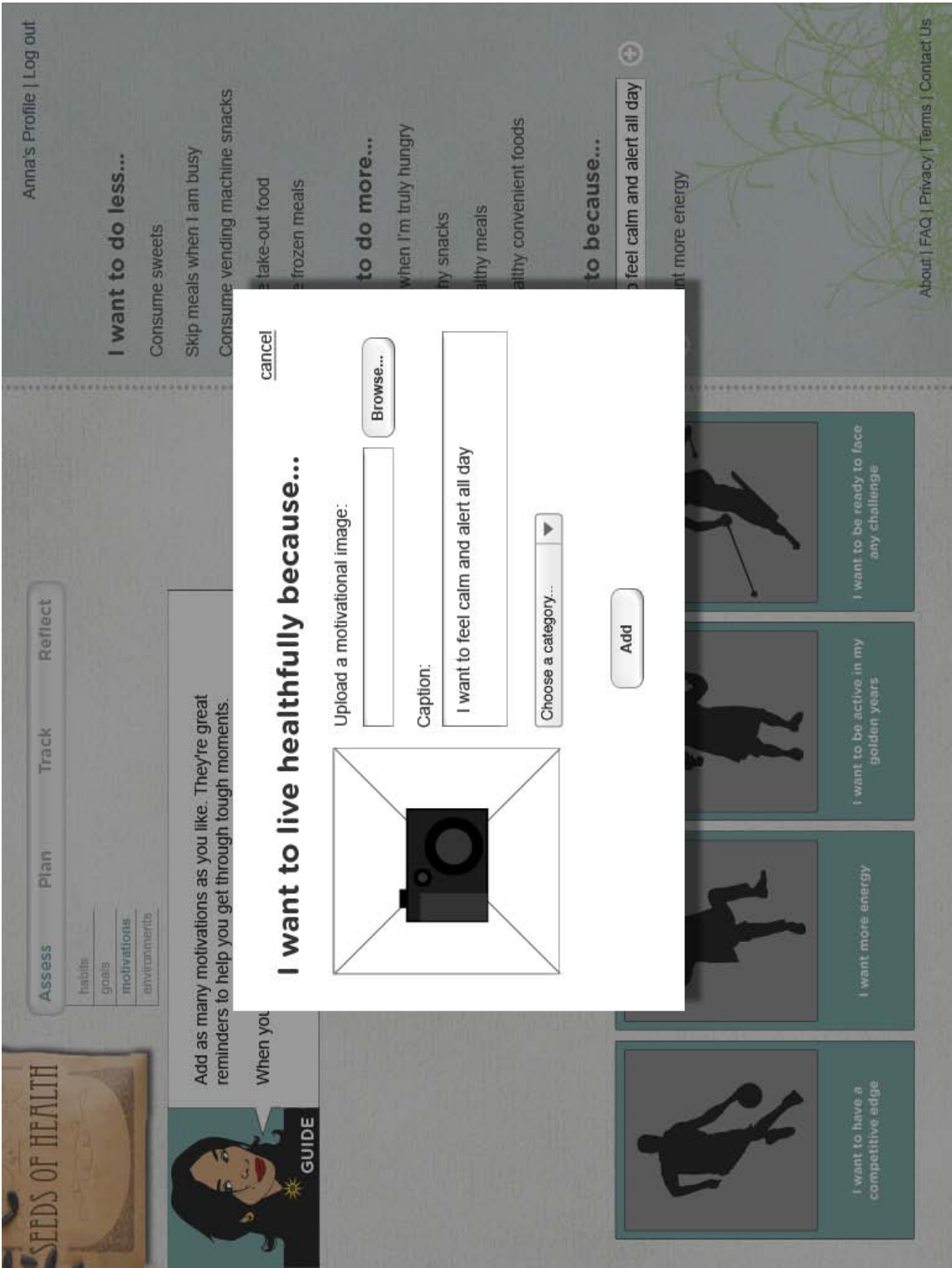
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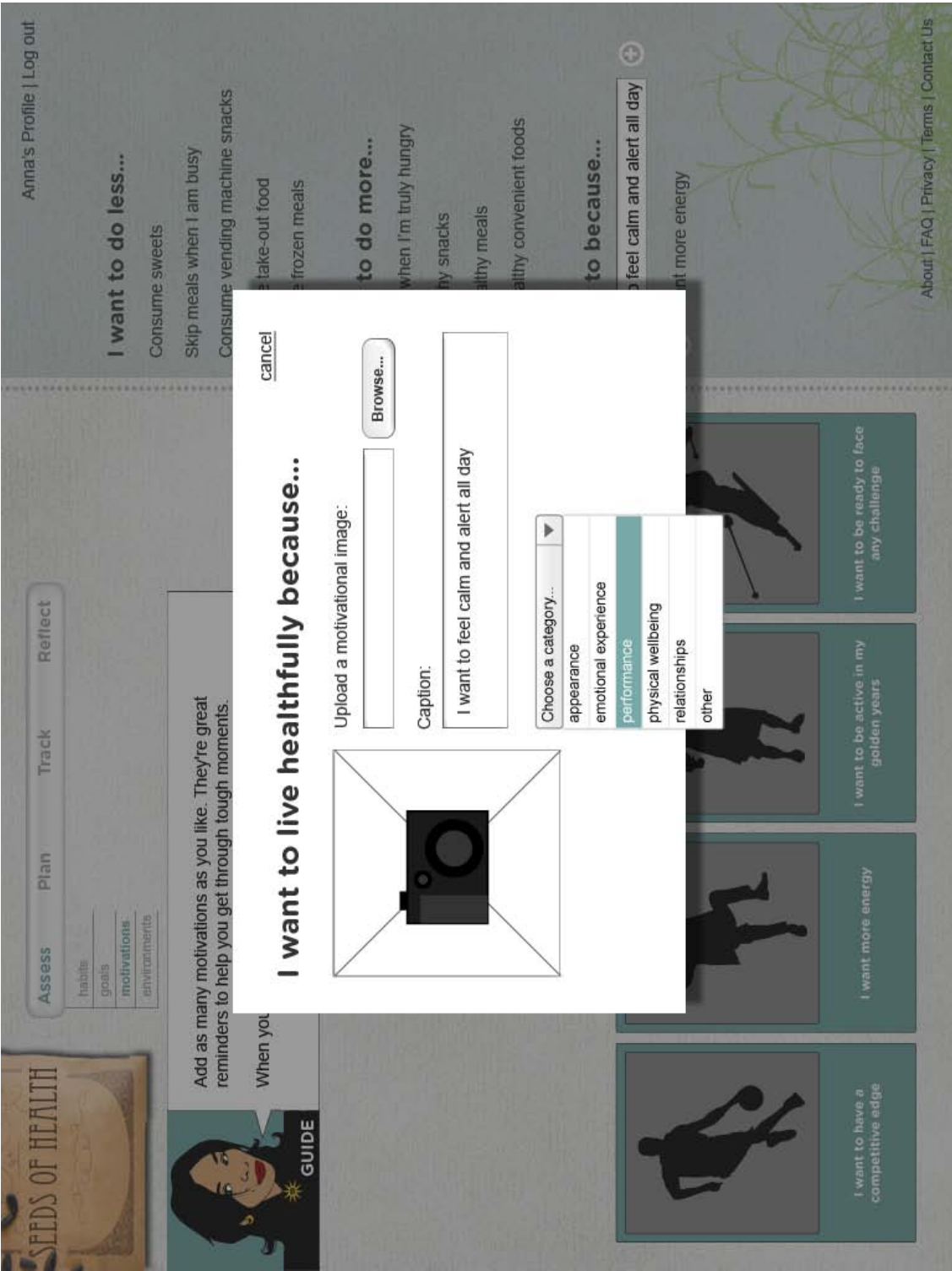


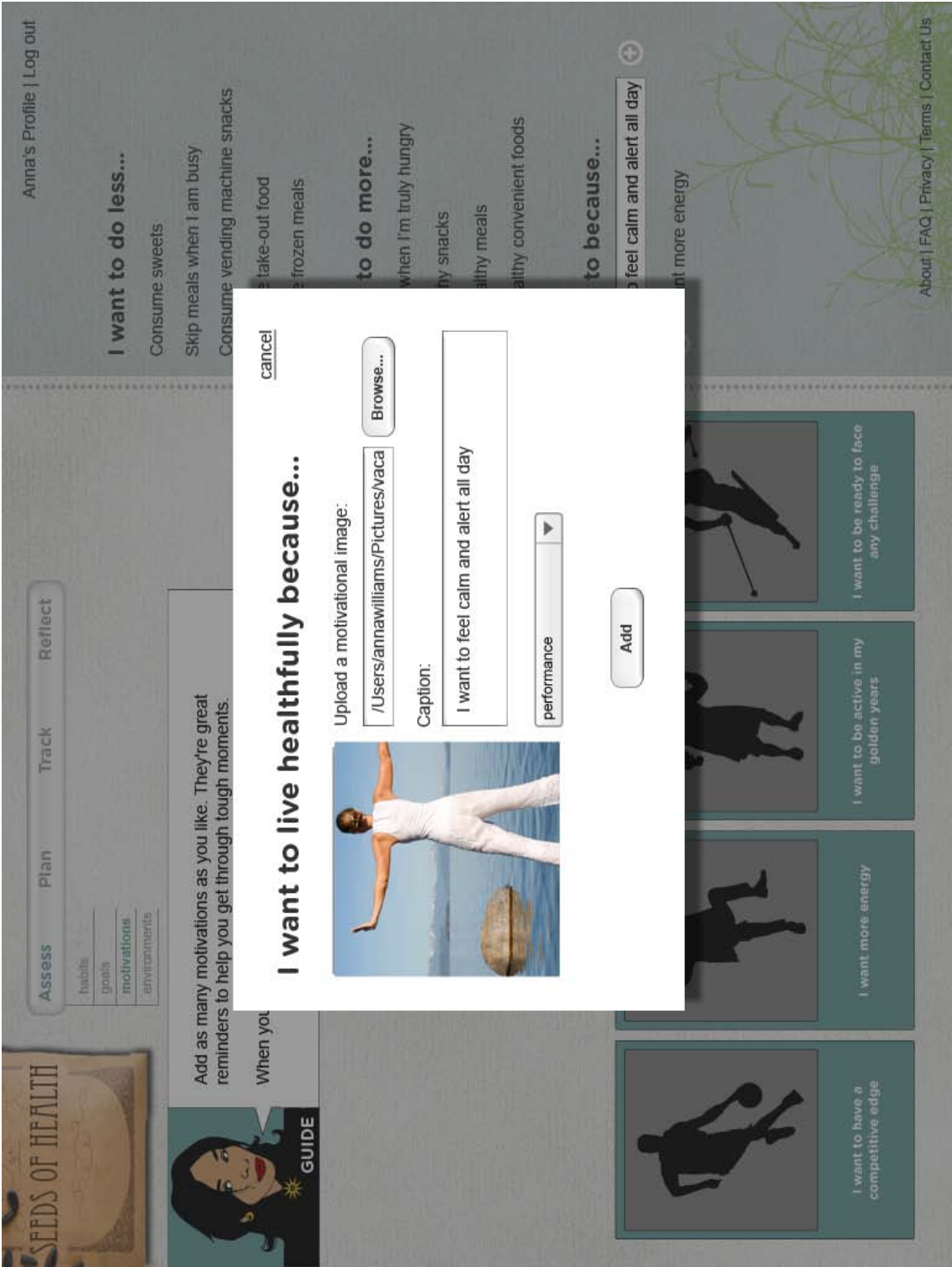




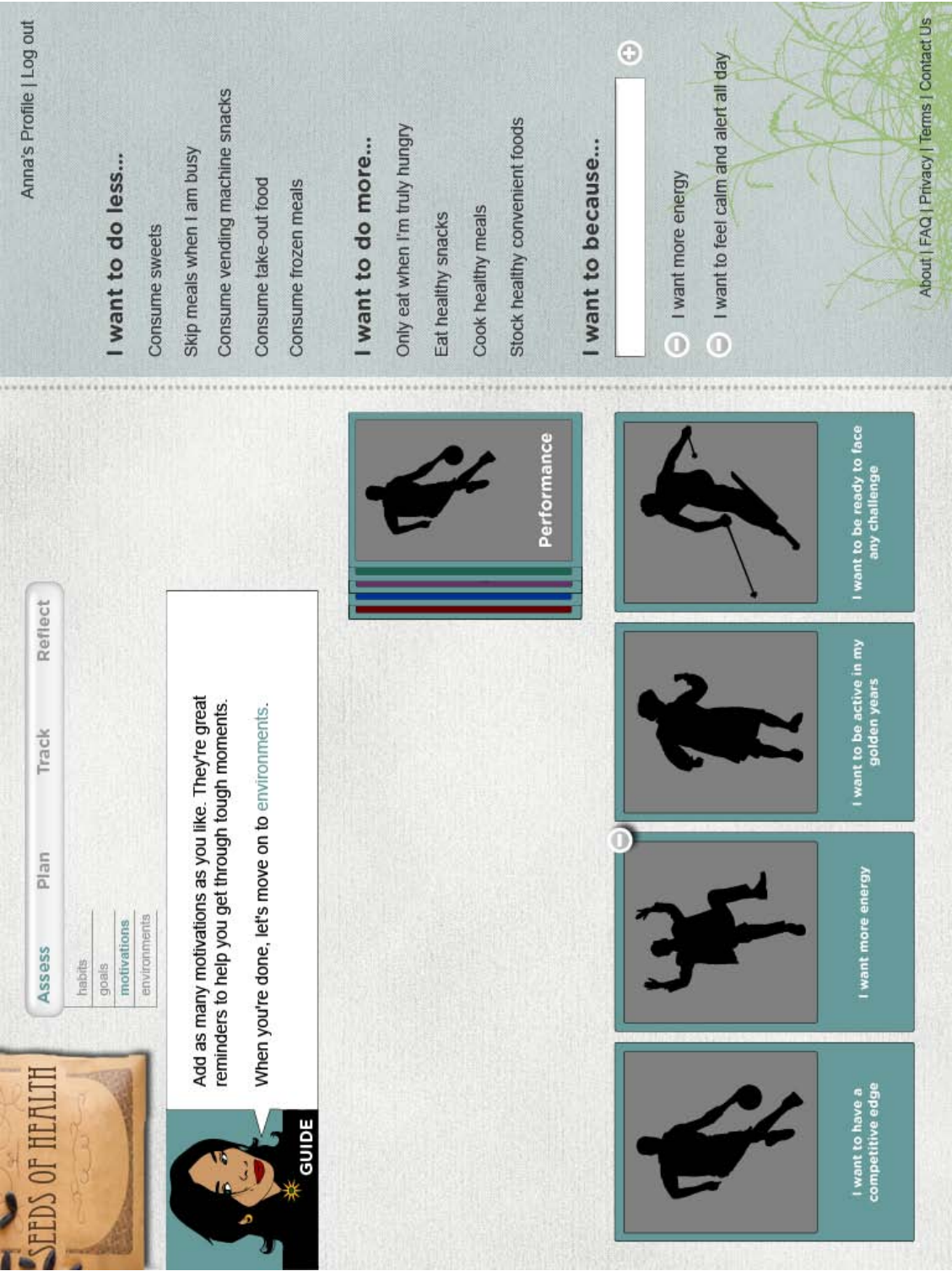


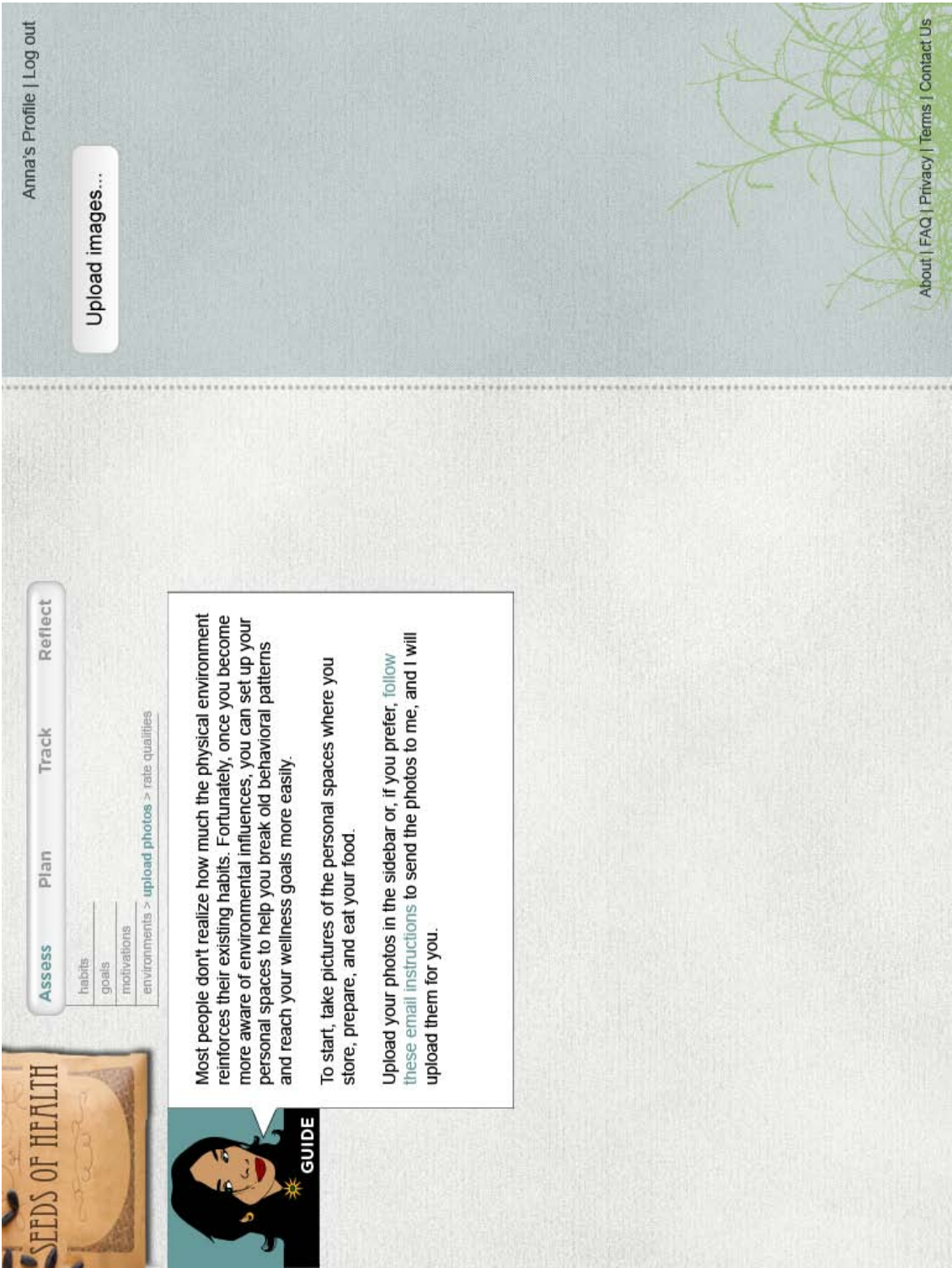


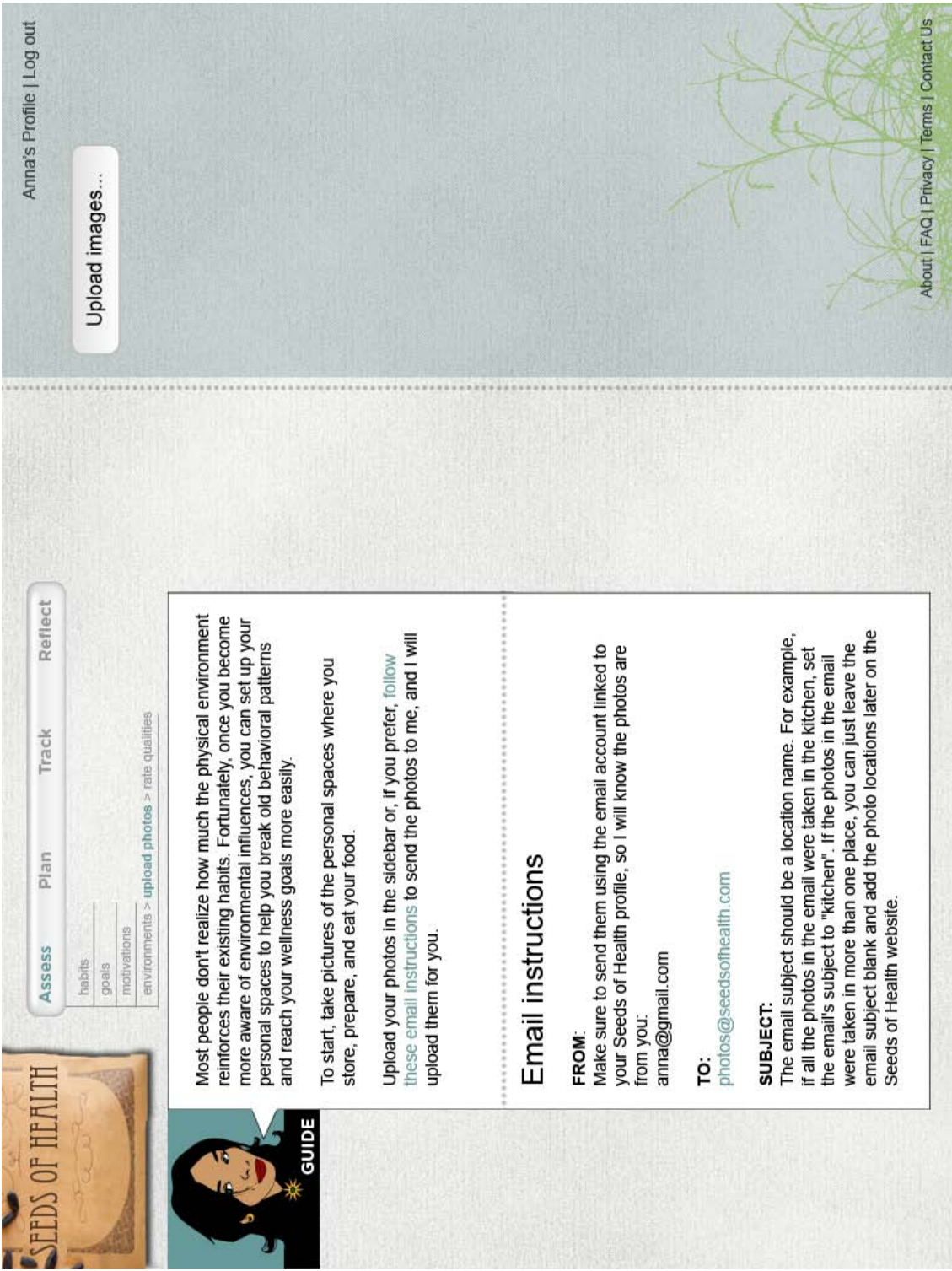


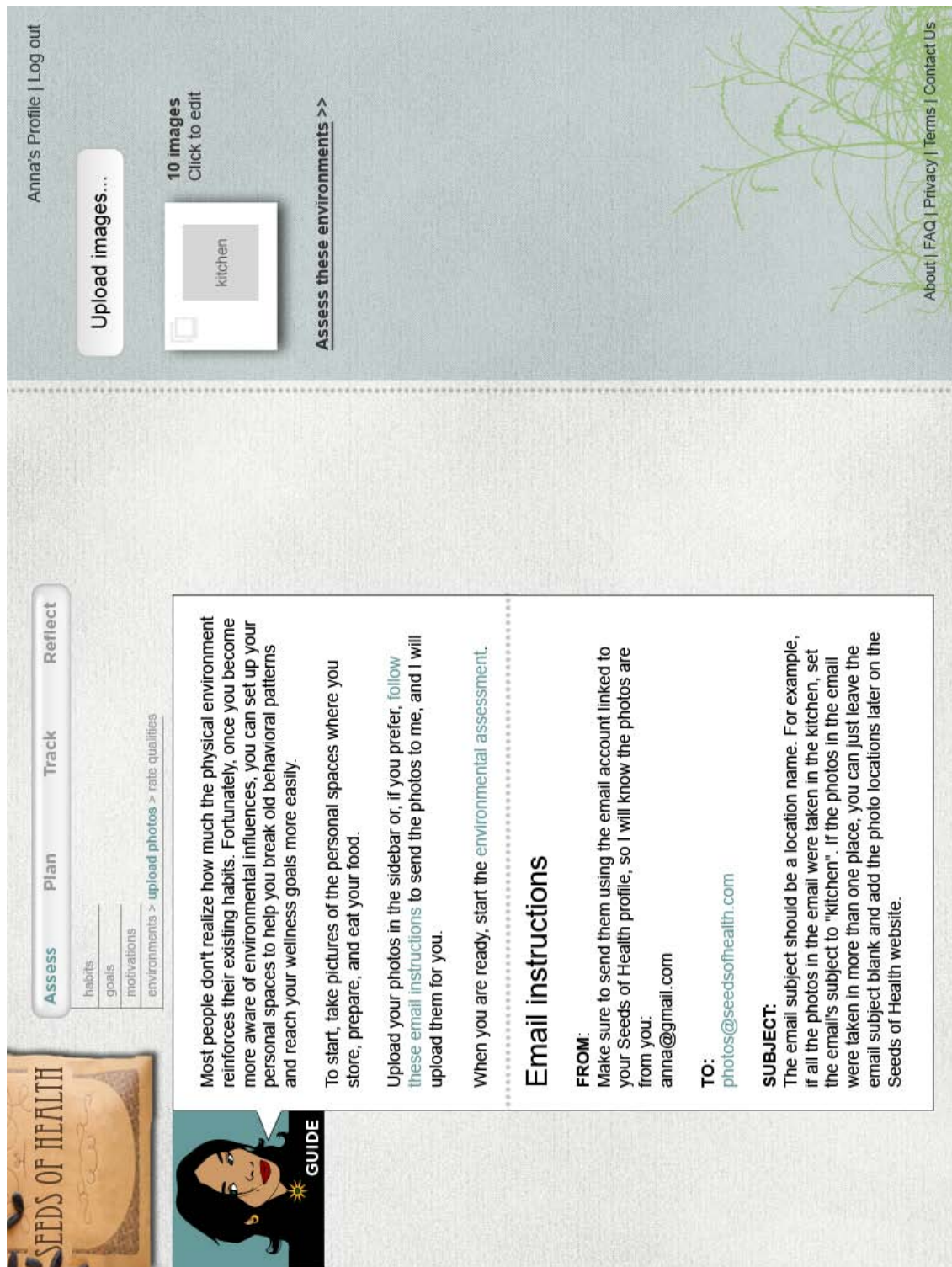


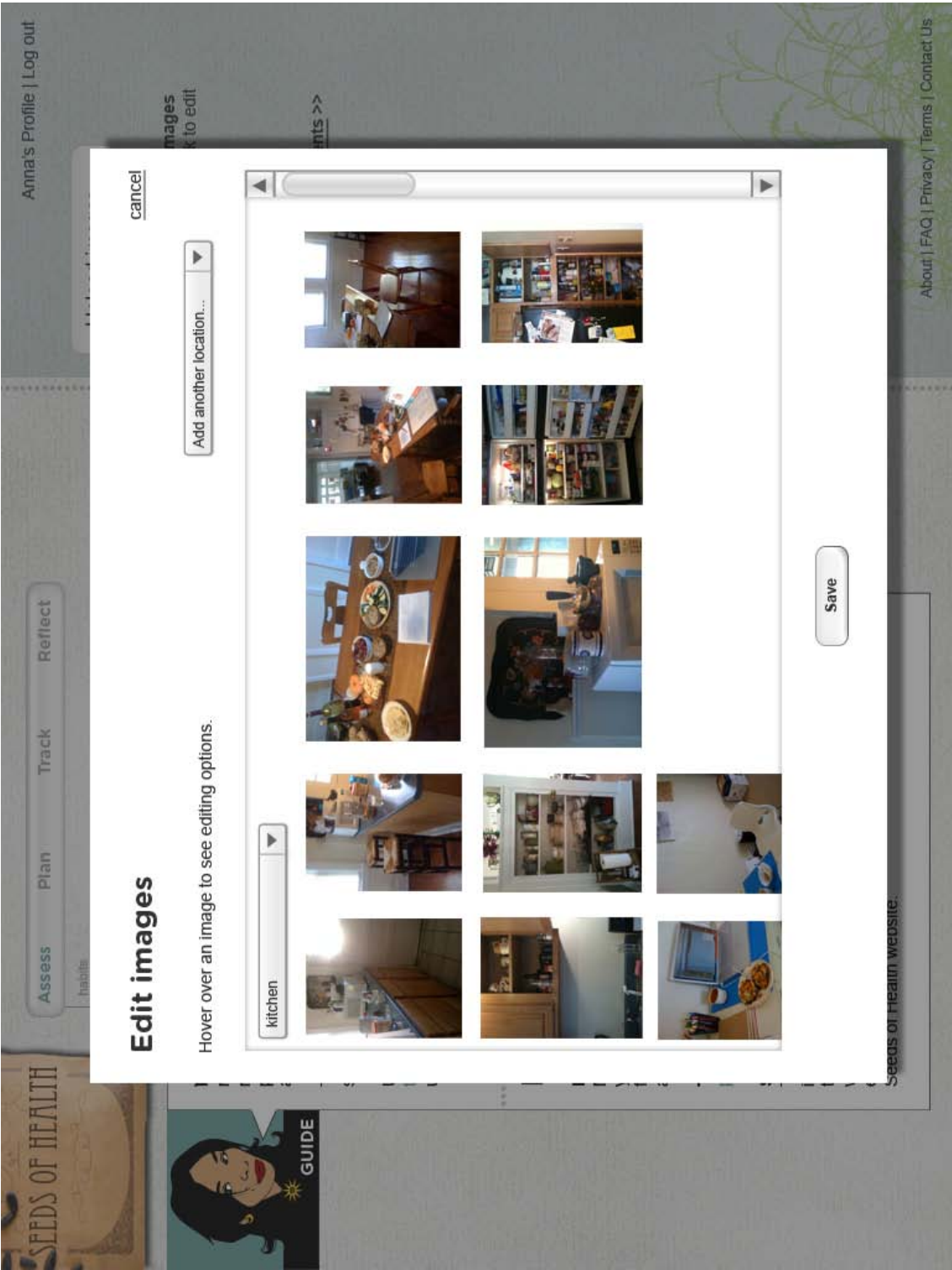
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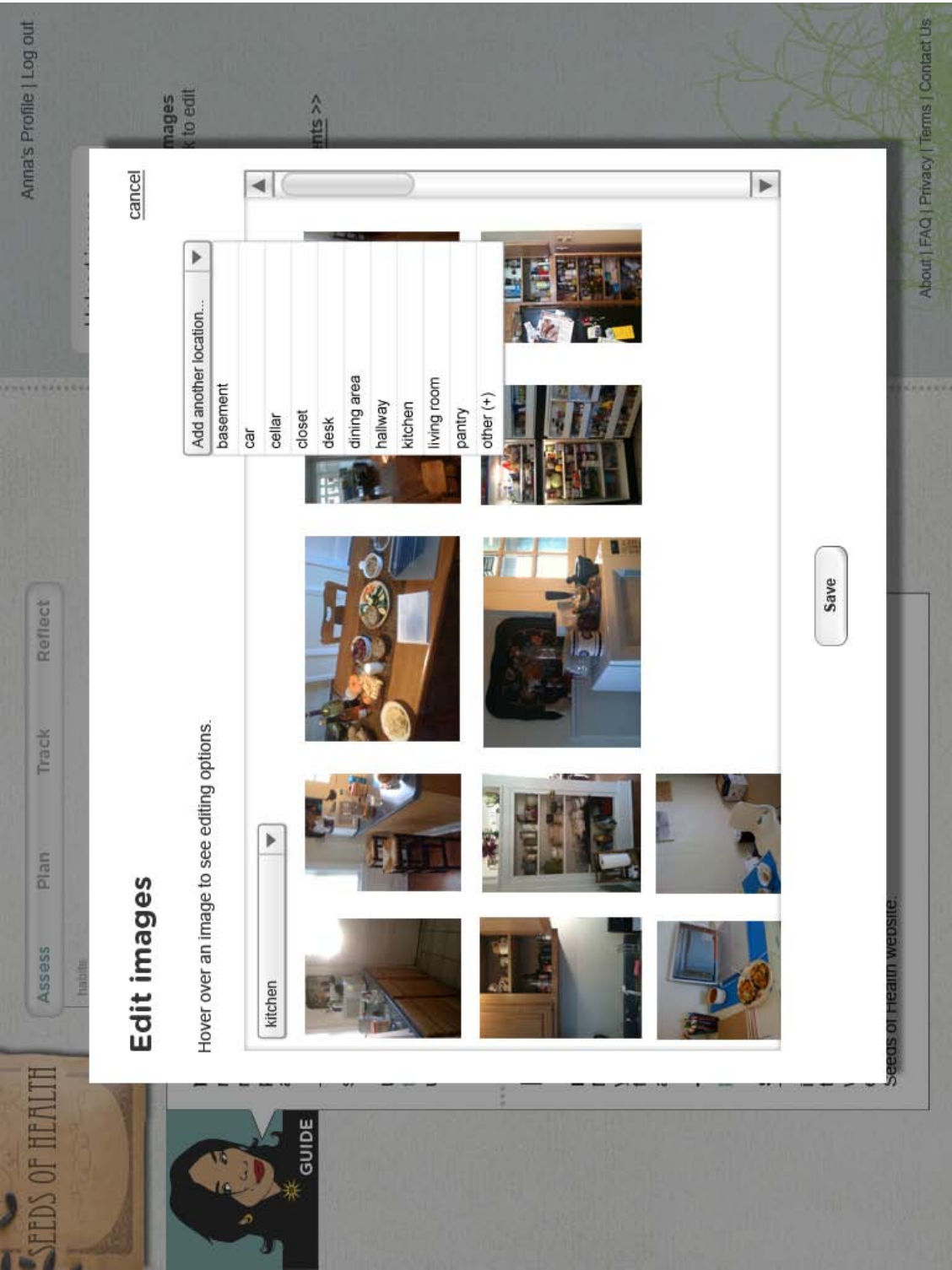


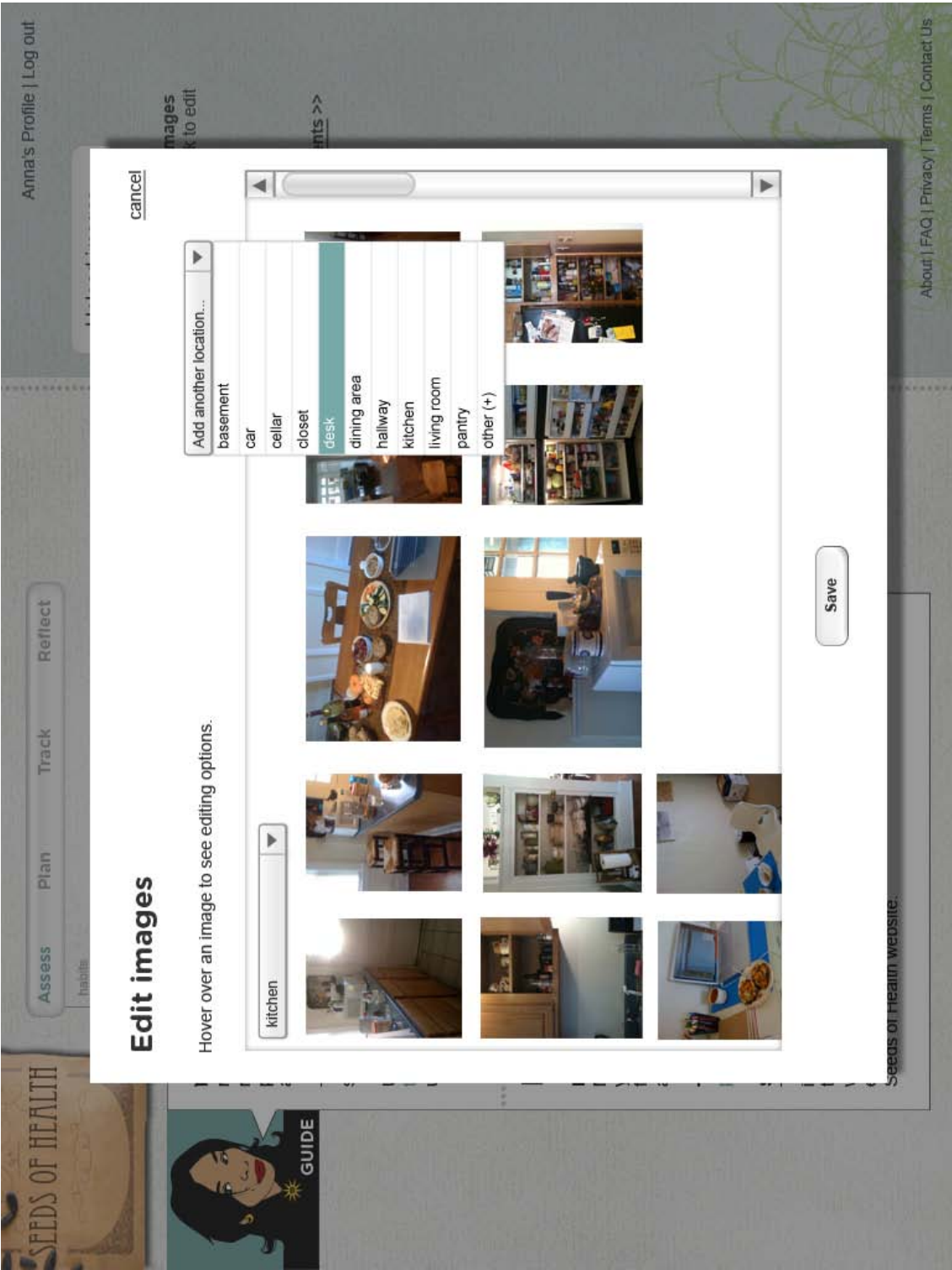


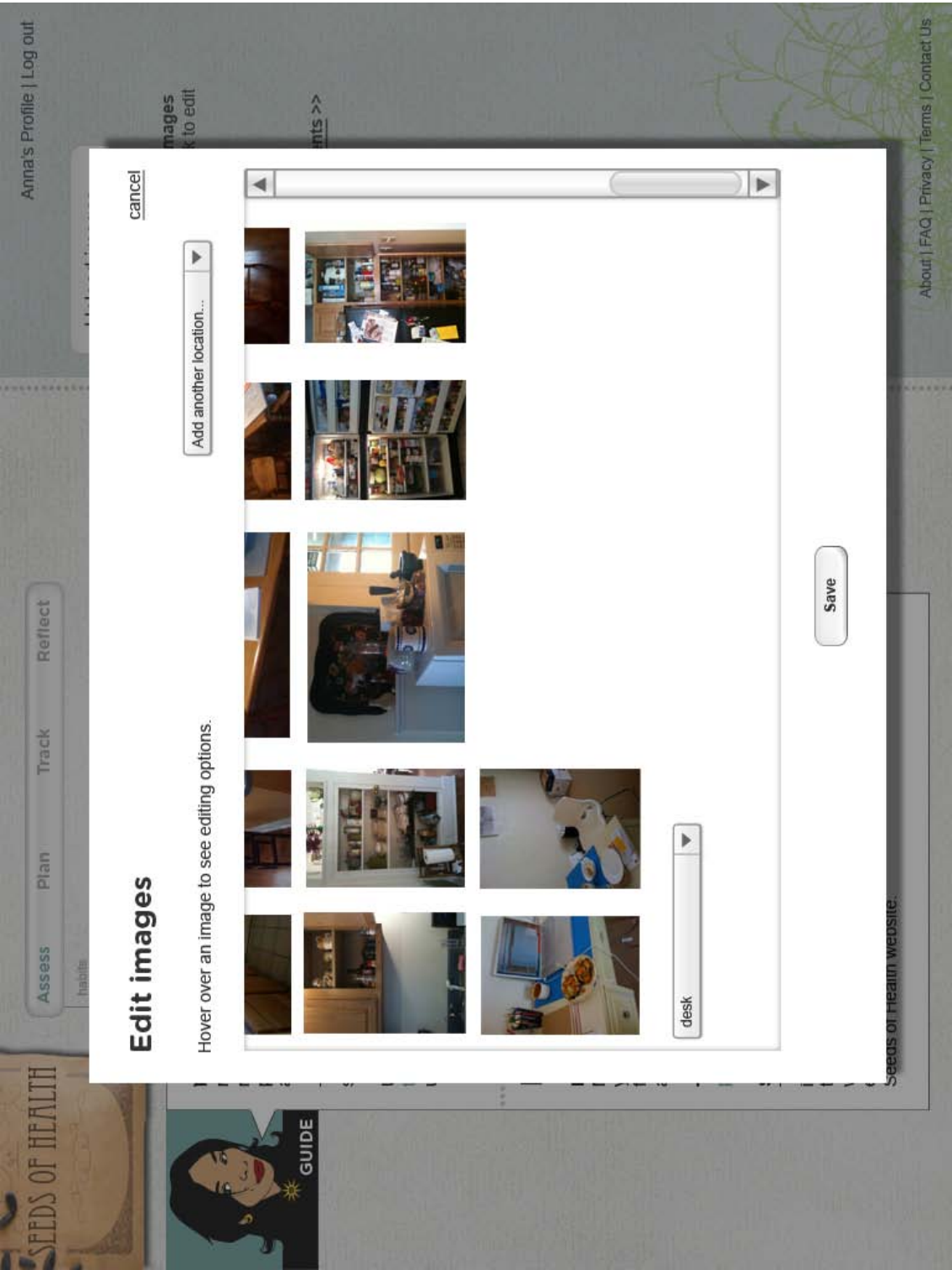


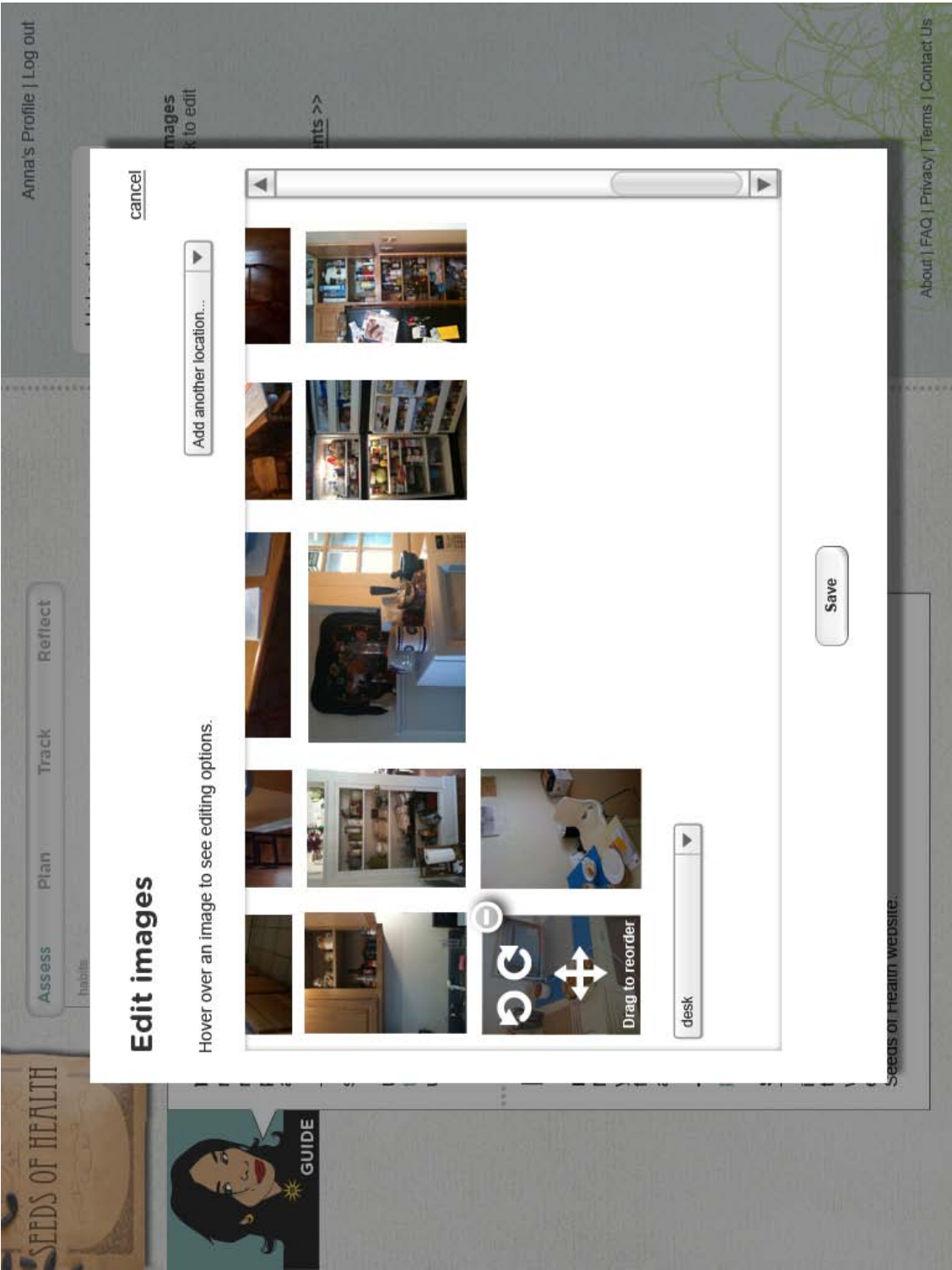


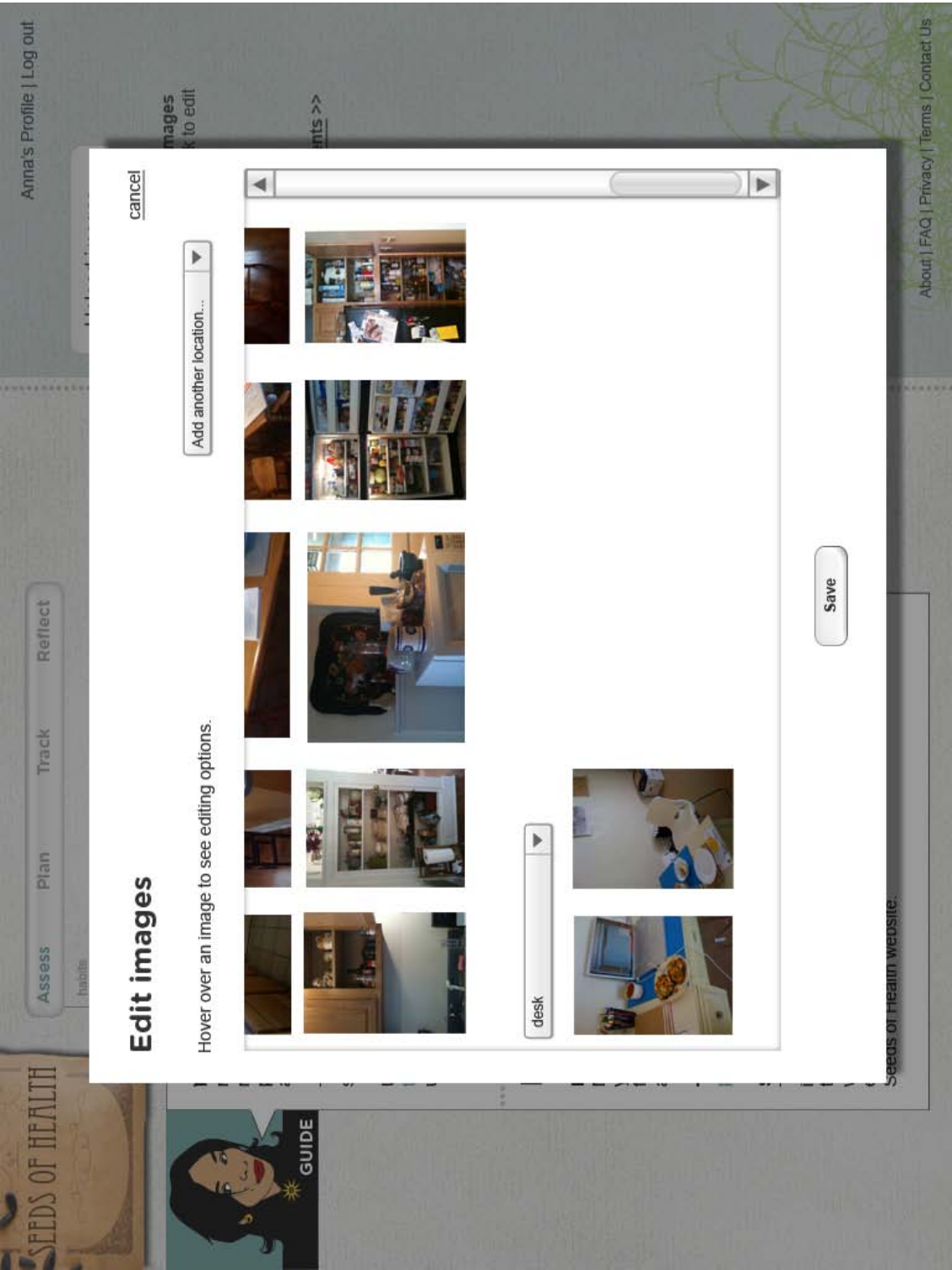


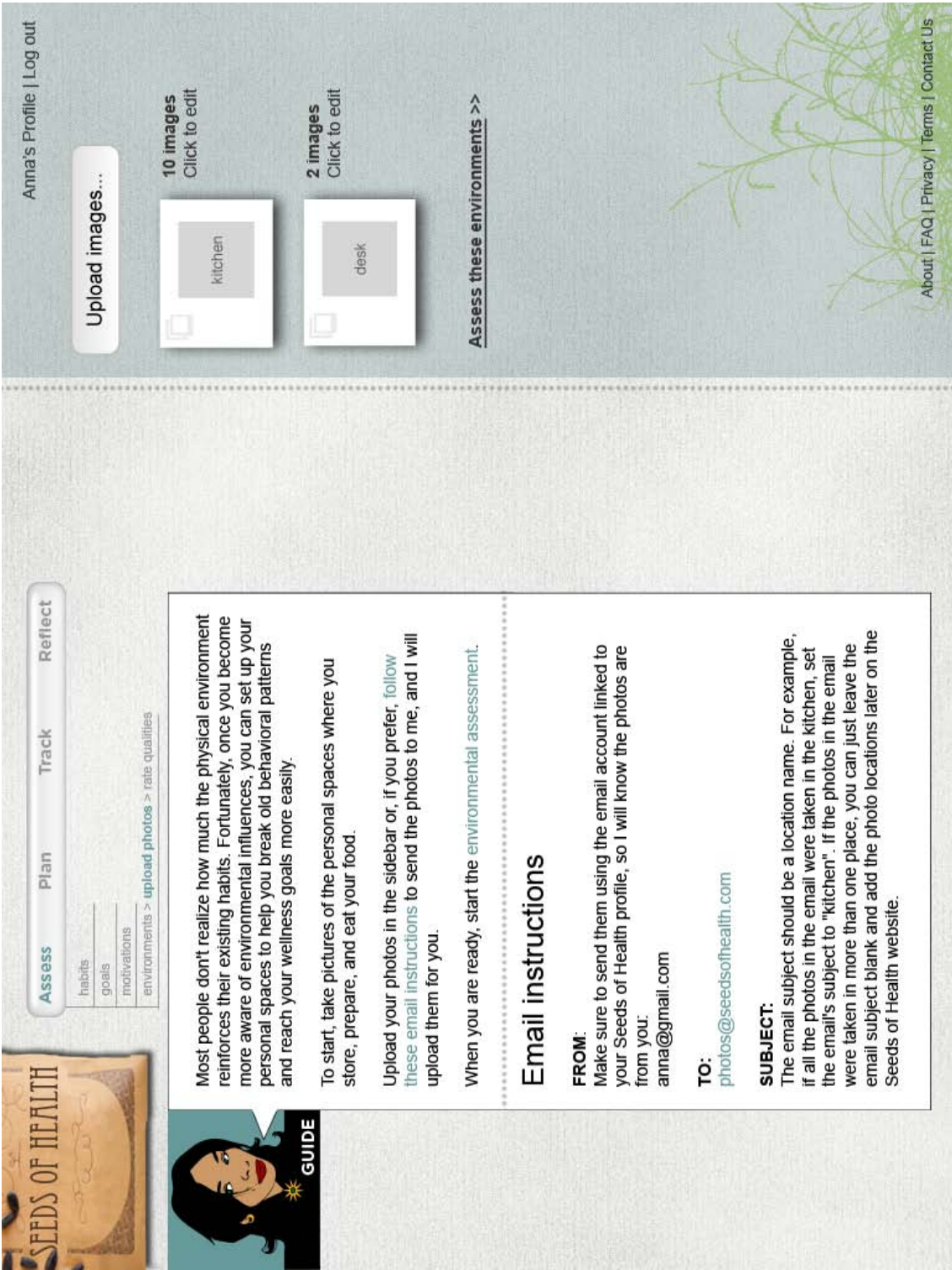














GUIDE

Rate the qualities of the spaces you photographed, and I'll use your ratings to improve my suggestions for your wellness plan. If you notice any environmental changes you'd like to make as you review your photos, you can also add notes for yourself. When you are ready, move on to your wellness plan.

kitchen



1 2 3 4 5 6 7



kitchen 1

April 8, 2011

Functions

I use this space for

☐ food storage
 ☐ equipment storage
 ☐ food preparation
 ☐ eating

Add note

Qualities

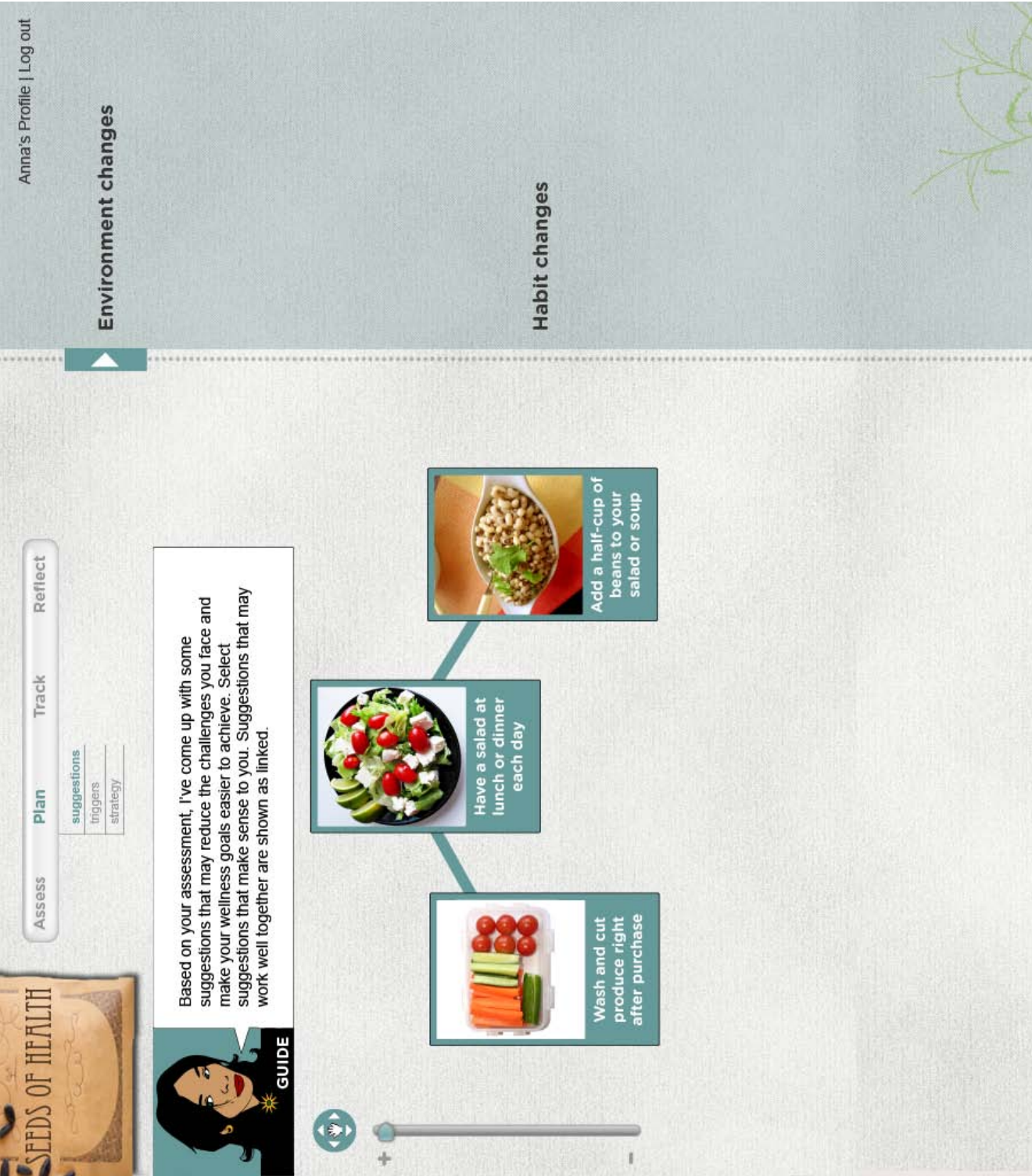
light ————— dark
 warm ————— cold
 dry ————— moist
 open ————— enclosed
 ordered ————— disordered
 clean ————— dirty
 airy ————— stuffy
 quiet ————— loud

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Stock photos from <http://www.sxc.hu/>

- Eat vending machine snacks + Cook healthy meals

Community experiences

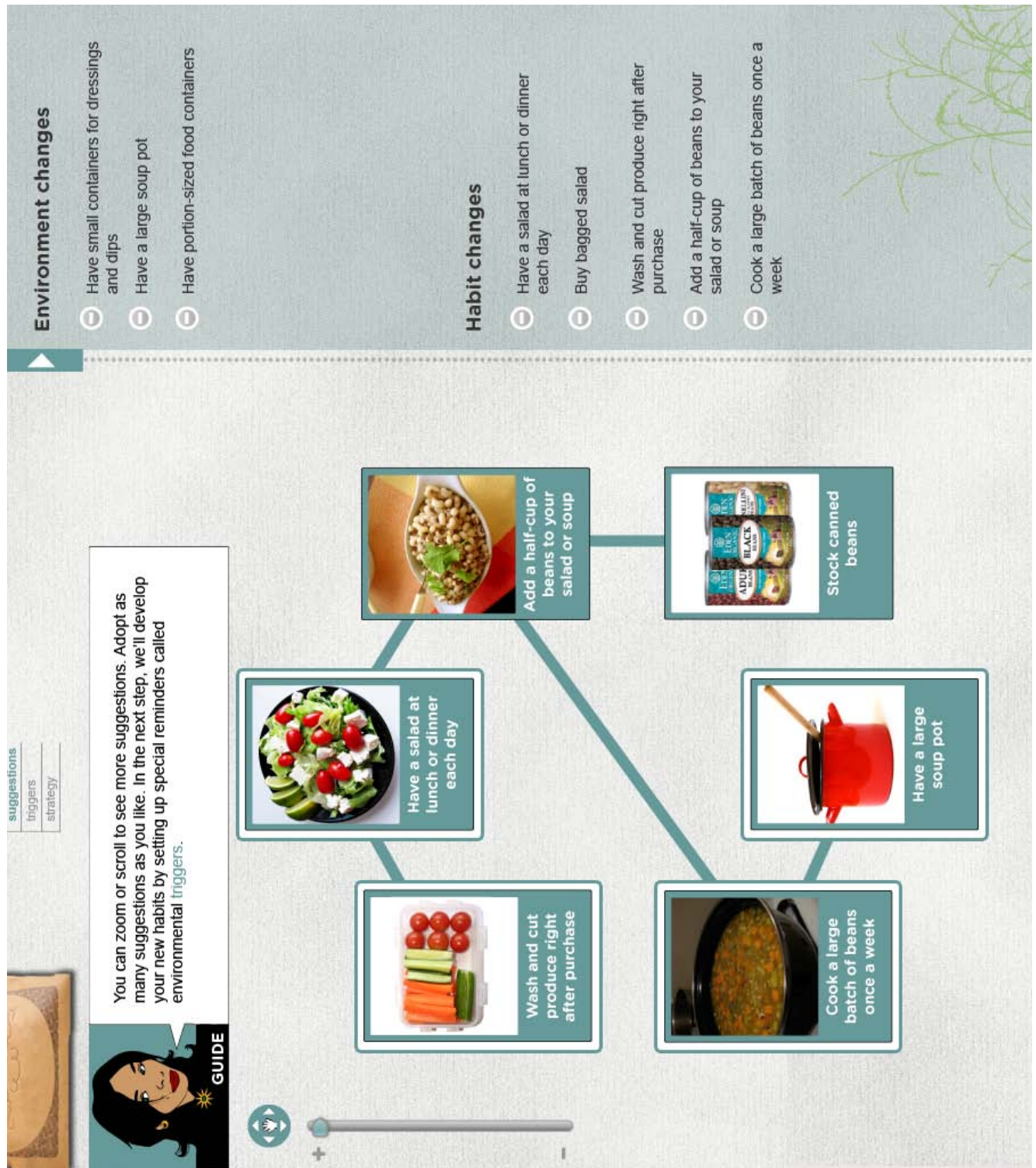
16 members have adopted this goal in the past month.

[View comments >>](#)

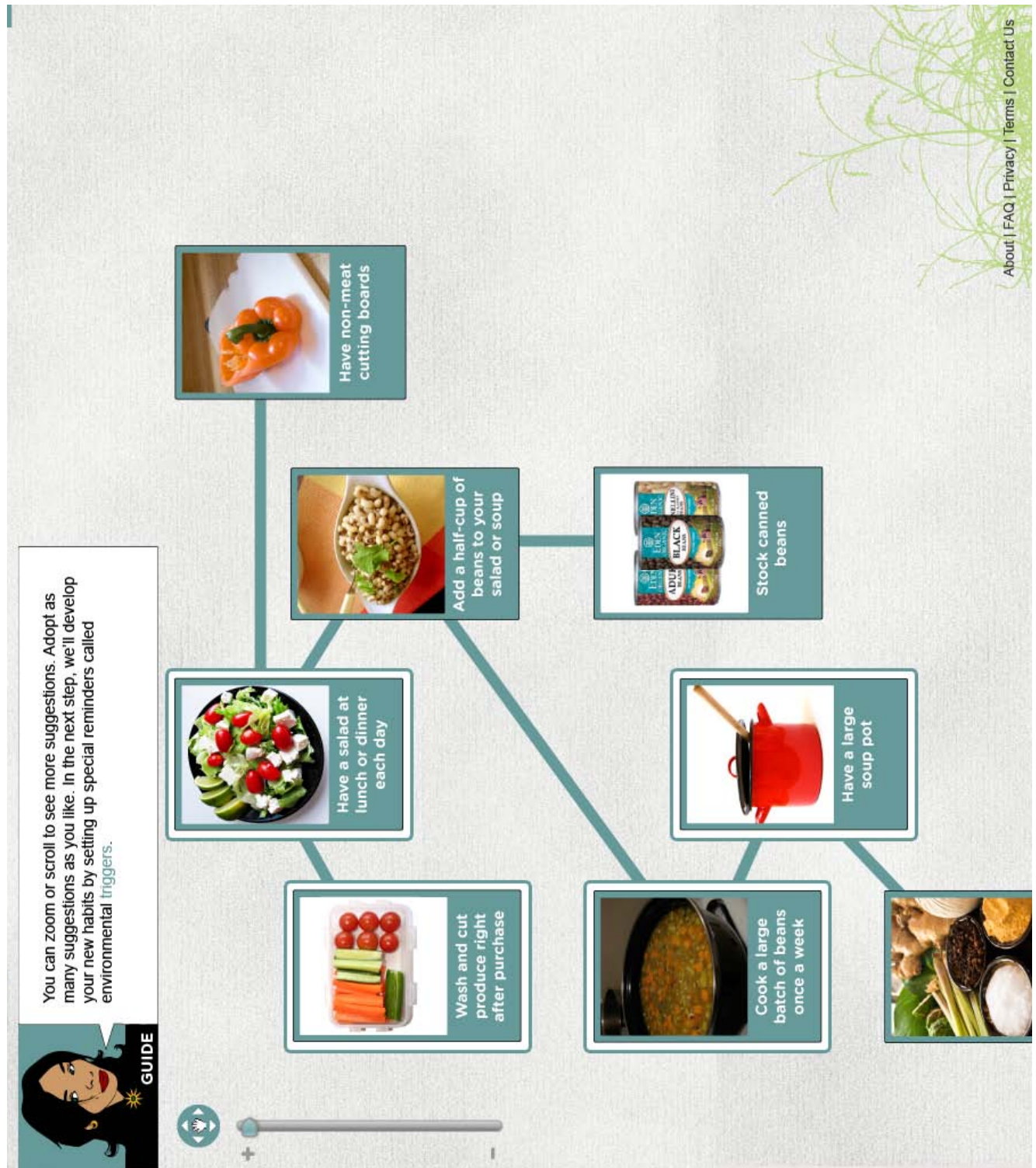
Wash and cut produce right after purchase
Buy bagged salad
Cook a large batch of beans once a week



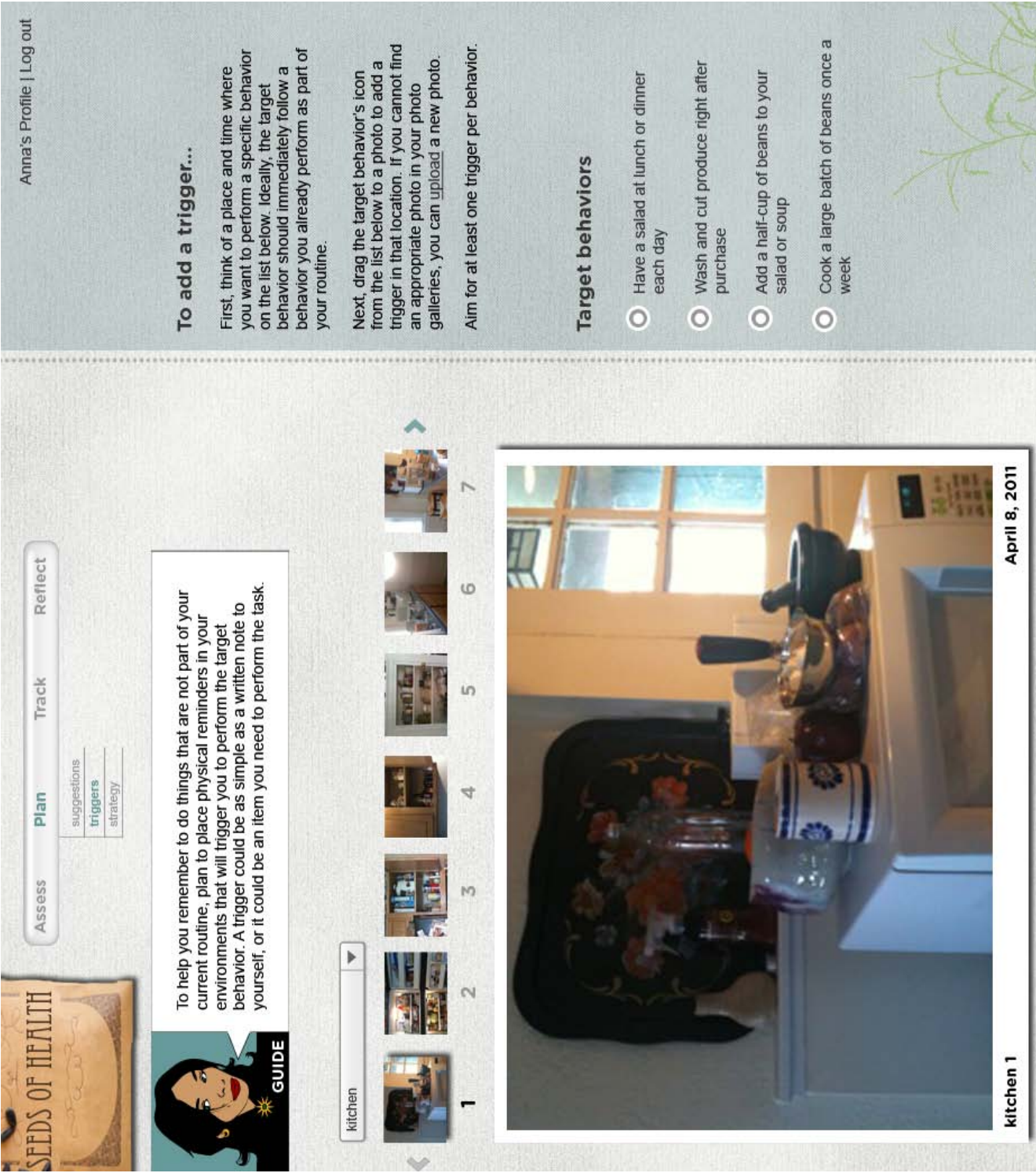
Redesigning Our Personal Environments and Behaviors: A Systems Approach to Wellness

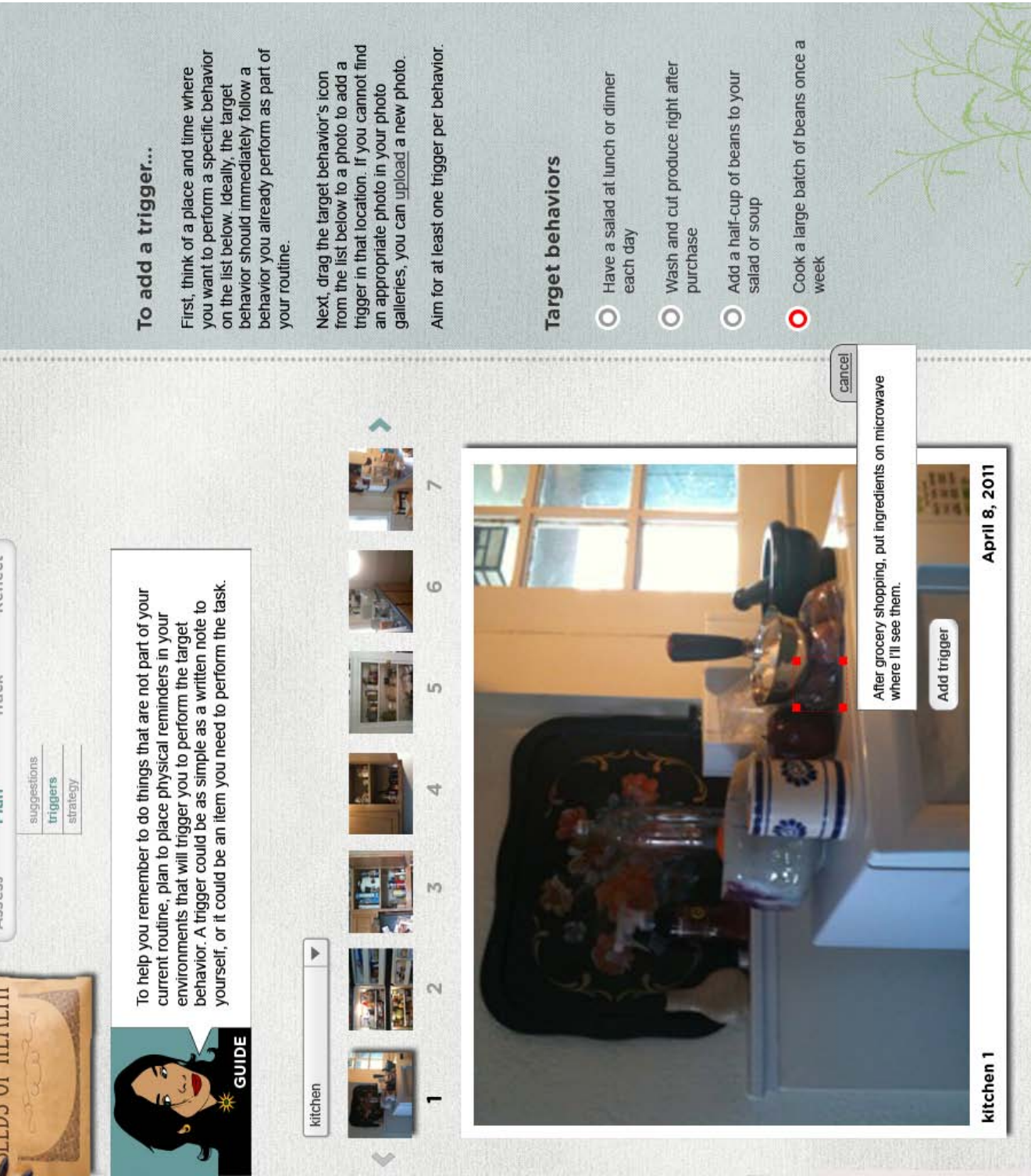


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SEEDS OF HEALTH

AssessPlanTrackReflect

individuallysocially

Anna's Profile | Log out




GUIDE


Congratulations! You've been very consistent in meeting both your monthly and weekly targets. Consider adjusting your plan by adding another trigger for your goal of eating salad for lunch or dinner each day, or browse related suggestions for a more gradual approach. You'll get there!

Current targetsAdjust plan


Habit changes



Have a salad at lunch or dinner each day



Cook a large batch of beans once a week



Wash and cut produce right after purchase

Adopted: 32 days ago

Mean: 1 time per week

Target: 3 times per week

Adopted: 32 days ago

Mean: 1 time per week

Target: 1 time per week

Adopted: 32 days ago

Mean: 1 time per week

Target: 1 time per week

Environment changes

I want to do less...

- Consume sweets
- Skip meals when I am busy
- Consume vending machine snacks
- Consume take-out food
- Consume frozen meals

I want to do more...

- Only eat when I'm truly hungry
- Eat healthy snacks
- Cook healthy meals
- Stock healthy convenient foods

I want to because...

- I want more energy
- I want to feel calm and alert all day

Stock photos from <http://www.sxc.hu/>

The Distracted Non-Cook

Anna Williams



"I don't want food to be one more thing for me to stress about."

Anna graduated last year from the University of Florida with a bachelor degree in English and is currently attending graduate school in Pennsylvania as a full-time student. She is living in an apartment on her own for the first time, having spent the past four years in dormitory housing, and relies on campus food, frozen dinners, and other convenience foods.

Anna doesn't have a lot of time, so buying real groceries is a once-a-week proposition at best. She tends to eat particularly badly when she is stressed out with her school work, grabbing whatever is quick even if she feels terrible afterwards. She would like to eat more balanced meals, meaning fewer processed foods and more vegetables. Changing her habits sounds like something she would consider if she had more time, but she doesn't want to have food be one more thing she has to stress about.

She has a Mac laptop, a smartphone, and is currently living on loans.

Age: 23

Education: BA English

Occupation: Graduate Student

Life Aspirations

- Live a long, disease-free life
- Have enough energy and stamina to go on active adventures with friends
- Excel at school and find a fulfilling job
- Keep learning new things

Nutrition Goals

- Eat more vegetables
- Stop eating after dinner
- Eat fewer frozen meals
- Eat fewer sugary desserts and snacks

Motivations

- Wants to avoid additional stress over diet textures
- Wants to enjoy a variety of food flavors and textures
- Wants to to feel good physically and mentally

Eating Habits

- Eats 2-3 meals a day at irregular times, depending on workload and class schedule
- Sometimes gets random free food on campus – mostly pizza, chips, and cookies
- Reads or surfs the Internet while eating at home
- Chats with other students while eating at school
- Eats badly to cope in stressful situations

Social Influences

- Usually eats two meals a day with friends at school
- Eats as well as most of her peers at school
- Family is far away but still gets together for holidays

Resource Constraints

- **TIME:** Constantly on the go and has trouble finding time when she can sit down and write out a shopping list and meal plan
- **MONEY:** Very limited budget
- **SOCIAL DEVIANCE:** Fitting in is important
- **PHYSICAL EFFORT:** Very small kitchen space with little equipment. Cooks most meals using a microwave or a single pot
- **MENTAL EFFORT:** Doesn't know what it means to eat healthfully – diet information is overwhelming and contradictory
- **NON-ROUTINE:** Unaccustomed to planning meals more than a day in advance

Food Sources

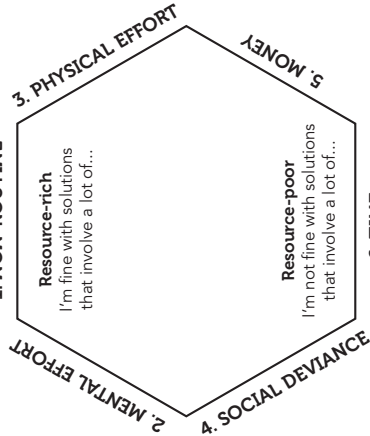
- Campus events: free food, vending machine
- Convenience store: snacks and frozen meals
- Grocery store: frozen and prepared meals

Information Channels

- Peers at school
- Text messages
- Internet, mostly Facebook and email

Questions

- How bad is convenience food, really?
- What are the healthiest convenience foods?
- How do I make healthy food quickly and cheaply?
- What's the bare minimum of equipment I need?



Resource scarcity model from BJ Fogg's Simplicity Profile discussed at <http://vimeo.com/2094487>

The Supportive Partner

Grace Young



Age: 33

Education: B.A. Business

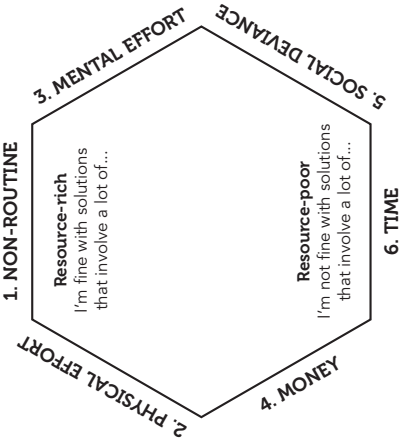
Occupation: Administrative assistant

“Eating is fun! Just use moderation.”

Grace grew up in a household where food was a celebration, and she likes to let loose and enjoy herself at parties. She tends to eat unhealthy when she visits her parents or when someone at work brings in food to share and she can’t say no. However, she compensates for her occasional indulgences by exercising regularly and isn’t overweight. She values her health and thinks she takes care of herself pretty well, although not perfectly.

Although she doesn’t cook herself, her boyfriend Nathan, with whom she shares an apartment, cooks dinner occasionally. Nathan was recently told by his doctor that he has prediabetes and wants to change his own lifestyle for health reasons. She wants to support him and is willing to encourage him when she can, but doesn’t feel a strong need to change her own lifestyle. Since Nathan is at home more often than she is, he has set up their apartment to suit his needs, so the changes he makes end up affecting her anyway.

She has a cell phone and a combined household income of \$45,000.



Life Aspirations

- Live a long and healthy life
- Travel the world with loved ones
- Start a family someday soon

Nutrition Goals

- Eat more vegetables
- Eat more fruits
- Drink more water
- Decrease caloric intake
- Eat less sugar and fat

Motivations

- Wants to set a good example
- Wants to have more stamina and energy
- Wants to enjoy a variety of food flavors and textures
- Wants to to feel good physically and mentally

- Wants to spend time with boyfriend

Resource Constraints

- TIME: Very little time outside work
- MONEY: Somewhat limited budget
- SOCIAL DEVIANCE: Lifestyle must be compatible with cohabiting boyfriend
- PHYSICAL EFFORT: Often too tired to cook
- MENTAL EFFORT: Willing to learn how to eat more healthfully
- NON-ROUTINE: Confident she can figure out what works for her under most circumstances

Eating Habits

- Always feels hungry and has 4-6 small meals a day to keep energy up (read somewhere that it keeps her metabolism revved)
- Eats breakfast in car on the way to work

- Eats mid-morning snack at desk
- Eats lunch at desk (takeout) or sometimes at a fast-food restaurant with friends
- Candy dish at work is personal nemesis
- Sometimes skips lunch and goes to gym instead; tends to eat late at night on these occasions
- Tends to eat until satisfied, except late at night when she sometimes has too much pizza
- Eats afternoon snack on most days
- Eats dinner at home with boyfriend
- Multitasks while eating – working on computer, chatting, or driving

Social Influences

- Picked up late-night-eating habit from boyfriend
- Eats and drinks too much at parties
- Family uses food as a means of celebration

- Parents are food-pushers and make her feel guilty if she refuses to overeat

Food Sources

- Restaurants: dine-in, takeout
- Deli counters: sandwiches, prepared meals
- Grocery store: frozen meals, fresh ingredients, pantry staples

Information Channels

- Doctor
- Significant other
- Friends
- Internet

Questions

- How can I support my significant other's lifestyle changes without feeling deprived?
- Is skipping meals harmful to my health?

Resource scarcity model from BJ Fogg's Simplicity Profile discussed at <http://vimeo.com/2094487>

Photo by Big D2112. <http://www.flickr.com/photos/bigd2112/5025666458/>

The Late-Night Snack Monster

Nathan Thompson



Age: 38

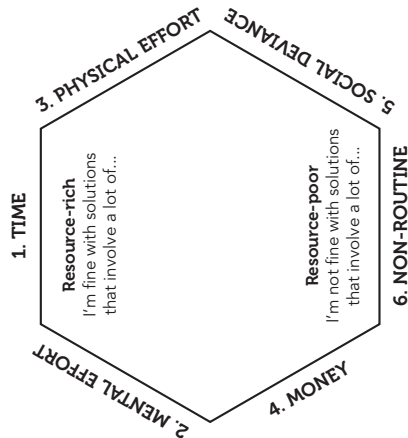
Education: Some college

Occupation: Freelance writer

"I need to make changes to my diet now to protect my long-term health."

According to his latest blood tests, Nathan's blood glucose levels, blood pressure, and cholesterol are higher than normal. After some tests, his doctor informed him that he has prediabetes, which – combined with his other risk factors – puts Nathan at a much higher risk of cardiovascular disease and diabetes. Concerned about his health, Nathan wants to follow his doctor's recommendation of losing weight through diet and at least 30 minutes of daily exercise. He has never tracked his eating or exercise before but now feels motivated to make changes to his lifestyle to protect his health. His girlfriend Grace, with whom he shares an apartment, supports his desires but doesn't feel motivated to change her own lifestyle and loves him the way he is now.

He has a Mac desktop computer, a cell phone, and a combined household income of \$45,000.



Life Aspirations

- Live a long and healthy life
- Travel the world with loved ones
- Be a successful writer

Nutrition Goals

- Eat more vegetables
- Drink more water
- Decrease caloric intake
- Stop eating after dinner
- Eat less sugar and fat

Motivations

- Fears illness and death
- Wants to protect long-term health
- Wants to enjoy a variety of food flavors and textures
- Wants to feel good physically and mentally

- Wants to spend time with girlfriend
- Wants to feel in control of own health
- Wants to control weight

Resource Constraints

- TIME: Not an issue
- MONEY: Somewhat limited budget
- SOCIAL DEVANCE: Lifestyle must be compatible with cohabiting girlfriend
- PHYSICAL EFFORT: Accustomed to low-effort snacking
- MENTAL EFFORT: Willing to learn how to eat more healthfully
- NON-ROUTINE: Has some firmly entrenched bad habits he hasn't been able to break in the past

Eating Habits

- Grazes throughout the day and does not have distinct mealtimes

- Sometimes makes meals at home but just as often gets takeout from restaurants and deli counters
- Eats most often at home, where he also works
- Eats until his plate is empty and usually feels uncomfortably full after the biggest meal of the day
- Tends to eat late at night, which is also when he is most prone to overeat
- Buys sugary snacks every time he enters a convenience store but really wants to stop, given his medical condition
- Always multitasks while eating – TV, chat, or computer

Social Influences

- Orders pizza late at night when his girlfriend wants to eat, then shares it with her

Food Sources

- Restaurants: dine-in, takeout
- Convenience stores: sugary and salty snacks
- Deli counters: sandwiches, prepared meals
- Grocery store: frozen meals, fresh ingredients, pantry staples

Information Channels

- Doctor
- Significant other
- Friends
- Internet

Questions

- How can I make lifestyle changes that will work for me and not upset my significant other?
- How can I break my sugar addiction?
- How can I overeat less often?

Resource scarcity model from BJ Fogg's Simplicity Profile discussed at <http://vimeo.com/2094487>

Photo by Chris Dag. <http://www.flickr.com/photos/chrisdag/4626436839/>

The Busy Overeater

Paula Green



“There is a disconnect between what I want to do and what I actually do.”

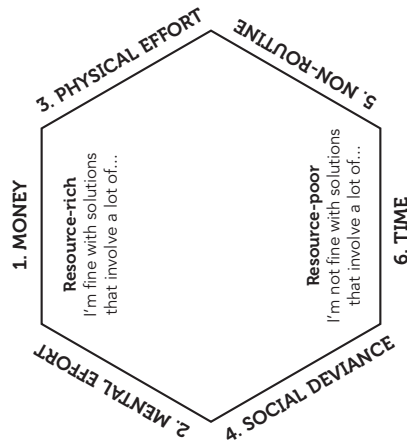
Paula has watched her own parents’ health suffer because of poor lifestyle choices. She values her personal well being and wants to live to a healthy 100. However, she and her husband both work full-time at demanding jobs and have two small children, making it hard to find the time to grocery shop and cook. She is often too tired to make the effort in the short term, even though she worries about the long term impact of her choices on herself and her family. Her husband likes to keep their home stocked with his favorite snack foods, and she will eat them sometimes, too. She and her husband are looking to buy a new home in the next year and would like to customize it so that it meets their needs.

She has a PC laptop, a smartphone, and a combined annual household income of \$230,000.

Age: 40

Education: JD

Occupation: Corporate lawyer



Life Aspirations

- Live to be a healthy centenarian
- Excel at her job
- Nurture her family

Nutrition Goals

- Decrease caloric intake
- Snack less often
- Drink less caffeine
- Eat fewer sugary desserts and fat

Motivations

- Wants to avoid making her parents’ health mistakes
- Wants to set a good example for her children
- Enjoys being in pleasant, calming surroundings
- Enjoys learning new things

- Wants to feel competent
- Wants to fit in with peers
- Wants to be attractive to others

Resource Constraints

- TIME: Constantly on the go and has trouble finding time when she can sit down and write out a shopping list and meal plan
- MONEY: Not an issue
- SOCIAL DEVIANCE: Wants to fit in with work colleagues and be accepted by family
- PHYSICAL EFFORT: Exhausted after work
- MENTAL EFFORT: Enjoys learning and thinking about health
- NON-ROUTINE: Highly structured schedule does not permit much deviation

Eating Habits

- Eats 3 meals a day at the same places and times

- Eats breakfast at home or in car during commute
- Eats lunch at work at her desk or at a restaurant with clients or friends
- Eats at home on the weekends
- Multitasks while eating – chatting or working on computer
- Sometimes snacks on comfort foods while watching television to unwind after work
- Member of the Clean Plate Club
- Tends to overeat when busy, stressed out, and/or feeling very emotional

Social Influences

- Husband and children enjoy eating snack foods
- Clients and colleagues prefer eating at fine restaurants
- Parents were chronic overeaters with obesity-related health problems

Food Sources

- Work cafeteria: entrées, sandwiches, salads
- Restaurants: dine-in, wine
- Grocery store: fresh ingredients
- Wholesale store: pantry staples, snack foods

Information Channels

- Family members
- Peers at work
- Television news
- Internet, mostly Facebook

Questions

- How can I strike a balance between work and taking care of my family?
- How can I calm myself without using food?
- What tools can save me time and help me eat more healthfully?

Resource scarcity model from BJ Fogg’s Simplicity Profile discussed at <http://vimeo.com/2094487>

Photo by Shannon Kringen. <http://www.flickr.com/photos/shannonkringen/4725578864/>

**Scenario: Anna**

After hearing about it from a friend at school, Anna uses her laptop to go to the Seeds of Health website to see if it can help her improve her eating habits. Looking at common personal environment influences depicted on the home page sparks her interest and gives her an idea what the site is about.

She still isn't totally sure whether she wants to use the service, so she starts answering assessment quiz questions one by one on the homepage. After answering a few multiple-choice questions, she sees that her preliminary results are already accessible.

Here is a summary of the information she enters:

Motivation to eat healthfully

- Overall health and wellbeing
- Better skin
- Increased energy and stamina

Nutrition and wellness goals can be activities or outcomes. (prompt to make each goal specific and measurable occurs after she has created an account)

- Increase consumption of vegetables and water [daily goal, self-measurable]
- Decrease consumption of calories, sugar, and saturated fat [daily goal, self-measurable]
- Habits related to eating, exercise, and stress management
- I eat most often at school or on the go. [structure]
- I tend to eat late at night, and this is when I am most prone to making poor food choices that I later regret. [coping mechanism]
- I seek a sugar/carb fix when I'm stressed out. [food script, trigger situation, trigger foods]
- When I'm eating, there's always something else going on – TV, conversation, or computer usage. [food script, distraction]
- Personal challenges to reaching goals (flagged from habits)
- I tend to eat late at night, and this is when I am most prone to the overeating behavior that I later regret. [coping mechanism]
- When I'm eating, there's always something else going on – TV or computer usage. [food script, distraction]

- I tend to eat more poorly when I'm with friends than when I am alone. [distraction, social norms]
- I rarely have time to shop or cook.

A sidenote reminds her that she can save her assessment results at any time by creating a free account.

After she does so, the site invites her to answer some more questions about her specific goals, habits, challenges, and personal environments. As she does so, she can flag each habit as something she wants to reinforce, reduce, or stop. **With each piece of additional information she provides, the site lets her know that it is generating a more detailed profile.**

PHYSICAL ENVIRONMENT ASSESSMENT

- Appliance inventory
 - » refrigerator = yes
 - » freezer = yes
 - » stove = yes
 - » kitchen timer = yes (microwave feature)
 - » microwave oven = yes
 - » water filtration system = no
 - » pressure cooker = no
 - » juicer = no
 - » blender = no
 - » food processor = no
 - » dehydrator = no
 - » food scale = no
- Dish inventory
 - » 1 set of dishes and utensils

Based on her eating behavior and biggest challenges (time constraints, frequent out-of-home dining, low budget), the site presents **5 suggestions** that Anna can adopt immediately to move closer to her goals:

1. Give away unhealthy snacks or throw them out.

2. Substitute raw, precut vegetables for less healthy snacks. Each week, buy a colorful variety of vegetables, wash and cut them, and store them in the refrigerator on the first or second shelf within easy reach.
3. Never eat directly from a package. Always portion food out into a dish so you know exactly how much you'll eat.
4. Bring one meal from home to school each day.
5. Eat a salad first for one meal each day.

For each suggestion, Anna can choose to adopt (“I will do this today”), defer (“Maybe later”), reject (“Not for me”), or ask for a baby step (“I will work up to this – give me baby steps!”). For each suggestion that she defers or rejects, the site produces a replacement suggestion for her to consider. Once she selects at least one suggestion to adopt or baby-step, she can use a daily checklist to track her progress.

Anna likes the idea of suggestion #4. However, she is worried that she won't be able to do it consistently, so she asks for a baby step. She gets a first step of buying five meal-size storage containers, plus a list of recipes that each makes 6 servings she can portion out for a week, along with food storage tips.

The site also graphs her long-term progress for any health measures she enters herself. She can specify when and how often she wants to be reminded to enter new data, and the system will send email, text, or tweet her the reminder. She sets an email reminder to pack her lunch for the next day to arrive at 8pm each night.



Scenario: Nathan

One of Nathan's friends recommends he try an online tool to help him reach his nutrition and wellness goals.

Using his desktop computer, Nathan goes to the Seeds of Health website and signs up for an account immediately.

After he confirms his email address, the site invites him to take an **assessment quiz**. The quiz asks him a series of questions about his

1. nutrition and wellness goals
2. motivations for change
3. habits related to eating, exercise, and stress management
4. personal challenges to reaching his goals

Taking the quiz gets Nathan thinking more about the variety of factors that influence his eating behavior. He doesn't have to fill out all the sections in one sitting, but the more information he provides, the more the results will be tailored to him.

Here is a summary of the information he enters; some he selects from prepopulated lists, while some he enters free-form based on guiding questions:

PERSONAL ASSESSMENT

Nutrition and wellness goals can be activities or outcomes. (prompt to make each goal specific and measurable)

- Lose weight [long-term outcome]
 - » Prompt -> Lose 20 pounds to reach ideal weight [self-measurable]
- Exercise more [long-term behavioral goal]
 - » Exercise at least 30 minutes per day [daily habit, self-measurable]
- Lower blood pressure into a healthy range [long-term outcome, self-measurable]
- Lower cholesterol into a healthy range [long-term outcome, doctor-measurable]
- Increase consumption of vegetables and water [daily goal, self-measurable]
- Decrease consumption of calories, sugar, and saturated fat – especially sweets [daily goal, self-measurable]

- Motivations for change
- Medical diagnosis
- Prevent onset of diabetes
- Protect long-term health
- Habits related to eating, exercise, and stress management
- I typically eat throughout the day and don't have distinct mealtimes. [structure]
- Sometimes I make my meals at home but just as often will get takeout from restaurants and deli counters.
- I eat most often at home.
- I sometimes eat out of boredom rather than hunger. [coping mechanism]
- I tend to keep eating until whatever I'm eating is gone, rather than when I feels satisfied. Consequently, I usually feel stuffed and uncomfortably full after my biggest meal of the day. [food script]
- I tend to eat late at night, and this is when I am most prone to the overeating behavior that I later regret. [coping mechanism]
- If my girlfriend wants to order pizza and watch a movie, it always turns into an overeating episode. [food script]
- I have a sweet tooth and have a habit of buying sugary snacks every time I'm in a convenience store. [food script, trigger situation, trigger foods]
- When I'm eating, there's always something else going on – TV, radio, or computer usage. [food script, distraction]
- Personal challenges to reaching goals (flagged from habits)
- I sometimes eat out of boredom rather than hunger.
- I tend to keep eating until whatever I'm eating is gone, rather than when I feels satisfied. Consequently, I usually feel stuffed and uncomfortably full after my biggest meal of the day.
- I tend to eat late at night, and this is when I am most prone to the overeating behavior that I later regret. [coping mechanism]
- If my girlfriend wants to order pizza and watch a movie, it always turns into an overeating episode. [food script]
- I have a sweet tooth and have a habit of buying sugary snacks every time I'm in a convenience store. [food script, trigger situation, trigger

foods]

- When I'm eating, there's always something else going on – TV, radio, or computer usage. [food script, distraction]

Based on his responses, the site generates a personal eating behavior profile with today's date that categorizes Nathan as a snack grazer:

As a grazer, you tend to reach for whatever food is available, typically about three times a day. You prefer sweet snacks, but if it's convenient, you'll probably eat it. Snacking may be a nervous habit, something that gives you an excuse to get up and walk around, or something you can do with your hands while watching TV or reading. You might be hungry when you snack, but it's almost done more out of habit than hunger. (adapted from Brian Wansink's *Mindless Eating*, Appendix B, p. 225-226)

Yes, Nathan thinks. This is him.

The site invites him to review his list of specific, measurable goals and habits and flag each as something he wants to reinforce, reduce, or stop.

The site has also used his responses to gauge his **motivation level** as "High." Each **personal motivator** he entered in the quiz is shown as the text on a rectangle the size of a playing card. There is an image above each description, and he notices he can substitute his own image for any of them, print them out in playing card form, or thumb through them on the mobile phone app. Since Nathan doesn't have a smart phone, he opts to print out the cards to put in his wallet.

PHYSICAL ENVIRONMENT ASSESSMENT

Flag negative triggers with *.

- Refrigerator
 - » Top shelf of fridge contains low-fat yogurt, coffee creamer, 2% milk, leftover takeout food from night before*, orange juice, eggs, deli ham
 - » Second shelf of fridge contains olives, guacamole, salsa, sour cream, chocolate pudding*, American cheese
 - » Inside door contains cans of Coke, Diet Coke, butter
 - » Produce drawer contains bag of baby carrots, 2 lemons, and 3 red apples
- Freezer
 - » 2 pint containers of Ben & Jerry's ice cream*
 - » 1 box of Klondike bars*

- » bag of frozen spinach
- » 2 frozen Hungryman dinners
- » bag of frozen buffalo wings
- Kitchen cupboards
 - » lowest shelves contain Twinkies*, Ho-hos*, microwave popcorn, Doritos, Pringles, Little Debbie snack cakes*, and Entemann's chocolate chip cookies*, coffee
 - » higher shelves contain canned corn, canned pumpkin, canned green beans, baking powder, cornstarch, nutmeg, and cinnamon
- Under the sink
 - » cleaning supplies
 - » garbage bags
 - » trash can
- Countertops
 - » microwave oven
 - » coffee maker
 - » 1 bunch of bananas
 - » bills
 - » magazines
 - » paperwork
 - » takeout menus*
- Appliance inventory
 - » refrigerator = yes
 - » freezer = yes
 - » stove = yes
 - » kitchen timer = yes (microwave feature)
 - » water filtration system = no
 - » pressure cooker = no
 - » juicer = no
 - » blender = no
 - » food processor = no

- » dehydrator = no
- » food scale = no
- Tool inventory
 - » weight scale
- Dish inventory
 - » set of 4 of cereal bowls, salad bowls, dinner plates, dessert plates

Based on his eating behavior and motivation level, the site presents **3 suggestions** that Nathan can adopt immediately to move closer to his goals:

1. Give away unhealthy snacks or throw them out.
2. Substitute raw, precut vegetables for less healthy snacks. Each week, buy a colorful variety of vegetables, wash and cut them, and store them in the refrigerator on the first or second shelf within easy reach.
3. Never eat directly from a package. Always portion food out into a dish so you know exactly how much you'll eat.

For each suggestion, Nathan can choose to adopt (“do it today”), defer (“maybe later”), or reject (“not for me”). For each suggestion that he defers or rejects, the site produces a replacement suggestion for him to consider. Once he selects at least one suggestion to adopt, he can use a daily checklist to track his progress.

Nathan likes the idea of the first suggestion, but since he figures his girlfriend wouldn't like him throwing out her favorite snacks, he rejects it. When he does so, the site asks him why he is rejecting the suggestion: “too extreme for me,” “too expensive,” “other household members object,” or “other (please specify).” He selects the reason, “other household members object,” and the site suggests an alternative:

Move unhealthy snacks to the back of cupboards, freezer, or refrigerator, so they are out of sight and more difficult to access.

He still thinks this would be a problem and rejects it for the same reason, “other household members object.” The site suggests a new alternative:

- Have separate cupboards that are assigned to other household members and off-limits to you.

Nathan thinks his girlfriend would be okay with this alternative and adopts the suggestion.

Once Nathan adopts 3 suggestions, he chooses to generate a daily checklist that he can use to track his progress. He prints out a 4-week

checklist and posts it at his desk in his home office, where he will be able to see and update it every day.

The site also graphs his long-term progress for any health measures he enters himself. He can specify when and how often he wants to be reminded to enter new data, and the system will send email, text, or tweet him the reminder.

He accomplishes the first item on the list that day. Since it is a one-time change, the site credits him for making the change, updates his overall progress, and gives him a new suggestion to consider:

- Eat a lettuce salad with beans at lunch or dinner.

Nathan looks at the recipes linked from this suggestion and likes the first one. It looks simple – he only needs to buy a bag of salad greens and a can of beans. The dressing calls for ingredients he already has in the house. He decides to adopt the suggestion.



Scenario: Paula

Paula downloads the Seeds of Health mobile phone app and takes the assessment quiz at home.

Since she is using the app on her phone, she has the option of **mapping her personal food environments** to document present state. At the guidance of the app, she specifies rooms in her home: 1 kitchen, 1 livingroom, 2 bedrooms, 2 bathrooms, 2 cars. Then she goes to each of these places and uses her mobile phone to take timestamped photos of the inside of her refrigerator, the places where she most frequently eats her meals at home, and her food storage setup. The app enables her to link each photo she has taken to a specific place in her personal food environment map.

Based on her responses, the site generates a **personal eating behavior profile** with today's date that categorizes Paula as a meal stuffer: *Stuffers eat primarily during mealtimes, but then they eat to excess, cleaning everything on their plate. They often eat so quickly that they're uncomfortably full after they finish. Meal stuffers consider themselves to have "healthy appetites." They often take second helpings at home.* (from Brian Wansink's *Mindless Eating*, Appendix B)

Yes, Paula thinks. This is her. The site also generates a list of suggestions Paula can use to redesign her eating behavior:

1. Adopt the Half-Plate Rule: half his plate is vegetables and the other half is protein and starch.
2. Preplate high-calorie foods in the kitchen and put away any leftovers before eating. Do not serve dishes family-style unless they are vegetables or salad.
3. Chew each bite until it is liquid.
4. Paula decides to adopt first two suggestions but isn't sure about the third one. She defers it ("too extreme for me") and gets an alternative suggestion:
5. 3. Play slow, pleasant music at mealtimes.

She likes this idea a lot and decides to adopt it. Now that she has 3 suggestions she is ready to use, she generates a daily checklist she can use to track her progress.

Video Sketch: Seeds of Health

by
Corinna Sherman

Current Revisions by
Corinna Sherman, 2011 April 6

INT. ANNA'S HOUSE - EVENING

Anna walks to the kitchen, opens the freezer, and pulls out a frozen dinner. She puts it into the microwave and heats it. After the microwave dings, she pulls the heated frozen dinner out and sits at the dining table to eat while using her laptop.

ANNA

I've made New Year's resolutions to eat better, but it's hard. I'll do all right for about a week...and then I'll have a really long day, and I just fall back on all my old habits. Basically, if I'm super busy or tired, I'll eat whatever's convenient. I know that about myself. I just don't know what to do about it. I wish eating healthy food was easier to do, so I'd just do it automatically and not have to stress about it. That would be ideal.

Anna goes to the Seeds of Health **homepage** on her laptop.

NARRATOR

Based on a friend's recommendation, Anna checks out the Seeds of Health website, which offers to guide Anna to healthier eating habits through the gradual redesign of her personal environments - from kitchen to dining table to office cubicle. Intrigued by the demo video on the homepage, Anna signs up for a free account.

A series of personal assessment screens appear, covering **habits**, **goals**, and **motivations**. Anna inputs data.

NARRATOR (CONT'D)

To begin, a virtual guide walks Anna through a wellness assessment that reviews her current eating habits, goals, and motivations. This step gets Anna thinking more deeply about what she wants to change about her behavior and why. It also prompts her to frame goals in such a way that she can measure how she is progressing over time.

(CONTINUED)

2.

CONTINUED:

Anna takes photos of her kitchen and dining area with her smartphone and emails them to Seeds of Health.

NARRATOR (CONT'D)

Next, the virtual guide invites Anna to photograph personal environments where she stores, cooks, and eats food. Anna uploads photos to her Seeds of Health account simply by emailing them to her virtual guide.

Anna moves on to the **environmental analysis**.

NARRATOR (CONT'D)

Using these photos, Anna's guide prompts her to rate the qualities of her personal environments and to note the ones that pose specific challenges to her goals.

ANNA

Ah, the fact that my freezer contains nothing but frozen dinners and ice cream is *probably* an issue.

Anna moves on to the **plan section**.

NARRATOR

Using the information she provided in the assessment, Anna's guide offers her a short list of personalized wellness suggestions.

ANNA

I appreciate being able to pick suggestions that I think will work best for me. And I like that the list is short, because I can go through it quickly.

Anna adopts a suggestion, and related suggestions appear on her screen.

NARRATOR

Anna's guide offers suggestions that complement the ones she has already chosen, making it easier to craft a self-reinforcing plan.

(CONTINUED)

3.

CONTINUED: (2)

ANNA

I also like that I can see the success rates and user comments for each suggestion. It's interesting to see which suggestions people with similar goals have adopted.

NARRATOR

Once she has finished reviewing suggestions, Anna's guide generates a personalized wellness plan that contains one-time environment changes, recurring action items that help Anna build healthy habits over the long term, and related resources like recipes and links to shopping guides.

Anna prints and reviews her environment change checklist, which includes a handful of items.

NARRATOR (CONT'D)

Anna prints the environment change checklist and addresses items when she has time.

Anna stows new food containers in her cupboard.

ANNA

Buy food storage containers I can use to pack my lunch - check!

Anna throws out her frozen dinner and ice cream motherlode.

ANNA (CONT'D)

No more frozen meals and tempting treats in the freezer - check!

Anna stores dry beans in the pantry.

ANNA (CONT'D)

Stock dry beans in the pantry - check! It's a good thing this plan includes chili recipes, because otherwise I'd have no idea what to do with dry beans. My guide tells me I can cook a big batch of chili and freeze it in meal-sized portions using the containers I bought, which will replace those frozen dinners I tossed out.

Track screen appears on her laptop.

(CONTINUED)

4.

CONTINUED: (3)

NARRATOR

In the Track section, Anna can update her checklists directly on the site, data visualizations update automatically.

Anna checks off an item.

ANNA

Awesome! I used those new containers to pack my lunch after dinner three nights this week!

Reflect screen appears.

NARRATOR

Once she does, the Reflect section updates to show her environmental changes and behavioral trends over time. The Reflect section is also where Anna can make plan adjustments.

Baby step goal adjustment pop-up appears.

ANNA

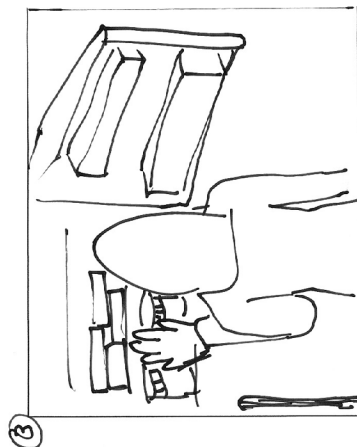
If I'm struggling with a particular goal, my guide can break it down into baby steps that I can follow more easily. But if I'm just on vacation or something, I don't worry about a short-term disruption. My plan will still there for me when I'm ready to resume my normal routine.

NARRATOR

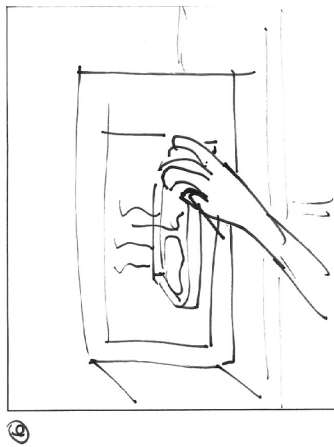
After consistently meeting her goals for a while, Anna's guide notifies her when she is ready to level up and invites her to make additional changes to her wellness plan.

ANNA

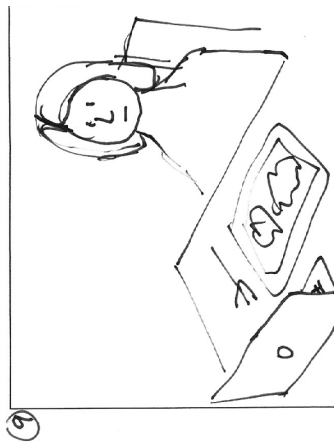
I appreciate that ongoing guidance, because it means I can progress without having to think too hard about managing my plan. I guess, looking back on it, I have come a long way from where I started. But it was baby steps all the way.



Grabs a frozen meal from the freezer...



Takes it out when it's done...



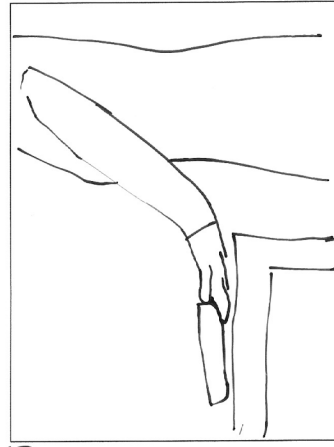
Sits down... with laptop...



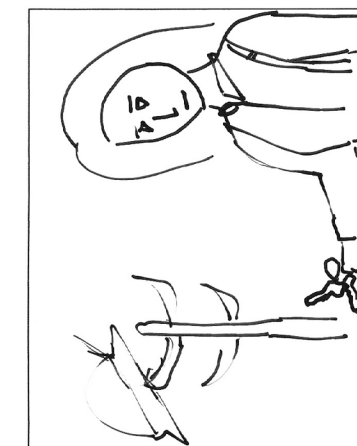
Goes to the kitchen...



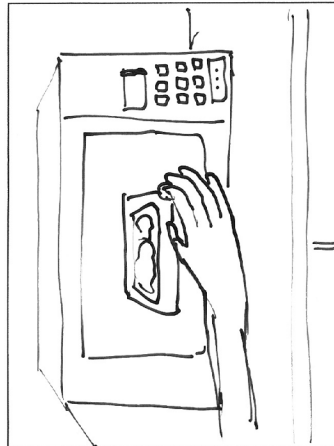
Heats it...



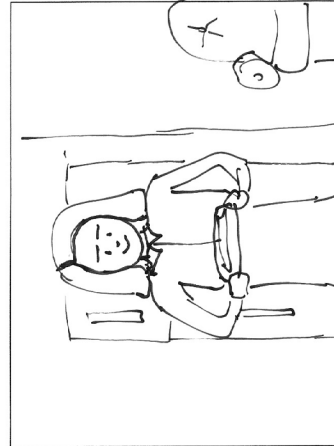
Sets down meal...



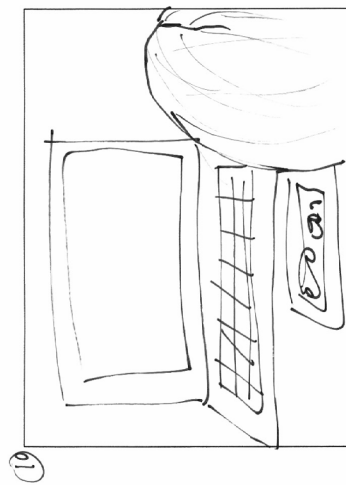
Anna comes home looking tired after a long day.



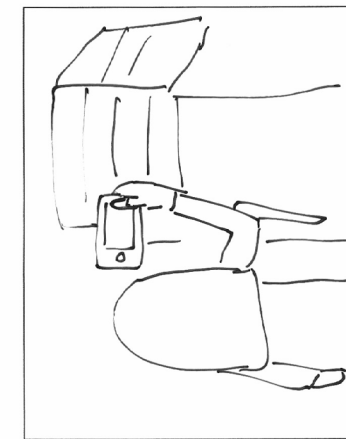
Puts it in the microwave...



Goes to the table...



Surfs net while eating.



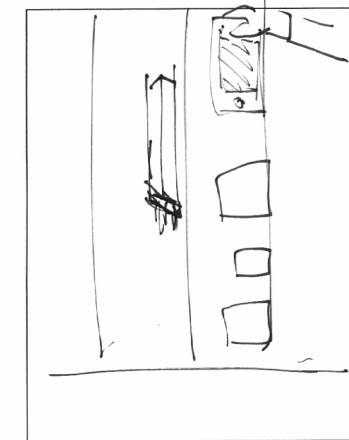
Takes photo of freezer...



Counter-tops...



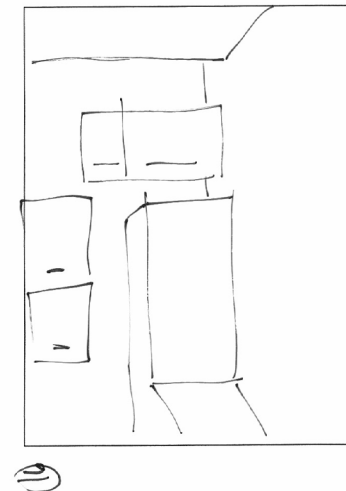
Table.



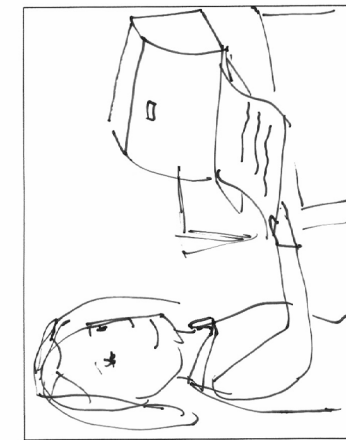
Pantry.



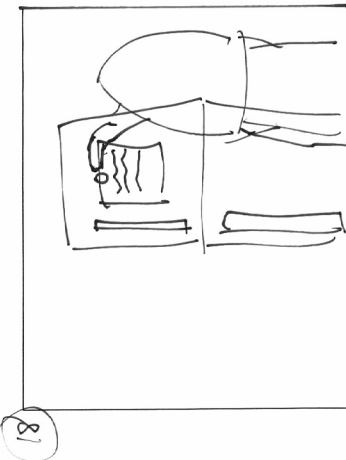
Cupboards.



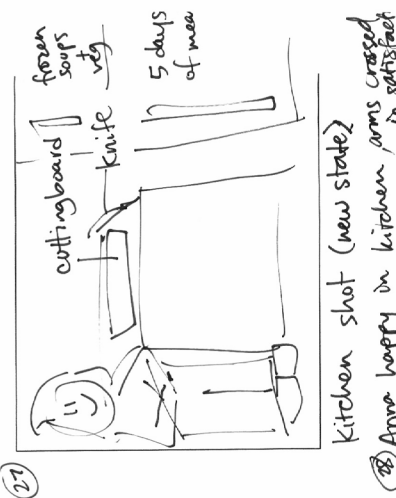
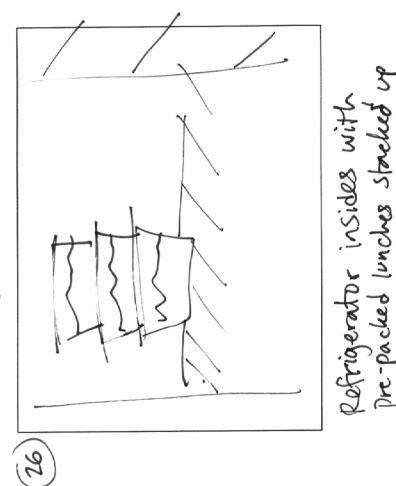
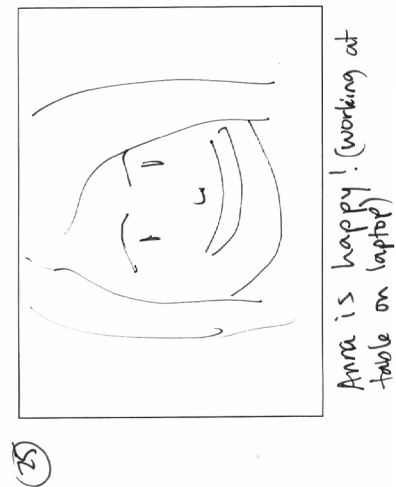
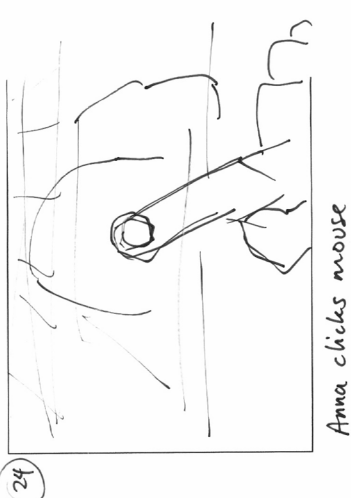
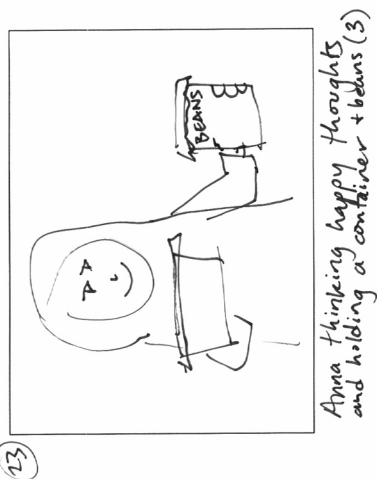
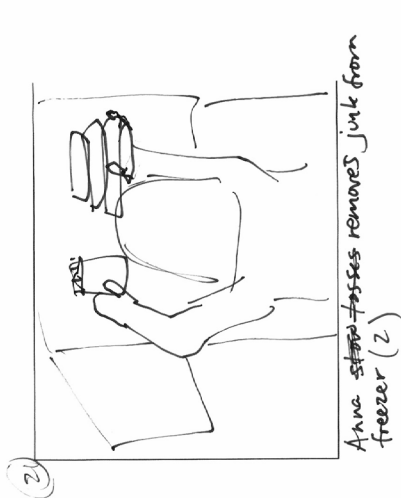
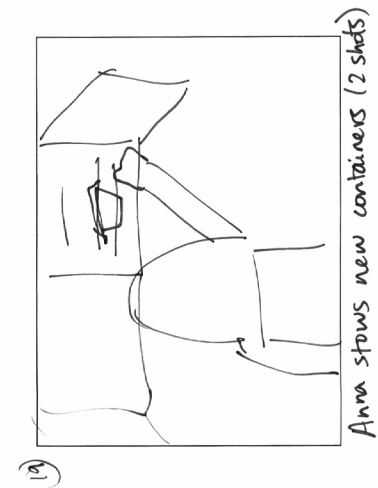
Whole kitchen.



Anna prints checklist



Sticks it on fridge



See the video sketch at
<http://vimeo.com/corinna/seeds-of-health>

Redesigning Our Personal Environments & Behaviors

A Systems Approach to Wellness

People are creatures of habit. We don't need to think through the pros and cons of brushing our teeth every morning or plan a fresh route from home to work. Our reliance on habit keeps us from being overwhelmed by the thousands of decision points we encounter each day, but it can also undermine our efforts to make positive lifestyle changes. With kitchens full of processed foods, cars large enough to accommodate bulk food purchases, and workplaces that furnish stress and snacks in equal measure, the majority of

Americans are surrounded by environmental influences that promote overeating, unhealthy food choices, and physical inactivity. Personal environments - those settings in which we spend most of our daily life - are filled with cues that reinforce existing habits yet only dimly impact our conscious awareness. This project seeks to increase people's awareness of how personal environments influence their food choices and eating behaviors and provide them with tools to redesign those environments to promote wellness.

Seeds of Health

A Personal Wellness Tool

1. Promote healthier eating habits by taking baby steps to redesign your personal environments.

2. Track your progress over time to discover which changes actually work for you.

3. Get notified when the data shows it's time to update your wellness plan and level up your health.

Explore & Assess

Current habits



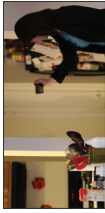
Desired habits and challenges



Motivations



Personal environments



Plan & Prepare

Adopt suggestions for habit and environmental changes



Adopt related suggestions for multiple reinforcement



Create environmental triggers to cue new behaviors



Get checklists of action items



Practice & Track

Make environmental changes and perform goal behaviors



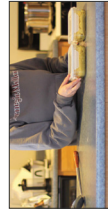
Check in with wellness community and share tips



Record one-shot achievements

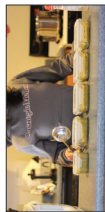


Record recurring achievements



Reflect & Adjust

Visualize progress over time



Acknowledge and celebrate incremental successes



Adjust course by changing goals, triggers, or adopted suggestions



Level up with new suggestions and goals over the long term



Design Considerations

Physical Environment

- > Increase awareness of how physical environmental factors influence food choices and eating behaviors
- > Facilitate assessment of the physical attributes of personal environments with regard to how well they support personal wellness goals
- > Offer suggestions for cultivating physical environmental conditions that support personal wellness goals, i.e.
 - > Remove unhealthy and trigger food items from personal spaces.
 - > Organize spaces for efficient and safe preparation, cooking, and storage of healthy food.
- > Create conditions that promote eating for health and enjoyment through the manipulation of ambient factors

Information Environment

- > Manage the individual's action plan for personal environment redesign
- > Illustrate trends of behavioral and environmental change over time at multiple levels of granularity.
- > Juxtapose incremental changes in personal environments with long-term progress toward goals.
- > Increase self-efficacy with regard to healthy behaviors.
- > Enable critical thinking about health behaviors.

Social Environment

- > Increase awareness of how social factors influence food choices and eating behaviors
- > Offer suggestions for coping with social influences that undermine personal wellness goals.
- > Strengthen connections to social relationships and networks that support wellness goals.

Behavior

- > Facilitate the breaking or weakening of undesired habits.
- > Facilitate the formation or strengthening of desired habits.
- > Guide behavior change in incremental steps.
- > Encourage reflection on personal wellness goals, motivations, challenges, and progress.
- > Acknowledge incremental and long-term accomplishments.
- > Do not provide a pathway to failure.
- > Do not make contradictory demands on the individual.
- > Encourage priming for and triggering of desired behaviors in opportune settings according to the principle of kairos.

System

- > Complement other components of the wellness ecosystem
- > Calibrate demands on the user to respect the individual's time, money, physical, mental, emotional, and social constraints.

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Cited Works

Aarts, Henk, Ruud Custers, and Hans Marien. 2008. "Preparing and Motivating Behavior Outside of Awareness." *Science* 319 (5870) (March 21): 1639. doi:10.1126/science.1150432.

Alexander, Christopher, Sara Ishikawa, and Murray Silverstein. 1977. *A Pattern Language: Towns, Buildings, Construction*. Oxford University Press.

Andrew, Adrienne, Gaetano Borriello, and James Fogarty. 2007. "Toward a Systematic Understanding of Suggestion Tactics." In *Persuasive Technologies, International Conference on Persuasive Technology For Human Well-being, PERSUASIVE 2007*. <http://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.66.1028>.

Ariely, Dan, Uri Gneezy, George Loe, and Nina Mazar. 2009. "Large Stakes and Big Mistakes." *Review of Economic Studies* 76 (2) (April 1): 451-469. doi:10.1111/j.1467-937X.2009.00534.x.

Austin, S. Bryn, Steven J. Melly, Brisa N. Sanchez, Aarti Patel, Stephen Buka, and Steven L. Gortmaker. 2005. "Clustering of Fast-Food Restaurants Around Schools: A Novel Application of Spatial Statistics to the Study of Food Environments." *Am J Public Health* 95 (9) (September 1): 1575-1581. doi:10.2105/AJPH.2004.056341.

Axisa, F., P.M. Schmitt, C. Gehin, G. Delhomme, E. McAdams, and A. Dittmar. 2005. "Flexible Technologies and Smart Clothing for Citizen Medicine, Home Healthcare, and Disease Prevention." *IEEE Transactions on Information Technology in Biomedicine* 9 (3) (September): 325-336. doi:10.1109/TITB.2005.854505.

Ball, Kylie, Anna Timperio, and David Crawford. 2006. "Understanding environmental influences on nutrition and physical activity behaviors: where should we look and what should we count?" *International Journal of Behavioral Nutrition and Physical Activity* 3 (1): 33. doi:10.1186/1479-5868-3-33.

Bandura, Albert. 1991. "Social cognitive theory of self-regulation." *Organizational Behavior and Human Decision Processes* 50 (2) (December): 248-287. doi:10.1016/0749-5978(91)90022-L.

Bandura, Albert, and Dale H. Schunk. 1981. "Cultivating competence, self-efficacy, and intrinsic interest through proximal self-motivation." *Journal of Personality and Social Psychology* 41 (3): 586-598. doi:10.1037/0022-3514.41.3.586.

Bannister, Justin. 2010. NMSU: College of Business – Eye on Research: NMSU researchers shop around for healthier grocery carts. *Eye on Research: NMSU researchers shop around for healthier grocery carts*. July 19. <http://business.nmsu.edu/2010/07/19/eye-on-research-nmsu-researchers-shop-around-for-healthier-grocery-carts/>.

- Bell, Rick, and Patricia Pliner. 2003. "Time to eat: the relationship between the number of people eating and meal duration in three lunch settings." *Appetite* 41 (2) (October): 215-218. doi:10.1016/S0195-6663(03)00109-0.
- Bellisle, France, and Anne-Marie Dalix. 2001. "Cognitive restraint can be offset by distraction, leading to increased meal intake in women." *The American Journal of Clinical Nutrition* 74 (2): 197 -200.
- Bickmore, Timothy, Daniel Mauer, Francisco Crespo, and Thomas Brown. 2007. Persuasion, Task Interruption and Health Regimen Adherence. In *Persuasive technology: Second International Conference on Persuasive Technology, PERSUASIVE 2007, Palo Alto, CA, USA, April 26-27, 2007 : revised selected papers*, ed. Yvonne de Kort, Wijnand IJsselstein, and Cees Midden. Springer.
- BodyMedia, Inc. 2011. BodyMedia FIT Armband - holistic weight management system | BodyMedia. *BodyMedia FIT Armband - holistic weight management system* | BodyMedia. <http://www.bodymedia.com/What-is-BodyMedia-FIT>.
- Bronfenbrenner, Urie. 1981. *The ecology of human development*. Harvard University Press, September 15.
- Brownell, Kelly, and Katherine Battle Horgen. 2004. *Food Fight: The Inside Story of The Food Industry, America's Obesity Crisis, and What We Can Do About It*. 1st ed. McGraw-Hill, September 16.
- Brownell, Kelly, Rogan Kersh, David S. Ludwig, Robert C. Post, Rebecca M. Puhl, Marlene B. Schwartz, and Walter C. Willett. 2010. "Personal Responsibility And Obesity: A Constructive Approach To A Controversial Issue." *Health Affairs* 29 (3) (March 1): 379 -387. doi:10.1377/hlthaff.2009.0739.
- Caldwell, Clare, and Sally A Hibbert. 2002. "The influence of music tempo and musical preference on restaurant patrons' behavior." *Psychology and Marketing* 19 (11) (November 1): 895-917. doi:10.1002/mar.10043.
- Casa, Douglas J. 1999. "Exercise in the Heat. II. Critical Concepts in Rehydration, Exertional Heat Illnesses, and Maximizing Athletic Performance." *Journal of Athletic Training* 34 (3): 253-262.
- Chang, Virginia W., and Nicholas A. Christakis. 2002. "Medical modelling of obesity: a transition from action to experience in a 20th century American medical textbook." *Sociology of Health & Illness* 24 (2): 151-177. doi:10.1111/1467-9566.00289.
- Chatterjee, Samir, and Alan Price. 2009. "Healthy Living with Persuasive Technologies: Framework, Issues, and Challenges." *Journal of the American Medical Informatics Association : JAMIA* 16 (2): 171-178. doi:10.1197/jamia.M2859.
- Consolvo, Sunny, David W McDonald, Tammy Toscos, Mike Y Chen, Jon Froehlich, Beverly Harrison, Predrag Klasnja, et al. 2008. Activity sensing in the wild: a field trial of ubifit garden. In *Proceeding of the twenty-sixth annual SIGCHI conference on Human factors in computing systems*, 1797-1806. CHI '08. New York, NY, USA: ACM. doi:10.1145/1357054.1357335.
- Csikszentmihalyi, Mihaly. 2008. *Flow: The Psychology of Optimal Experience*. HarperCollins, June 23.
- Deterding, Sebastian. 2009. Persuasive Design or The Fine Art of Separating People from Their Bad Behaviours - Online. *Persuasive Design or The Fine Art of Separating People from Their Bad Behaviours - Online*. June. <http://www.slideshare.net/dings/persuasive-web-design-how-to-separate-users-from-their-bad-behaviours>.

- Ding, Dan, Hsin-Yi Liu, Rosemarie Cooper, Rory A Cooper, Asim Smailagic, and Dan Siewiorek. 2010. "Virtual coach technology for supporting self-care." *Physical Medicine and Rehabilitation Clinics of North America* 21 (1) (February): 179-194. doi:10.1016/j.pmr.2009.07.012.
- Duggan, Andrew. 1988. "Energy cost of stepping in protective clothing ensembles." *Ergonomics* 31 (1): 3. doi:10.1080/00140138808966645.
- Flegal, K. M., M. D. Carroll, C. L. Ogden, and L. R. Curtin. 2010. "Prevalence and Trends in Obesity Among US Adults, 1999-2008." *JAMA: The Journal of the American Medical Association* 303 (3) (January): 235-241. doi:10.1001/jama.2009.2014.
- Fogg, B. J. 2002. "Persuasive technology: using computers to change what we think and do." *Ubiquity* 2002 (December): 2.
- Glanz, Karen, Barbara K. Rimer, and K. Viswanath. 2008. *Health Behavior and Health Education: Theory, Research, and Practice*. John Wiley and Sons, July 28.
- Glanz, Karen, James F Sallis, Brian E Saelens, and Lawrence D Frank. 2005. "Healthy nutrition environments: concepts and measures." *American Journal of Health Promotion: AJHP* 19 (5) (June): 330-333, ii.
- Herman, C. Peter, Deborah A. Roth, and Janet Polivy. 2003. "Effects of the Presence of Others on Food Intake: A Normative Interpretation." *Psychological Bulletin* 129 (6): 873-886. doi:10.1037/0033-2909.129.6.873.
- Horowitz, Carol R., Kathryn A. Colson, Paul L. Hebert, and Kristie Lancaster. 2004. "Barriers to Buying Healthy Foods for People With Diabetes: Evidence of Environmental Disparities." *Am J Public Health* 94 (9) (September 1): 1549-1554. doi:10.2105/AJPH.94.9.1549.
- Hsieh, Gary, Ian Li, Anind Dey, Jodi Forlizzi, and Scott E Hudson. 2008. Using visualizations to increase compliance in experience sampling. In *Proceedings of the 10th international conference on Ubiquitous computing*, 164-167. UbiComp '08. New York, NY, USA: ACM. doi:10.1145/1409635.1409657.
- Jansen, Anita, and Marcel van den Hout. 1991. "On being led into temptation: 'Counterregulation' of dieters after smelling a 'preload'." *Addictive Behaviors* 16 (5): 247-253. doi:10.1016/0306-4603(91)90017-C.
- Kahn, Barbara E., and Brian Wansink. 2004. "The Influence of Assortment Structure on Perceived Variety and Consumption Quantities." *The Journal of Consumer Research* 30 (4) (March 1): 519-533.
- King, Diane. 2010. Evaluating multi-level healthy eating interventions: Lessons from LiveWell Colorado presented at the 2010 American Public Health Association annual meeting, November, Denver, CO. <http://www.re-aim.org/PDFs/LiveWellpresentation.pdf>.
- Lawton, M. Powell. 1988. Behavior-Relevant Ecological Factors. In *Social Structure and Aging: Psychological Processes*, ed. K. Warner Schaie and Carmi Schooler. illustrated edition. Psychology Press, November 1. <http://books.google.com/books?id=aI7UTeFqdSEC&lpq=PA57&ots=Mip1QmVCvJ&dq=Competence%2C%20environmental%20press%2C%20and%20the%20adaptation%20of%20older%20people&lr=&pg=P-A60#v=onepage&q=Competence,%20environmental%20press,%20and%20the%20adaptation%20of%20older%20people&f=false>.

- LeBlanc, J A. 1957. "Effect of environmental temperature on energy expenditure and caloric requirements." *Journal of Applied Physiology* 10 (2) (March): 281-283.
- Lehrer, Jonah. 2009. *How We Decide*. 1st ed. Houghton Mifflin Harcourt, February 9.
- Li, Ian. 2011. Personal Informatics. *Personal Informatics*. <http://personalinformatics.org/>.
- Locke, Edwin A., Gary P. Latham, Ken J. Smith, and Robert E. Wood. 1990. *A Theory of Goal Setting & Task Performance*. Prentice Hall College Div, January.
- Lockton, Dan, David Harrison, and Neville Stanton. 2008. Design with Intent: Persuasive Technology in a Wider Context. In *Persuasive Technology*, ed. Harri Oinas-Kukkonen, Per Hasle, Marja Harjumaa, Katarina Segerstahl, and Peter Øhrstrøm, 5033:274-278. Berlin, Heidelberg: Springer Berlin Heidelberg. <http://www.springerlink.com/content/m16118421r28717x/>.
- Mahnke, Frank H. 1996. *Color, Environment, and Human Response: An Interdisciplinary Understanding of Color and Its Use as a Beneficial Element in the Design of the Architectural Environment*. John Wiley and Sons.
- McLeroy, Kenneth R., Daniel Bibeau, Allan Steckler, and Karen Glanz. 1988. "An Ecological Perspective on Health Promotion Programs." *Health Education & Behavior* 15 (4) (December 1): 351 -377. doi:10.1177/109019818801500401.
- Murray, Henry Alexander. 1938. *Explorations in personality: a clinical and experimental study of fifty men of college age, by the workers at the Harvard psychological clinic*. Wiley.
- Nike, Inc. 2011. Nike Running - What Is Nike+? *Nike Running - What Is Nike+?* http://nikerunning.nike.com/nikeos/p/nikeplus/en_US/what_is_nike_plus.
- OpenIDEO. OpenIDEO - How can we raise kids' awareness of the benefits of fresh food so they can make better choices? - Winning Concepts - Evaluation. *OpenIDEO – How can we raise kids' awareness of the benefits of fresh food so they can make better choices? – Winning Concepts – Evaluation*. <http://openideo.com/open/how-might-we-give-children-the-knowledge-to-eat-better/winner-announced/shopping-cart-provokes-healthier-purchases/>.
- Ory, M. G., P. J. Jordan, and T. Bazzarre. 2002. "The Behavior Change Consortium: setting the stage for a new century of health behavior-change research." *Health Education Research* 17 (5) (October 1): 500 -511. doi:10.1093/her/17.5.500.
- Polivy, Janet, C. Peter Herman, Jonathan C. Younger, and Barbara Erskine. 1979. "Effects of a model on eating behavior: The induction of a restrained eating style1." *Journal of Personality* 47 (1) (March): 100-117. doi:10.1111/j.1467-6494.1979.tb00617.x.
- Prochaska, James O., and Carlo C. Diclemente. 1994. *The Transtheoretical Approach: Crossing Traditional Boundaries of Therapy*. Krieger Pub Co, January.
- Rollnick, S., C. C. Butler, P. Kinnersley, J. Gregory, and B. Mash. 2010. "Motivational interviewing." *BMJ* 340 (apr27 2) (April): c1900-c1900. doi:10.1136/bmj.c1900.

- Rolls, Barbara J. 2003. "The Supersizing of America: Portion Size and the Obesity Epidemic." *Nutrition Today* 38 (2) (April): 42-53.
- Ryan, Richard M., and Edward L. Deci. 2000. "Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being." *American Psychologist* 55 (1): 68-78. doi:10.1037/0003-066X.55.1.68.
- Sallis, J. F., and N. G. Owen. 2002. Ecological models of health behaviour. In *Health Behavior and Health Education: Theory, Research, and Practice*, ed. Karen Glanz, B.K. Rimer, and F.M. Lewis. Third. San Francisco: Jossey-Bass. <http://espace.library.uq.edu.au/view/UQ:68927>.
- Sobal, Jeffery, and Brian Wansink. 2007. "Kitchenscapes, Tablesapes, Platescapes, and Foodscapes: Influences of Microscale Built Environments on Food Intake." *Environment and Behavior* 39 (1) (January 1): 124-142. doi:10.1177/0013916506295574.
- Sommer, Robert. 1969. *Personal Space. The Behavioral Basis of Design*. Prentice-Hall, Inc., Englewood Cliffs, New Jersey (\$2.75).
- Stevenson, Richard J., John Prescott, and Robert A. Boakes. 1999. "Confusing Tastes and Smells: How Odours can Influence the Perception of Sweet and Sour Tastes." *Chemical Senses* 24 (6) (December 1): 627 -635.
- Stokols, D. 1996. "Translating social ecological theory into guidelines for community health promotion." *American Journal of Health Promotion: AJHP* 10 (4) (April): 282-298.
- Story, Mary, Karen M. Kaphingst, Ramona Robinson-O'Brien, and Karen Glanz. 2008. "Creating Healthy Food and Eating Environments: Policy and Environmental Approaches." *Annual Review of Public Health* 29 (1) (April): 253-272. doi:10.1146/annurev.publhealth.29.020907.090926.
- Stroebele, Nanette, and John De Castro. 2004. "Effect of ambience on food intake and food choice." *Nutrition* 20 (9) (September): 821-838. doi:10.1016/j.nut.2004.05.012.
- Swinburn, Boyd, Garry Egger, and Fezeela Raza. 1999. "Dissecting Obesogenic Environments: The Development and Application of a Framework for Identifying and Prioritizing Environmental Interventions for Obesity." *Preventive Medicine* 29 (6) (December): 563-570. doi:10.1006/pmed.1999.0585.
- Teitlebaum, A., and R. Goldman. 1972. "Increased energy cost with multiple clothing layers." *Journal of Applied Physiology* 32 (6) (June 1): 743-744.
- Wansink, Brian. 1994. "Antecedents and Mediators of Eating Bouts." *Family and Consumer Sciences Research Journal* 23 (2) (December): 166-182. doi:10.1177/1077727X94232005.
- . 1996. "Can Package Size Accelerate Usage Volume?" *The Journal of Marketing* 60 (3) (July 1): 1-14. doi:10.2307/1251838.
- . 2004. "Environmental Factors That Increase the Food Intake and Consumption Volume of Unknowing Consumers." *Annual Review of Nutrition* 24 (1): 455-479.
- . 2006. *Mindless Eating: Why We Eat More Than We Think*. 1st ed. New York: Bantam Books.

- Wansink, Brian, and Koert van Ittersum. 2003. "Bottoms Up! The Influence of Elongation on Pouring and Consumption Volume." *Journal of Consumer Research* 30 (3) (December 1): 455-463. doi:10.1086/378621.
- Wansink, Brian, and Junyong Kim. 2005. "Bad Popcorn in Big Buckets: Portion Size Can Influence Intake as Much as Taste." *Journal of Nutrition Education and Behavior* 37 (5): 242-245. doi:10.1016/S1499-4046(06)60278-9.
- Wansink, Brian, J E Painter, and Y-K Lee. 2006. "The office candy dish: proximity's influence on estimated and actual consumption." *Int J Obes* 30 (5) (January 17): 871-875.
- Wansink, Brian, and Jeffery Sobal. 2007. "Mindless Eating: The 200 Daily Food Decisions We Overlook." *Environment and Behavior* 39 (1) (January 1): 106-123.
- Wansink, Brian, K Vanittersum, and J Painter. 2006. "Ice Cream Illusions Bowls, Spoons, and Self-Served Portion Sizes." *American Journal of Preventive Medicine* 31 (3) (September): 240-243. doi:10.1016/j.amepre.2006.04.003.
- Wells, N. M., S. P. Ashdown, E. H. S. Davies, F. D. Cowett, and Y. Yang. 2007. "Environment, Design, and Obesity: Opportunities for Interdisciplinary Collaborative Research." *Environment and Behavior* 39 (1) (January): 6-33. doi:10.1177/0013916506295570.
- Westerterp-Plantenga, Margriet S. 1999. "Effects of Extreme Environments on Food Intake in Human Subjects." *Proceedings of the Nutrition Society* 58 (04): 791-798. doi:10.1017/S002966519900107X.
- Wilson, Terence, and Tanya R. Schlam. 2004. "The transtheoretical model and motivational interviewing in the treatment of eating and weight disorders." *Clinical Psychology Review* 24 (3) (July): 361-378. doi:10.1016/j.cpr.2004.03.003.

Additional Sources and Related Works

Aarts, Henk, Ruud Custers, and Hans Marien. 2008. "Preparing and Motivating Behavior Outside of Awareness." *Science* 319 (5870) (March 21): 1639. doi:10.1126/science.1150432.

Ajzen, Icek. 1991. "The theory of planned behavior." *Organizational Behavior and Human Decision Processes* 50 (2) (December): 179-211. doi:10.1016/0749-5978(91)90020-T.

Alexander, Christopher, Sara Ishikawa, and Murray Silverstein. 1977. *A Pattern Language: Towns, Buildings, Construction*. Oxford University Press.

Andrew, Adrienne, Gaetano Borriello, and James Fogarty. 2007. "Toward a Systematic Understanding of Suggestion Tactics." *In Persuasive Technologies, International Conference on Persuasive Technology for Human Well-Being, PERSUASIVE 2007*. <http://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.66.1028>.

Anon. Ecological models of health behaviour. Book Chapter. <http://espace.library.uq.edu.au/view/UQ:68927>.

Anon. The Capital Ambition guide to behaviour change. <http://www.youngfoundation.org/our-work/the-capital-ambition-guide-behaviour-change>.

Ariely, Dan, Uri Gneezy, George Loewenstein, and Nina Mazar. 2009. "Large Stakes and Big Mistakes." *Review of Economic Studies* 76 (2) (April 1): 451-469. doi:10.1111/j.1467-937X.2009.00534.x.

Austin, S. Bryn, Steven J. Melly, Brisa N. Sanchez, Aarti Patel, Stephen Buka, and Steven L. Gortmaker. 2005. "Clustering of Fast-Food Restaurants Around Schools: A Novel Application of Spatial Statistics to the Study of Food Environments." *Am J Public Health* 95 (9) (September 1): 1575-1581. doi:10.2105/AJPH.2004.056341.

Avena, Nicole M, Pedro Rada, and Bartley G Hoebel. 2008. "Evidence for sugar addiction: behavioral and neurochemical effects of intermittent, excessive sugar intake." *Neuroscience and Biobehavioral Reviews* 32 (1): 20-39. doi:10.1016/j.neubiorev.2007.04.019.

Axisa, F., P.M. Schmitt, C. Gehin, G. Delhomme, E. McAdams, and A. Dittmar. 2005. "Flexible Technologies and Smart Clothing for Citizen Medicine, Home Healthcare, and Disease Prevention." *IEEE Transactions on Information Technology in Biomedicine* 9 (3) (September): 325-336. doi:10.1109/TITB.2005.854505.

Ayala, Guadalupe Xochitl. 2006. "An experimental evaluation of a group- versus computer-based intervention to improve food portion size estimation skills." *Health Education Research* 21 (1) (February): 133 -145. doi:10.1093/her/cyh049.

- Ayduk, Özlem, and Ethan Kross. 2010. "From a Distance: Implications of Spontaneous Self-Distancing for Adaptive Self-Reflection." *Journal of Personality and Social Psychology* 98 (5) (May): 809-829. doi:10.1037/a0019205.
- Ball, Kylie, Anna Timperio, and David Crawford. 2006. "Understanding environmental influences on nutrition and physical activity behaviors: where should we look and what should we count?" *International Journal of Behavioral Nutrition and Physical Activity* 3 (1): 33. doi:10.1186/1479-5868-3-33.
- Bandura, Albert. 1991. "Social cognitive theory of self-regulation." *Organizational Behavior and Human Decision Processes* 50 (2) (December): 248-287. doi:10.1016/0749-5978(91)90022-L.
- Bandura, Albert, and Dale H. Schunk. 1981. "Cultivating competence, self-efficacy, and intrinsic interest through proximal self-motivation." *Journal of Personality and Social Psychology* 41 (3): 586-598. doi:10.1037/0022-3514.41.3.586.
- Bannister, Justin. 2010. NMSU: College of Business – Eye on Research: NMSU researchers shop around for healthier grocery carts. *Eye on Research: NMSU researchers shop around for healthier grocery carts*. July 19. <http://business.nmsu.edu/2010/07/19/eye-on-research-nmsu-researchers-shop-around-for-healthier-grocery-carts/>.
- Bechtel, Robert B., Arza Churchman, and Arzah Ts'erts'man. 2002. *Handbook of environmental psychology*. John Wiley and Sons.
- Bell, Genevieve, Mark Blythe, and Phoebe Sengers. 2005. "Making by Making Strange: Defamiliarization and the Design of Domestic Technologies." *ACM TRANS. COMPUT.-HUM. INTERACT* 12: 149--173.
- Bell, Rick, and Herbert Meiselman. 1995. The role of eating environments in determining food choice. In *Food choice and the consumer*, ed. David Marshall, 292-310. Springer, December 1.
- Bell, Rick, and Patricia Pliner. 2003. "Time to eat: the relationship between the number of people eating and meal duration in three lunch settings." *Appetite* 41 (2) (October): 215-218. doi:10.1016/S0195-6663(03)00109-0.
- Bellisle, France, and Anne-Marie Dalix. 2001. "Cognitive restraint can be offset by distraction, leading to increased meal intake in women." *The American Journal of Clinical Nutrition* 74 (2): 197 -200.
- Bernier, Michel, and Jacqueline Avar. 1986. "Self-efficacy, outcome, and attrition in a weight-reduction program." *Cognitive Therapy and Research* 10 (3) (June): 319-338. doi:10.1007/BF01173469.
- Bickmore, Timothy, Daniel Mauer, Francisco Crespo, and Thomas Brown. 2007. Persuasion, Task Interruption and Health Regimen Adherence. In *Persuasive technology: Second International Conference on Persuasive Technology, PERSUASIVE 2007, Palo Alto, CA, USA, April 26-27, 2007: revised selected papers*, ed. Yvonne de Kort, Wijnand IJsselstein, and Cees Midden. Springer.
- Blake, Christine E., Carole A. Bisogni, Jeffery Sobal, Margaret Jastran, and Carol M. Devine. 2008a. "How adults construct evening meals. Scripts for food choice." *Appetite* 51 (3) (November): 654-662. doi:10.1016/j.appet.2008.05.062.
- . 2008b. "How adults construct evening meals. Scripts for food choice." *Appetite* 51 (3) (November): 654-662. doi:10.1016/j.appet.2008.05.062.

- Bleich, Sara N., David Cutler, Christopher Murray, and Alyce Adams. 2008a. "Why Is the Developed World Obese?" *Annual Review of Public Health* 29 (1) (April): 273-295. doi:10.1146/annurev.publhealth.29.020907.090954.
- . 2008b. "Why Is the Developed World Obese?" *Annual Review of Public Health* 29 (1) (April): 273-295. doi:10.1146/annurev.publhealth.29.020907.090954.
- BodyMedia, Inc. 2011. BodyMedia FIT Armband - holistic weight management system | BodyMedia. *BodyMedia FIT Armband - holistic weight management system* | BodyMedia. <http://www.bodymedia.com/What-is-BodyMedia-FIT>.
- Booth, Katie M., Megan M. Pinkston, and Walker S. Carlos Poston. 2005a. "Obesity and the Built Environment." *Journal of the American Dietetic Association* 105 (5, Supplement 1) (May): 110-117. doi:10.1016/j.jada.2005.02.045.
- . 2005b. "Obesity and the Built Environment." *Journal of the American Dietetic Association* 105 (5, Supplement 1) (May): 110-117. doi:10.1016/j.jada.2005.02.045.
- Bronfenbrenner, Urie. 1981. *The ecology of human development*. Harvard University Press, September 15.
- Brownell, Kelly, and Katherine Battle Horgen. 2004. *Food Fight: The Inside Story of The Food Industry, America's Obesity Crisis, and What We Can Do About It*. 1st ed. McGraw-Hill, September 16.
- Brownell, Kelly, Rogan Kersh, David S. Ludwig, Robert C. Post, Rebecca M. Puhl, Marlene B. Schwartz, and Walter C. Willett. 2010. "Personal Responsibility And Obesity: A Constructive Approach To A Controversial Issue." *Health Affairs* 29 (3) (March 1): 379 -387. doi:10.1377/hlthaff.2009.0739.
- Brownson, Ross C., Debra Haire-Joshu, and Douglas A. Luke. 2006. "Shaping the Context of Health: A Review of Environmental and Policy Approaches in the Prevention of Chronic Diseases." *Annual Review of Public Health* 27 (1) (April): 341-370. doi:10.1146/annurev.publhealth.27.021405.102137.
- Buchenaus, Marion, and Jane Fulton Suri. 2000. Experience prototyping. In *Proceedings of the 3rd conference on Designing interactive systems: processes, practices, methods, and techniques*, 424-433. New York City, New York, United States: ACM. doi:10.1145/347642.347802. <http://portal.acm.org/citation.cfm?id=347642.347802>.
- Burleson, Winslow. 2005a. "Developing creativity, motivation, and self-actualization with learning systems." *International Journal of Human-Computer Studies* 63 (4-5) (October): 436-451. doi:10.1016/j.ijhcs.2005.04.007.
- . 2005b. "Developing creativity, motivation, and self-actualization with learning systems." *International Journal of Human-Computer Studies* 63 (4-5) (October): 436-451. doi:10.1016/j.ijhcs.2005.04.007.
- Byrne, Sahara, Gay, Geri, Pollak, J.P., Retelny, Daniela, Gonzales, Amy, and Wansink, Brian. When I Eat So Bad, My Pet Looks So Sad: An Initial Test of the Persuasive Effect of Feedback From a Mobile Phone Virtual Pet on Adolescent Breakfast Intake.
- Caldwell, Clare, and Sally A Hibbert. 2002. "The influence of music tempo and musical preference on restaurant patrons' behavior." *Psychology and Marketing* 19 (11) (November 1): 895-917. doi:10.1002/mar.10043.

Casa, Douglas J. 1999. "Exercise in the Heat. II. Critical Concepts in Rehydration, Exertional Heat Illnesses, and Maximizing Athletic Performance." *Journal of Athletic Training* 34 (3): 253-262.

CDC.gov. Obesity and Overweight for Professionals: Data and Statistics: U.S. Obesity Trends | DNPAO | CDC. <http://www.cdc.gov/obesity/data/trends.html>.

Center for History and New Media. Zotero Quick Start Guide. http://zotero.org/support/quick_start_guide.

Chang, Virginia W., and Nicholas A. Christakis. 2002. "Medical modelling of obesity: a transition from action to experience in a 20th century American medical textbook." *Sociology of Health & Illness* 24 (2): 151-177. doi:10.1111/1467-9566.00289.

Chatterjee, Samir, and Alan Price. 2009. "Healthy Living with Persuasive Technologies: Framework, Issues, and Challenges." *Journal of the American Medical Informatics Association : JAMIA* 16 (2): 171-178. doi:10.1197/jamia.M2859.

Consolvo, Sunny, David W McDonald, Tammy Toscos, Mike Y Chen, Jon Froehlich, Beverly Harrison, Predrag Klasnja, et al. 2008. Activity sensing in the wild: a field trial of ubifit garden. In *Proceeding of the twenty-sixth annual SIGCHI conference on Human factors in computing systems*, 1797-1806. CHI '08. New York, NY, USA: ACM. doi:10.1145/1357054.1357335.

Cordain, Loren, S Boyd Eaton, Anthony Sebastian, Neil Mann, Staffan Lindeberg, Bruce A Watkins, James H O'Keefe, and Janette Brand-Miller. 2005. "Origins and evolution of the Western diet: health implications for the 21st century." *Am J Clin Nutr* 81 (2) (February 1): 341-354.

Csikszentmihalyi, Mihaly. 2008. *Flow: The Psychology of Optimal Experience*. HarperCollins, June 23.

Cummins, Steven, and Sally Macintyre. 2002. "A Systematic Study of an Urban Foodscape: The Price and Availability of Food in Greater Glasgow." *Urban Stud* 39 (11) (October 1): 2115-2130. doi:10.1080/0042098022000011399.

Dan Ariely, and Michael I. Norton. 2009. "Conceptual Consumption." *Annual Review of Psychology* 60 (January): 475-499.

Deci, Edward L., Richard Koestner, and Richard M. Ryan. 1999. "A meta-analytic review of experiments examining the effects of extrinsic rewards on intrinsic motivation." *Psychological Bulletin* 125 (6): 627-668. doi:10.1037/0033-2909.125.6.627.

Deterding, Sebastian. 2009. Persuasive Design or The Fine Art of Separating People from Their Bad Behaviours - Online. *Persuasive Design or The Fine Art of Separating People from Their Bad Behaviours - Online*. June. <http://www.slideshare.net/dings/persuasive-web-design-how-to-separate-users-from-their-bad-behaviours>.

Ding, Dan, Hsin-Yi Liu, Rosemarie Cooper, Rory A Cooper, Asim Smailagic, and Dan Siewiorek. 2010. "Virtual coach technology for supporting self-care." *Physical Medicine and Rehabilitation Clinics of North America* 21 (1) (February): 179-194. doi:10.1016/j.pmr.2009.07.012.

Dourish, Paul. 2004. *Where the Action Is: The Foundations of Embodied Interaction*. New edition. The MIT Press, September 1.

Downs, Julie S, George Loewenstein, and Jessica Wisdom. 2009. "Strategies for Promoting Healthier Food Choices." *American Economic Review* 99 (2) (May): 159-164. doi:10.1257/aer.99.2.159.

Duggan, Andrew. 1988. "Energy cost of stepping in protective clothing ensembles." *Ergonomics* 31 (1): 3. doi:10.1080/00140138808966645.

Engell D., Kramer M., Malafi T., Salomon M., and Leshner L. 1996. "Effects of Effort and Social Modeling on Drinking in Humans." *Appetite* 26: 129-138.

Erickson, Thomas. 1993. From interface to interplace: the spatial environment as a medium for interaction. In *Spatial Information Theory A Theoretical Basis for GIS*, 391-405. http://dx.doi.org/10.1007/3-540-57207-4_26.

Evans, Gary W., and Janetta Mitchell McCoy. 1998. "When Buildings Don't Work: The Role of Architecture in Human Health." *Journal of Environmental Psychology* 18 (1) (March): 85-94. doi:10.1006/jevp.1998.0089.

Evans, Robert G., M. L. Barer, and Theodore R. Marmor. 1994. *Why are some people healthy and others not?: the determinants of health of populations*. Transaction Publishers.

Flegal, K. M., M. D. Carroll, C. L. Ogden, and L. R. Curtin. 2010. "Prevalence and Trends in Obesity Among US Adults, 1999-2008." *JAMA: The Journal of the American Medical Association* 303 (3) (January): 235-241. doi:10.1001/jama.2009.2014.

Flynn, M. A. T., D. A. McNeil, B. Maloff, D. Mutasingwa, M. Wu, C. Ford, and S. C. Tough. 2006a. "Reducing obesity and related chronic disease risk in children and youth: a synthesis of evidence with 'best practice' recommendations." *Obesity Reviews* 7 (s1): 7-66. doi:10.1111/j.1467-789X.2006.00242.x.

———. 2006b. "Reducing obesity and related chronic disease risk in children and youth: a synthesis of evidence with 'best practice' recommendations." *Obesity Reviews* 7 (s1): 7-66. doi:10.1111/j.1467-789X.2006.00242.x.

———. 2006c. "Reducing obesity and related chronic disease risk in children and youth: a synthesis of evidence with 'best practice' recommendations." *Obesity Reviews* 7 (s1): 7-66. doi:10.1111/j.1467-789X.2006.00242.x.

Fogg, B. J. 2002. "Persuasive technology: using computers to change what we think and do." *Ubiquity* 2002 (December): 2.

Fogg, B.J. 2010. 3 Steps to New Habits. *3 Steps to New Habits*. December 30. <http://www.slideshare.net/captology/3-steps-to-new-habits>.

Fogg, BJ. 2009. BJ Fogg on Simplicity on Vimeo. *BJ Fogg on Simplicity on Vimeo*. <http://vimeo.com/2094487>.

Franco, Manuel, Ana V Diez-Roux, Jennifer A Nettleton, Mariana Lazo, Frederick Brancati, Benjamin Caballero, Thom Glass, and Latetia V Moore. 2009a. "Availability of healthy foods and dietary patterns: the Multi-Ethnic Study of Atherosclerosis." *The American Journal of Clinical Nutrition* 89 (3) (March 1): 897 -904. doi:10.3945/ajcn.2008.26434.

———. 2009b. "Availability of healthy foods and dietary patterns: the Multi-Ethnic Study of Atherosclerosis." *The American Journal of Clinical Nutrition* 89 (3) (March 1): 897 -904. doi:10.3945/ajcn.2008.26434.

- Frank, Lawrence D., Martin A. Andresen, and Thomas L. Schmid. 2004. "Obesity relationships with community design, physical activity, and time spent in cars." *American Journal of Preventive Medicine* 27 (2) (August): 87-96. doi:10.1016/j.amepre.2004.04.011.
- French, Simone A, Mary Story, and Robert W Jeffery. 2001. "Environmental Influences on Eating and Physical Activity." *Annual Review of Public Health* 22 (1) (May): 309-335. doi:10.1146/annurev.publhealth.22.1.309.
- Fuhrman, Joel, and Mehmet C. Oz. 2003. *Eat to Live: The Revolutionary Formula for Fast and Sustained Weight Loss*. 1st ed. Little, Brown and Company, January 2.
- Furst, Tanis, Margaret Connors, Carole A. Bisogni, Jeffery Sobal, and Laura Winter Falk. 1996. "Food Choice: A Conceptual Model of the Process," *Appetite* 26 (3) (June): 247-266. doi:10.1006/appe.1996.0019.
- Garner, David M., and Paul E. Garfinkel. 1979. "The Eating Attitudes Test: An Index of the Symptoms of Anorexia Nervosa." *Psychological Medicine* 9 (02): 273-279. doi:10.1017/S0033291700030762.
- Glanz, Karen, Barbara K. Rimer, and K. Viswanath. 2008. *Health Behavior and Health Education: Theory, Research, and Practice*. John Wiley and Sons, July 28.
- Glanz, Karen, James F Sallis, Brian E Saelens, and Lawrence D Frank. 2005. "Healthy nutrition environments: concepts and measures." *American Journal of Health Promotion: AJHP* 19 (5) (June): 330-333, ii.
- Glasgow, Russell E, Lisa M Klesges, David A Dziewaltowski, Sheana S Bull, and Paul Estabrooks. 2004. "The future of health behavior change research: what is needed to improve translation of research into health promotion practice?" *Annals of Behavioral Medicine: A Publication of the Society of Behavioral Medicine* 27 (1) (February): 3-12. doi:10.1207/s15324796abm2701_2.
- Harris, Jennifer L., Jennifer L. Pomeranz, Tim Lobstein, and Kelly D. Brownell. 2009. "A Crisis in the Marketplace: How Food Marketing Contributes to Childhood Obesity and What Can Be Done." *Annual Review of Public Health* 30 (1) (April): 211-225. doi:10.1146/annurev.publhealth.031308.100304.
- Herman, C. Peter, Janet Polivy, and Roxane Silver. 1979. "Effects of an observer on eating behavior: The induction of 'sensible' eating¹." *Journal of Personality* 47 (1): 85-99. doi:10.1111/j.1467-6494.1979.tb00616.x.
- Herman, C. Peter, Deborah A. Roth, and Janet Polivy. 2003. "Effects of the Presence of Others on Food Intake: A Normative Interpretation." *Psychological Bulletin* 129 (6): 873-886. doi:10.1037/0033-2909.129.6.873.
- Horowitz, Carol R., Kathryn A. Colson, Paul L. Hebert, and Kristie Lancaster. 2004. "Barriers to Buying Healthy Foods for People With Diabetes: Evidence of Environmental Disparities." *Am J Public Health* 94 (9) (September 1): 1549-1554. doi:10.2105/AJPH.94.9.1549.
- Hsieh, Gary, Ian Li, Anind Dey, Jodi Forlizzi, and Scott E Hudson. 2008. Using visualizations to increase compliance in experience sampling. In *Proceedings of the 10th international conference on Ubiquitous computing*, 164-167. UbiComp '08. New York, NY, USA: ACM. doi:10.1145/1409635.1409657.

Hutchinson, Hilary, Wendy Mackay, Bo Westerlund, Benjamin B. Bederson, Allison Druin, Catherine Plaisant, Michel Beaudouin-Lafon, et al. 2003. Technology probes: inspiring design for and with families. In *Proceedings of the SIGCHI conference on Human factors in computing systems*, 17-24. Ft. Lauderdale, Florida, USA: ACM. doi:10.1145/642611.642616. <http://portal.acm.org/citation.cfm?id=642611.642616&type=series>.

Inter IKEA Systems B.V. Kitchen | Kitchen cabinets | Countertops | IKEA. http://www.ikea.com/us/en/catalog/categories/departments/kitchen/tools/kitchen_rooms_ideas.

Intille, Stephen S. 2002. "Designing a Home of the Future." <http://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.19.742>.

Jansen, Anita, and Marcel van den Hout. 1991. "On being led into temptation: 'Counterregulation' of dieters after smelling a 'preload'." *Addictive Behaviors* 16 (5): 247-253. doi:10.1016/0306-4603(91)90017-C.

Johnson, Paul M, and Paul J Kenny. 2010. "Dopamine D2 receptors in addiction-like reward dysfunction and compulsive eating in obese rats." *Nat Neurosci* advance online publication (March 28). doi:10.1038/nn.2519. <http://dx.doi.org/10.1038/nn.2519>.

Johnson, Rachel K., Lawrence J. Appel, Michael Brands, Barbara V. Howard, Michael Lefevre, Robert H. Lustig, Frank Sacks, Lyn M. Steffen, Judith Wylie-Rosett, and Physical Activity on behalf of the American Heart Association Nutrition Committee of the Council on Nutrition. 2009. "Dietary Sugars Intake and Cardiovascular Health: A Scientific Statement From the American Heart Association." *Circulation* 120 (11) (September 15): 1011-1020.

Just, David R., Lisa Mancino, and Brian Wansink. 2007. "Could Behavioral Economics Help Improve Diet Quality for Nutrition Assistance Program Participants?" *SSRN eLibrary* (June 1). http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1084548.

Just, David R., and Collin R. Payne. 2009. "Obesity: Can Behavioral Economics Help?" *Annals of Behavioral Medicine* 38 (S1) (September): 47-55. doi:10.1007/s12160-009-9119-2.

Just, David, and Collin Payne. 2009. "Obesity: Can Behavioral Economics Help?" *Annals of Behavioral Medicine* 38 (0) (December 1): 47-55. doi:10.1007/s12160-009-9119-2.

Kahn, Barbara E., and Brian Wansink. 2004. "The Influence of Assortment Structure on Perceived Variety and Consumption Quantities." *The Journal of Consumer Research* 30 (4) (March 1): 519-533.

Kaplan, Stephen, and Marc G. Berman. 2010. "Directed Attention as a Common Resource for Executive Functioning and Self-Regulation." *Perspectives on Psychological Science* 5 (1) (January 1): 43 -57.

Katz, D.L. 2009. "School-Based Interventions for Health Promotion and Weight Control: Not Just Waiting on the World to Change." *Annual Review of Public Health* 30 (1) (April): 253-272.

Katz, Mitchell H. 2009. "Structural Interventions for Addressing Chronic Health Problems." *JAMA* 302 (6) (August 12): 683-685. doi:10.1001/jama.2009.1147.

King, Diane. 2010. Evaluating multi-level healthy eating interventions: Lessons from LiveWell Colorado presented at the 2010 American Public Health Association annual meeting, November, Denver, CO. <http://www.re-aim.org/PDFs/LiveWellpresentation.pdf>.

- Kirk, S. F. L., T. L. Penney, and T.-L. F. McHugh. 2010. "Characterizing the obesogenic environment: the state of the evidence with directions for future research." *Obesity Reviews* 11 (2): 109-117.
- Krukowski, Rebecca, Delia West, Jean Harvey-Berino, and T. Elaine Prewitt. "Neighborhood Impact on Healthy Food Availability and Pricing in Food Stores." *Journal of Community Health*. doi:10.1007/s10900-010-9224-y.
- Lawrence, D L, and S M Low. 1990. "The Built Environment and Spatial Form." *Annual Review of Anthropology* 19 (1) (October): 453-505. doi:10.1146/annurev.an.19.100190.002321.
- Lawton, M. Powell. 1988. Behavior-Relevant Ecological Factors. In *Social Structure and Aging: Psychological Processes*, ed. K. Warner Schaie and Carmi Schooler. illustrated edition. Psychology Press, November 1. <http://books.google.com/books?id=aI7UTeFqdSEC&clpg=PA57&ots=Mip1QmVCvJ&dq=Competence%2C%20environmental%20press%2C%20and%20the%20adaptation%20of%20older%20people&lr=&pg=P-A60#v=onepage&q=Competence,%20environmental%20press,%20and%20the%20adaptation%20of%20older%20people&f=false>.
- LeBlanc, J A. 1957. "Effect of environmental temperature on energy expenditure and caloric requirements." *Journal of Applied Physiology* 10 (2) (March): 281-283.
- Lehrer, Jonah. 2009. *How We Decide*. 1st ed. Houghton Mifflin Harcourt, February 9.
- Li, Ian. 2011. Personal Informatics. *Personal Informatics*. <http://personalinformatics.org/>.
- Lieux, E M, and C K Manning. 1992. "Evening meals selected by college students: impact of the foodservice system." *Journal of the American Dietetic Association* 92 (5) (May): 560-566.
- Locke, Edwin A., Gary P. Latham, Ken J. Smith, and Robert E. Wood. 1990. *A Theory of Goal Setting & Task Performance*. Prentice Hall College Div, January.
- Lockton, Dan, David Harrison, and Neville Stanton. 2008. Design with Intent: Persuasive Technology in a Wider Context. In *Persuasive Technology*, ed. Harri Oinas-Kukkonen, Per Hasle, Marja Harjuma, Katarina Segerstahl, and Peter Øhrstrøm, 5033:274-278. Berlin, Heidelberg: Springer Berlin Heidelberg. <http://www.springerlink.com/content/m16118421r28717x/>.
- Lyson, Thomas A., and Judy Green. 1999. "The Agricultural Marketscape: A Framework for Sustaining Agriculture and Communities in the Northeast." *Journal of Sustainable Agriculture* 15 (2): 133. doi:10.1300/J064v15n02_12.
- Lyson, Thomas, and Judy Green. 1999. "The Agricultural Marketscape: A Framework for Sustaining Agriculture and Communities in the Northeast." *Journal of Sustainable Agriculture* 15 (2) (December): 133-150. doi:10.1300/J064v15n02_12.
- MacFie, H.J.H., and Herbert L. Meiselman. 1996. *Food Choice Acceptance and Consumption*. 1st ed. Springer, April 30.
- MacIntyre, Blair, Maribeth Gandy, Steven Dow, and Jay David Bolter. 2004. DART: a toolkit for rapid design exploration of augmented reality experiences. In *Proceedings of the 17th annual ACM symposium on User interface software and technology*, 197-206. Santa Fe, NM, USA: ACM. doi:10.1145/1029632.1029669. <http://portal.acm.org/citation.cfm?id=1029669>.

- Mackay, Wendy E., and Anne Laure Fayard. 1999. Video brainstorming and prototyping: techniques for participatory design. In *CHI '99 extended abstracts on Human factors in computing systems*, 118-119. Pittsburgh, Pennsylvania: ACM. doi:10.1145/632716.632790. <http://portal.acm.org/citation.cfm?id=632790>.
- Maes, Pattie. 1994. "Agents that reduce work and information overload." *Communications of the ACM* 37 (7) (July): 30-40. doi:10.1145/176789.176792.
- Mahnke, Frank H. 1996. *Color, Environment, and Human Response: An Interdisciplinary Understanding of Color and Its Use as a Beneficial Element in the Design of the Architectural Environment*. John Wiley and Sons.
- Maibach, Edward, and Debra A. Murphy. 1995. "Self-efficacy in health promotion research and practice: conceptualization and measurement." *Health Education Research* 10 (1) (March 1): 37 -50. doi:10.1093/her/10.1.37.
- Marshall, David. 1993. "Appropriate meal occasions: understanding conventions and exploring situational influences on food choice." *The International Review of Retail, Distribution and Consumer Research* 3 (3): 279. doi:10.1080/09593969300000019.
- Marshall, David, and Rick Bell. 2003. "Meal construction: exploring the relationship between eating occasion and location." *Food Quality and Preference* 14 (1) (January): 53-64. doi:10.1016/S0950-3293(02)00015-0.
- Mateas, Michael, Tony Salvador, Jean Scholtz, and Doug Sorensen. 1996. Engineering ethnography in the home. In *Conference companion on Human factors in computing systems: common ground*, 283-284. Vancouver, British Columbia, Canada: ACM. doi:10.1145/257089.257323. <http://portal.acm.org/citation.cfm?id=257089.257323>.
- McLeroy, Kenneth R., Daniel Bibeau, Allan Steckler, and Karen Glanz. 1988. "An Ecological Perspective on Health Promotion Programs." *Health Education & Behavior* 15 (4) (December 1): 351 -377. doi:10.1177/109019818801500401.
- Meiselman, Herbert. 1996. The contextual basis for food acceptance, food choice, and food intake: The food, the situation, and the individual. In *Food Choice Acceptance and Consumption*, ed. H.J.H. MacFie and Herbert L. Meiselman, 239-263. 1st ed. London: Blackie Academic, April 30.
- Monk, Andrew, Julia Brant, Peter Wright, and John Robinson. 2004. CUHTec: the Centre for Usable Home Technology. In *CHI '04 extended abstracts on Human factors in computing systems*, 1073-1074. Vienna, Austria: ACM. doi:10.1145/985921.985986. <http://portal.acm.org/citation.cfm?id=985921.985986>.
- Morland, Kimberly, Steve Wing, Ana Diez Roux, and Charles Poole. 2002. "Neighborhood characteristics associated with the location of food stores and food service places." *American Journal of Preventive Medicine* 22 (1) (January): 23-29. doi:10.1016/S0749-3797(01)00403-2.
- Morland, Kimberly, Steve Wing, and Ana Diez Roux. 2002. "The Contextual Effect of the Local Food Environment on Residents' Diets: The Atherosclerosis Risk in Communities Study." *Am J Public Health* 92 (11) (November 1): 1761-1768. doi:10.2105/AJPH.92.11.1761.
- Murray, Henry Alexander. 1938. *Explorations in personality: a clinical and experimental study of fifty men of college age, by the workers at the Harvard psychological clinic*. Wiley.

Nestle, Marion. 2007. *Food Politics: How the Food Industry Influences Nutrition, and Health, Revised and Expanded Edition*. 2nd ed. University of California Press, October 15.

Nestle, Marion, and David S. Ludwig. 2010. "Front-of-Package Food Labels: Public Health or Propaganda?" *JAMA* 303 (8) (February 24): 771-772.

Nike, Inc. 2011. Nike Running - What Is Nike+? *Nike Running - What Is Nike+?* http://nikerunning.nike.com/nikeos/p/nikeplus/en_US/what_is_nike_plus.

OpenIDEO. OpenIDEO - How can we raise kids' awareness of the benefits of fresh food so they can make better choices? - Winning Concepts - Evaluation. *OpenIDEO - How can we raise kids' awareness of the benefits of fresh food so they can make better choices? - Winning Concepts - Evaluation*. <http://openideo.com/open/how-might-we-give-children-the-knowledge-to-eat-better/winner-announced/shopping-cart-provokes-healthier-purchases/>.

Ory, M. G., P. J. Jordan, and T. Bazzarre. 2002. "The Behavior Change Consortium: setting the stage for a new century of health behavior-change research." *Health Education Research* 17 (5) (October 1): 500 -511.

Panero, Julius, and Martin Zelnick. 1979a. *Human Dimension and Interior Space: A Source Book of Design Reference Standards*. Watson-Guptill.

———. 1979b. *Human Dimension and Interior Space: A Source Book of Design Reference Standards*. Watson-Guptill.

Patel, K A, and D G Schlundt. 2001. "Impact of moods and social context on eating behavior." *Appetite* 36 (2) (April): 111-118. doi:10.1006/appe.2000.0385.

Paulos, Eric, and Tom Jenkins. 2005. Urban probes: encountering our emerging urban atmospheres. In *Proceedings of the SIGCHI conference on Human factors in computing systems*, 341-350. Portland, Oregon, USA: ACM.

Polivy, Janet, C. Peter Herman, Jonathan C. Younger, and Barbara Erskine. 1979. "Effects of a model on eating behavior: The induction of a restrained eating style1." *Journal of Personality* 47 (1) (March): 100-117. doi:10.1111/j.1467-6494.1979.tb00617.x.

Pomerleau, Joceline, Karen Lock, Cecile Knai, and Martin McKee. 2005. "Interventions Designed to Increase Adult Fruit and Vegetable Intake Can Be Effective: A Systematic Review of the Literature." *J. Nutr.* 135 (10) (October 1): 2486-2495.

Prochaska, J O, and W F Velicer. 1997. "The transtheoretical model of health behavior change." *American Journal of Health Promotion: AJHP* 12 (1) (October): 38-48.

Prochaska, James O., and Carlo C. Diclemente. 1994. *The Transtheoretical Approach: Crossing Traditional Boundaries of Therapy*. Krieger Pub Co, January.

Rapoport, Amos. 1990. *The Meaning of the Built Environment: A Nonverbal Communication Approach*. University of Arizona Press, April 1.

Riebe, Deborah, Bryan Blissmer, Geoffrey Greene, Marjorie Caldwell, Laurie Ruggiero, Kira M. Stillwell, and Claudio R. Nigg. 2005. "Long-term maintenance of exercise and healthy eating behaviors in overweight adults." *Preventive Medicine* 40 (6) (June): 769-778. doi:10.1016/j.ypmed.2004.09.023.

- Riebe, Deborah, Geoffrey W. Greene, Laurie Ruggiero, Kira M. Stillwell, Bryan Blissmer, Claudio R. Nigg, and Marjorie Caldwell. 2003. "Evaluation of a Healthy-Lifestyle Approach to Weight Management." *Preventive Medicine* 36 (1) (January): 45-54. doi:10.1006/pmed.2002.1126.
- Rimal, Rajiv N. 2001. "Longitudinal Influences of Knowledge and Self-efficacy on Exercise Behavior: Tests of a Mutual Reinforcement Model." *Journal of Health Psychology* 6 (1) (January 1): 31 -46.
- Rollnick, S., C. C. Butler, P. Kinnersley, J. Gregory, and B. Mash. 2010. "Motivational interviewing." *BMJ* 340 (apr27 2) (April): c1900-c1900. doi:10.1136/bmj.c1900.
- Rolls, Barbara J, Erin L Morris, and Liane S Roe. 2002a. "Portion size of food affects energy intake in normal-weight and overweight men and women." *Am J Clin Nutr* 76 (6) (December 1): 1207-1213.
- . 2002b. "Portion size of food affects energy intake in normal-weight and overweight men and women." *Am J Clin Nutr* 76 (6) (December 1): 1207-1213.
- Rolls, Barbara J. 2003. "The Supersizing of America: Portion Size and the Obesity Epidemic." *Nutrition Today* 38 (2) (April): 42-53.
- Rolls, Barbara J., and Robert A. Barnett. 2003a. *The Volumetrics Weight-Control Plan*. HarperTorch, January 1.
- . 2003b. *The Volumetrics Weight-Control Plan*. HarperTorch, January 1.
- Rolls, E.T., and J.H. Rolls. 1997. "Olfactory Sensory-Specific Satiety in Humans." *Physiology & Behavior* 61 (3) (March): 461-473. doi:10.1016/S0031-9384(96)00464-7.
- Ross, Robert, and Alison J. Bradshaw. 2009. "The future of obesity reduction: beyond weight loss." *Nature Reviews Endocrinology* 5 (6) (May): 319-326. doi:10.1038/nrendo.2009.78.
- Rothman, Alexander, Paschal Sheeran, and Wendy Wood. 2009. "Reflective and Automatic Processes in the Initiation and Maintenance of Dietary Change." *Annals of Behavioral Medicine* 38 (0) (December 1): 4-17. doi:10.1007/s12160-009-9118-3.
- Ryan, Richard M., and Edward L. Deci. 2000. "Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being." *American Psychologist* 55 (1): 68-78.
- Sallis, J. F., and N. G. Owen. 2002a. Ecological models of health behaviour. In *Health Behavior and Health Education: Theory, Research, and Practice*, ed. Karen Glanz, B.K. Rimer, and F.M. Lewis. Third. San Francisco: Jossey-Bass. <http://espace.library.uq.edu.au/view/UQ:68927>.
- . 2002b. Ecological models of health behaviour. In Jossey-Bass. <http://espace.library.uq.edu.au/view/UQ:68927>.
- Shepherd, R., and M. Raats. 2007a. *The Psychology of Food Choice*. 1st ed. CABI, April 12.
- . 2007b. *The Psychology of Food Choice*. 1st ed. CABI, April 12.
- Sheppard, Eric, and Robert B. McMaster. 2004. *Scale and Geographic Inquiry: Nature, Society, and Method*. Wiley-Blackwell, January 26.

- Siewiorek, Dan, Dan Ding, Hsin-Yi Liu, Rosemarie Cooper, Rory A. Cooper, and Asim Smailagic. Virtual Coach Technology.
- Sobal, Jeffery. 2000. Food System Globalization, Eating Transformations, and Nutrition Transitions. In *Food In Global History*, ed. Raymond Grew, 171-193. Boulder, CO: Westview Press, December 7.
- Sobal, Jeffery, and Carole Bisogni. 2009. "Constructing Food Choice Decisions." *Annals of Behavioral Medicine* 38 (December 1): 37-46. doi:10.1007/s12160-009-9124-5.
- Sobal, Jeffery, Carole A. Bisogni, Carol M. Devine, and Margaret Jastran. 2006. A Conceptual Model of the Food Choice Process over the Life Course. In *The Psychology of Food Choice*, ed. R. Shepherd and M. Raats, 1-18. 1st ed. Cambridge, MA: CABI Publishing.
- Sobal, Jeffery, Laura Kettel Khan, and Carole Bisogni. 1998. "A conceptual model of the food and nutrition system." *Social Science & Medicine* 47 (7) (October 1): 853-863. doi:10.1016/S0277-9536(98)00104-X.
- Sobal, Jeffery, and Brian Wansink. 2007. "Kitchenscapes, Tablesapes, Platescapes, and Foodscapes: Influences of Microscale Built Environments on Food Intake." *Environment and Behavior* 39 (1) (January 1): 124-142.
- Sommer, Robert. 1969. Personal Space. The Behavioral Basis of Design. Prentice-Hall, Inc., Englewood Cliffs, New Jersey (\$2.75).
- Sommer, Robert, and Jodie Steele. 1997. "Social Effects on Duration in Restaurants." *Appetite* 29 (1) (August): 25-30.
- Sorensen, G. 2004. "Worksite-based research and initiatives to increase fruit and vegetable consumption." *Preventive Medicine* 39 (September): 94-100. doi:10.1016/j.ypmed.2003.12.020.
- Stevenson, Richard J., John Prescott, and Robert A. Boakes. 1999. "Confusing Tastes and Smells: How Odours can Influence the Perception of Sweet and Sour Tastes." *Chemical Senses* 24 (6) (December 1): 627 -635.
- Stokols, D. 1996. "Translating social ecological theory into guidelines for community health promotion." *American Journal of Health Promotion: AJHP* 10 (4) (April): 282-298.
- Stokols, Daniel, and Irwin Altman. 1991. *Handbook of Environmental Psychology*. Krieger Pub Co, July.
- Stolterman, Erik. The Nature of Design Practice and Implications for Interaction Design Research. *International Journal of Design*. <http://www.ijdesign.org/ojs/index.php/IJDesign/article/view/240/148>.
- Story, Mary, Karen M. Kaphingst, Ramona Robinson-O'Brien, and Karen Glanz. 2008. "Creating Healthy Food and Eating Environments: Policy and Environmental Approaches." *Annual Review of Public Health* 29 (1) (April): 253-272. doi:10.1146/annurev.publhealth.29.020907.090926.
- Strahan, E. 2002. "Subliminal priming and persuasion: Striking while the iron is hot." *Journal of Experimental Social Psychology* 38 (6) (November): 556-568. doi:10.1016/S0022-1031(02)00502-4.
- Stroebele, Nanette, and John De Castro. 2004. "Effect of ambience on food intake and food choice." *Nutrition* 20 (9) (September): 821-838. doi:10.1016/j.nut.2004.05.012.

- Sun Young Lee, Hyunseo Hwang, Robert Hawkins, and Suzanne Pingree. 2008. "Interplay of Negative Emotion and Health Self-Efficacy on the Use of Health Information and Its Outcomes." *Communication Research* 35 (3) (June 1): 358 -381. doi:10.1177/0093650208315962.
- Sutherland, Kim, Jon B. Christianson, and Sheila Leatherman. 2008. "Impact of Targeted Financial Incentives on Personal Health Behavior." *Medical Care Research and Review* 65 (6 suppl) (December 1): 36S -78S. doi:10.1177/1077558708324235.
- Swinburn, Boyd, Garry Egger, and Fezeela Raza. 1999a. "Dissecting Obesogenic Environments: The Development and Application of a Framework for Identifying and Prioritizing Environmental Interventions for Obesity." *Preventive Medicine* 29 (6) (December): 563-570. doi:10.1006/pmed.1999.0585.
- . 1999b. "Dissecting Obesogenic Environments: The Development and Application of a Framework for Identifying and Prioritizing Environmental Interventions for Obesity." *Preventive Medicine* 29 (6) (December): 563-570. doi:10.1006/pmed.1999.0585.
- Tam, Leona, Richard P. Bagozzi, and Jelena Spanjol. "When Planning Is Not Enough: The Self-Regulatory Effect of Implementation Intentions on Changing Snacking Habits." *SSRN eLibrary*. http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1535473.
- Target.com. Plates : Dinnerware : Kitchen + Dining : Target. *Plates : Dinnerware : Kitchen + Dining : Target*. http://www.target.com/Plates-Dinnerware-Kitchen-Dining/b/ref=sc_iw_r_1_1_1042044?node=294130011#/abn?url=%2Fb.json%3Fie%3DUTF8%26node%3D294130011%26searchNodeID%3D294130011%26rh%3Dproduct_site_launch_date%253A-0a%257Claunch-date%253A-1y%257Cavailability%253A-2%257Ctarget_com_category-bin%253ADinner%2520Plate%26releaseID%3D%26searchView%3Dlist%26searchRank%3Dreviewrank%26searchSize%3D30&clear=false.
- Teitlebaum, A., and R. Goldman. 1972. "Increased energy cost with multiple clothing layers." *Journal of Applied Physiology* 32 (6) (June 1): 743-744.
- Thaler, Richard H. 2008. *Nudge*. Yale University Press.
- Vermeer, Willemijn M., Esther Alting, Ingrid H. M. Steenhuis, and Jacob C. Seidell. 2010. "Value for money or making the healthy choice: the impact of proportional pricing on consumers' portion size choices." *Eur J Public Health* 20 (1) (February 1): 65-69. doi:10.1093/eurpub/ckp092.
- Wahl, Hans-Werner. 2006. Introduction: The Person-Environment Perspective in Aging Research. *The Many Faces of Health, Competence and Well-Being in Old Age*. Wansink, Brian. 1994. "Antecedents and Mediators of Eating Bouts." *Family and Consumer Sciences Research Journal* 23 (2) (December): 166-182. doi:10.1177/1077727X94232005.
- . 1996. "Can Package Size Accelerate Usage Volume?" *The Journal of Marketing* 60 (3) (July 1): 1-14. doi:10.2307/1251838.
- . 2004. "Environmental Factors That Increase the Food Intake and Consumption Volume of Unknowing Consumers." *Annual Review of Nutrition* 24 (1): 455-479.
- . 2006. *Mindless Eating: Why We Eat More Than We Think*. 1st ed. New York: Bantam Books.

- Wansink, Brian, and Koert van Ittersum. 2003. "Bottoms Up! The Influence of Elongation on Pouring and Consumption Volume." *Journal of Consumer Research* 30 (3) (December 1): 455-463. doi:10.1086/378621.
- . 2007. "Portion Size Me: Downsizing Our Consumption Norms." *Journal of the American Dietetic Association* 107 (7) (July): 1103-1106. doi:10.1016/j.jada.2007.05.019.
- Wansink, Brian, David R. Just, and Collin R. Payne. 2008. "Mindless Eating and Environmental Cues."
- Wansink, Brian, and Junyong Kim. 2005. "Bad Popcorn in Big Buckets: Portion Size Can Influence Intake as Much as Taste." *Journal of Nutrition Education and Behavior* 37 (5): 242-245. doi:10.1016/S1499-4046(06)60278-9.
- Wansink, Brian, J E Painter, and Y-K Lee. 2006. "The office candy dish: proximity's influence on estimated and actual consumption." *Int J Obes* 30 (5) (January 17): 871-875.
- Wansink, Brian, Collin R. Payne, and Pierre Chandon. 2007. "Internal and External Cues of Meal Cessation: The French Paradox Redux?[ast][ast]." *Obesity* 15 (12) (December): 2920-2924.
- Wansink, Brian, and Jeffery Sobal. 2007. "Mindless Eating: The 200 Daily Food Decisions We Overlook." *Environment and Behavior* 39 (1) (January 1): 106-123.
- Wansink, Brian, K Vanittersum, and J Painter. 2006. "Ice Cream IllusionsBowls, Spoons, and Self-Served Portion Sizes." *American Journal of Preventive Medicine* 31 (3) (September): 240-243. doi:10.1016/j.amepre.2006.04.003.
- Watson, James L. 1997. *Golden Arches East: McDonald's in East Asia*. Stanford University Press, December.
- Wells, N. M., S. P. Ashdown, E. H. S. Davies, F. D. Cowett, and Y. Yang. 2007. "Environment, Design, and Obesity: Opportunities for Interdisciplinary Collaborative Research." *Environment and Behavior* 39 (1) (January): 6-33. doi:10.1177/0013916506295570.
- Westerterp-Plantenga, Margriet S. 1999. "Effects of Extreme Environments on Food Intake in Human Subjects." *Proceedings of the Nutrition Society* 58 (04): 791-798. doi:10.1017/S002966519900107X.
- Wilson, Terence, and Tanya R. Schlam. 2004. "The transtheoretical model and motivational interviewing in the treatment of eating and weight disorders." *Clinical Psychology Review* 24 (3) (July): 361-378. doi:10.1016/j.cpr.2004.03.003.
- Winett, Richard A. 1995. "A framework for health promotion and disease prevention programs." *American Psychologist* 50 (5): 341-350. doi:10.1037/0003-066X.50.5.341.
- Wisdom, Jessica, Julie S. Downs, and George Loewenstein. forthcoming. "Promoting Healthy Choices: Information vs. Convenience." *American Economic Review: Applied Economics*

