

Designing an Inclusive User-Centered Digital Product for Diet Management: Integrating Personalized Dietary Guidance, Emotional Support, and Sustainable Habit Formation

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Abstract

With the rapid development of digital tools, they have been widely applied in the fields of healthcare and dietary management. More people are beginning to use digital tools, represented by mobile applications, to help manage their diets. However, most existing digital tools on the market focus on dietary data recording and tracking features, lacking exploration of the user's pain points that users encountered during long-term diet management.

Many users have the need for dietary management and the awareness of maintaining health, but they encounter various difficulties during long-term practice, resulting in low usability of existing digital tools. For example, users may experience emotional fluctuations during the process of diet management, have diverse dietary backgrounds, and find it difficult to develop long-term dietary habits. Existing digital tools lack exploration of potential design opportunities in these areas. Therefore, the purpose of this research project is to explore the design of an inclusive, user-centered digital health product to help users manage their diets more effectively and comfortably in the long term and improve their health status.

This research adopts a mixed-methods approach, collecting both quantitative data and qualitative data for data analysis. The research team aims to gain a comprehensive understanding of users' experiences, needs, and pain points in the process of diet management. The research methods include an online survey, one-on-one user interviews, and a co-design workshop.

The research found that difficulties faced by users during diet management are multifaceted. After analyzing the research data, the research team identified the following user pain points: difficulty in maintaining healthy eating habits in the long-term, dietary planning consuming users' time and energy, lack of professional nutritional guidance, and emotional eating, etc. Therefore, users' need digital health tools that can provide professional nutritional guidance, personalized dietary support, emotional support, and sustainable habit-building features.

The significance of this research is exploring the potential design direction of digital dietary management tools from the perspective of inclusive and user-centered design. The research findings provide a new perspective for the design concepts and functional design of subsequent digital dietary management products.

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1.0 Introduction

1.1 Project background

In today's fast-paced life, individuals' dietary behaviors are highly affected by busy and irregular lifestyles, the multitude of highly processed foods sold in grocery shops, and the complex dietary environment. In Canada, individuals frequently purchase highly processed foods in grocery stores. When purchasing food ingredients, the person often faces problems with the absence of professional nutritional guidance, confusing nutritional labels, and difficulty in identifying nutritional components. Moreover, international students and immigrant individuals living in Canada have to overcome challenges such as encountering differences in dietary culture and a lack of understanding of the North American food industry. Therefore, those individuals wishing to consciously manage their diet and maintain healthy eating behaviors will encounter a portion of cognitive overload and emotional burden.

The modern food industry frequently adds sugar to processed foods and beverages, meaning that even without actively purchasing high-sugar foods, individuals may still consume excessive amounts of sugar in their daily diet. Much of the nutritional information on food packaging is highly technical and requires consumers to know basic nutritional information as well as ingredient knowledge in order to make a fair judgment. The lack of dietary sugar management can cause a spectrum of health problems, including hyperglycemia and diabetes. However, the awareness of dietary management in public is lacking. Very few high-risk individuals understand the gravity of their condition, find it difficult to develop better lifestyle habits, and cannot sustainably maintain their dietary habit changes.

For international students, immigrants, and other individuals from non-North American backgrounds living in Canada, diet management presents additional cultural and cognitive challenges. Most mainstream diet management apps on the market currently use Western dietary culture as their default reference, failing to adequately consider the difficulties users from diverse cultural backgrounds face in understanding food information. For example, their food databases often lack information on ingredients from multicultural contexts; nutrition labels may not be easily understood, and recipe planning is primarily Western-centric. Consequently, users from diverse cultural backgrounds may have difficulty identifying familiar

food ingredients or recipes and may be unable to accurately determine the nutritional content of unfamiliar ingredients. Individuals may feel confused by the healthy eating recommendations from digital tools when compared to the foods that already comprise their daily diet. Therefore, diet management is not a simple behavior linked to individual health management but rather is directly related to individuals' cultural adaptation, life experience, and knowledge reserves.

This research aims to combine the perspectives of inclusive design and user-centered design to explore a design scheme for an inclusive digital diet management tool that can help individuals manage their diet more effectively and comfortably in their daily lives. This research explores the functional positioning of digital diet management products, from just data tracking to being more emotionally supportive of digital tools. This research will adopt user research, user-centered design, and digital product design methodologies by which digital interfaces, information architecture, and interaction patterns reduce users' cognitive and emotional load during diet management to provide a more sustainable diet management support experience.

In this research, the research team primarily focuses on digital health products through mobile applications, that could assist individuals to record and track dietary intake and nutritional data and support long-term dietary habit formation of individuals with reminders and feedback mechanisms; the digital health products could integrate the personal needs of individuals, such as physical condition, lifestyle, and dietary culture background, to provide more personalized and tailored dietary advice; and the digital health product could provide appropriate emotional support and feasible coping strategies for users who experience emotional eating, mood fluctuations, and plan disruptions..

The research design of this project used an inclusive design as the theoretical and methodological framework. Inclusive design promotes that design should cater to diverse individuals' abilities, experiences, backgrounds, and user needs, not lead to the creation of a standard, homogenized user model. Individuals differ greatly in lifestyle, cultural background, dietary habits, dietary management needs, and professional nutritional knowledge bases. Therefore, the design of digital diet management products should focus not only on a particular user group but also on how to make the design more inclusive to a broader spectrum of users. With this view, this research will start by exploring individuals' behaviors about prioritizing accessibility, cultural adaptability, and emotional comfort, and investigate a digital diet management tool that is closer to individuals' daily lives and diverse situations.

The research is expected to be executed as part of the OCAD University Independent Design

Master's program, which runs until May 2026. This project will be conducted through a mixed-methods research approach with a co-design workshop to better understand users' needs and individual experiences in terms of their diet management practices. The research methodologies of this project comprise: an online questionnaire, one-on-one user interviews, and co-design workshops. Online questionnaires will be adopted to determine the common patterns, challenges, and demand trends of sugar management and daily diet control among users, one-on-one user interviews to investigate the dietary experiences and emotional reactions of participants across their life scenarios, and the co-design workshop to facilitate co-design exploration between researchers and participants to discover design opportunities closer to user needs. Research is mainly carried out on the online platform of Microsoft, designated by OCAD University. This research aims to investigate user experience, the user's pain points, and potential design directions, instead of treatment from a medical perspective or from a nutritional perspective.

1.2 Problem Statements

For many individuals, maintaining consistent eating habits in the long term is often challenging during diet management. Many existing digital diet management products are designed under the assumption that users have strong execution skills and clear health goals. Therefore, their features primarily rely on data recording, goal tracking, progress monitoring, and results of feedback to drive user behavior change. However, users encounter stress, fatigue, time constraints, emotional fluctuations, and social situations during practice, making the diet management process inconsistent. When digital products lack sufficient inclusive support mechanisms, users are prone to frustration and may even gradually abandon their use if their plans are interrupted.

Currently, the main user pain points are that some individuals may be more inclined to consume high-sugar foods when they are feeling stressed and experiencing emotional fluctuations; another group of individuals cannot stay motivated or lack professional nutrition guidance, so they may have difficulty maintaining regular eating habits. If digital health products concentrate on emotional support, behavioral guidance, or recovery mechanisms, they can help individuals obtain long-term improvements in their dietary habits.

Many current digital diet management tools lack an inclusive design perspective. They often implicitly assume a relatively standardized user pattern: users possess some health knowledge, are familiar with mainstream food classification methods, can understand

nutrition labels, have a relatively stable lifestyle, and are willing to invest time in long-term self-monitoring. However, users vary significantly in terms of abilities, experience, cultural background, dietary habits, and professional knowledge. For international students, immigrants, and other users with non-North American dietary backgrounds, these digital products may not provide food databases, dietary advice, or information expression methods that align with their dietary culture; for users who have difficulty understanding information, maintaining consistency, or regulating their emotions, the design of existing digital products may be unfriendly to users. Therefore, many existing digital diet management tools do not actually adequately address the real situations and specific needs of diverse user groups.

The psychological and emotional impact of diet management is often ignored in existing digital diet management products. Users may experience emotional fluctuations, especially regarding sugar intake management. If digital diet management tools overemphasize goal achievement, continuous check-in features, and behavior correction features while neglecting the user's emotional state and psychological resilience, they may unintentionally intensify user stress. Therefore, digital diet management products should consider more about how users feel during the diet management process.

1.3 Research Questions

Main research question

How can we design an inclusive, user-centric digital product to empower individuals with personalized sugar management, integrating modular features for dietary insight, emotional support, and sustainable habit formation to effectively reduce sugar intake and promote long-term metabolic health?

Secondary research questions

How do extrinsic rewards and intrinsic motivation interact over time in sugar management, and how can product designs sustain user engagement?

How do existing products help users recover from slip-ups in sugar consumption? And what reset mechanisms or self-forgiveness strategies are most effective?

The relationship between sugar intake and human emotions, for example: do people crave sugar more when they're feeling down?

How effective are chatbots or online communities in offering emotional support for the process of diet?

How can digital products for sugar reduction avoid triggering user anxiety, obsessive behaviors, or eating disorder tendencies?

How can digital tools assist people who experience mood swings related to their diet or struggles with sugar intake control?

To what extent do mainstream sugar management apps accommodate diverse cultural diets, food databases, and culinary traditions?

How can diet monitoring systems be effectively integrated with emotion care support?

How can multi-sensory interactive functions enhance the accessibility of digital sugar monitoring products?

How can continuous user engagement be maintained in long-term sugar management tools?

1.4 Significance and Purpose

The main purpose of this research is to explore the user pain points and user needs of individuals with diet management. It will investigate users' own experience and use three research methods, including online surveys, one-on-one user interviews, and co-design workshops, for gathering and analyzing data. This would help the research team to understand how users manage their diets on a daily schedule, how they interpret food nutritional information, and which particular cases they are more likely to be confronted with challenges. In this research, researchers extend the investigation of users' needs regarding the functionality of digital health tools and their psychological needs related to diet management. For example, the research will also assess the level of expectation of reward mechanisms, psychological support required in stressful eating scenarios, and users' maintenance of motivation and confidence for long-term diet management.

This research aims to explore the application value of digital products in diet management, and through user research, to transform digital health tools from tracking tools into more integrated support tools. Currently, many digital diet management tools focus on schedule reminders and calorie calculations features, building user experience on input and statistics, but paying less attention to how digital health tools can serve users' life contexts and enhance user experience. This research aims to explore a new design direction for digital diet

management tools, exploring potential design opportunities based on more user-centered feedback methods, gentle reminder mechanisms, and more inclusive interaction features. Digital diet management products should not be merely simple schedule management and calorie-counting tools, but rather comprehensive tools that help users understand their own behavior, gradually cultivate long-term eating habits, and obtain emotional support.

This research aims to address the shortcomings of current digital diet management products in terms of cultural adaptation and inclusivity. International students, immigrants, and other users with non-North American dietary backgrounds living in North American environments often encounter problems such as incomplete ingredient databases, unfamiliarity with food classification methods, and difficulty in understanding nutritional information when using mainstream digital diet management applications. This indicates that existing digital diet management products are often designed with a relatively mainstream and standardized dietary culture context in mind, without fully considering the differences in cultural background, dietary habits, and professional nutritional knowledge among user groups. This research aims to use an inclusive design approach, taking the individual differences of user groups as the starting point for design, to make digital diet management products more inclusive and attentive to the needs of users from diverse cultural backgrounds.

This research aims to explore the concept of support in digital diet management products from a more ethical perspective. The emphasis on the features of check-ins, goal completion, continuous recording, and self-correction in the design of some existing diet management apps may influence users' emotions to some extent. If digital diet management products do not understand users' emotions and stress during the design process, diet management itself may transform from a process of self-regulation into an additional source of psychological stress. Digital diet management products can further increase people's anxiety, self-blame, and burden in diet management. This research aims to consider a non-judgmental and more inclusive design method, facilitating understanding and a supportive response by digital diet management products for users who experience interpretation from their diet plans, mood fluctuations, or emotional eating, rather than further reinforcing their emotional burden.

1.5 Design Scope and Research Limitation

This research explores the design of digital diet management products, focusing on the digital user experience and interactive functionality design related to diet management. The aim of the research is not to develop digital platforms for medical diagnosis or digital health

products for clinical treatment, but rather to explore, from the perspectives of inclusive design and user-centered design, how digital diet management products can help users better understand dietary information, cultivate long-term healthy eating habits, and achieve a more inclusive and sustainable user experience in the diet management process.

This research focuses on mobile application design within the digital tools category, aiming to explore digital interfaces and efficient, user-friendly digital health support tools. The research may involve design directions such as dietary component tracking, personalized dietary advice, emotional support mechanisms, visual information feedback, and multi-sensory interaction, but will not extend to the development of complex hardware devices, integration of physiological monitoring devices, clinical database integration, or the construction of large-scale medical platform systems. The research objective is to explore inclusive digital product solutions, presenting core design concepts and user experience improvement.

While this research attempts to comprehensively understand user needs through diverse research methodologies and propose more inclusive and sustainable design directions, it still has several limitations due to constraints in project duration and resources. This research falls under the category of design research, not medical or public health research. Therefore, it will not conduct clinical validation of the product's actual medical effects in areas such as blood glucose control and metabolic health improvement. This research focuses on improving the user experience of digital health products and exploring interaction design methods, rather than proving the medical effectiveness of digital health products. Therefore, the research results are more suitable for providing design concepts for future digital health product design and should not be directly regarded as health intervention results.

The data for this research came from online questionnaires, user interviews, and co-design workshops. As the number of participants was limited and the sample was concentrated only on a specified group of volunteers from social media platforms, this research is useful for determining trending issues, user experience, and design opportunities among the target user group, but less suitable for wide statistical generalizations. Also, dietary behavior is influenced by cultural, social, economic, and personal experiences; thus, the results of this study should be interpreted as user experience investigations within specific contexts, rather than generalizations of behavioral patterns.

This research is based on inclusive design theory, but the sample size of participants recruited during the actual research process was limited, reflecting limitations in cultural background,

dietary management experience, and knowledge of professional dietary management expertise. This means that while the research aims to address the needs of international students, immigrants, and users from non-North American dietary backgrounds, the user experiences ultimately included may not cover all relevant groups. Therefore, the culturally adapted design approach proposed in this research is more of an exploratory induction based on the experiences of a specific user group, rather than a representation of all multicultural contexts.

This research was constrained by the project timeline and resources, making it impossible to conduct long-term, continuous prototyping, and product iteration. While the design solutions explored in the research can demonstrate core design logic and interaction mechanisms, they are unlikely to be further developed into a mature digital product within this project. This means that this research can explore the preliminary feasibility of potential design directions but cannot fully assess the long-term user experience and actual health impacts during the project period.

The research data obtained from co-design workshops and one-on-one user interviews are highly contextual and subjective. The user's pain points, needs, and design suggestions expressed by participants during the research process may be influenced by the specific context, the participants' current emotional state, and memory biases. While the research data is valuable for identifying potential design opportunities and forming initial design directions, it may not be entirely equivalent to the participants' behavior in long-term use. Further validation of the design directions proposed in this research requires supplementation through long-term product usability testing.

2.0 Theories and Literature Review

The main research question to consider in this research is: How can we design an inclusive, user-centric digital product to empower individuals with personalized sugar management, integrating modular features for dietary insight, emotional support, and sustainable habit formation to effectively reduce sugar intake and promote long-term metabolic health?

Based on my main research question and the secondary research questions mentioned earlier, I selected four relevant potential research areas for literature review and analysis. These three academic areas are: Research on Digital Health Applications for Diet Management, The relationship between eating behavior and emotional state, and Dietary Challenges in the

Canadian Food Environment. By researching these three areas that might be potentially relevant and helpful to my research, and after reading and understanding these previous studies, I gained a new understanding of my research question and formulated the following research directions. Within modern industrialized diets, particularly in North America, many people have experienced difficulty controlling sugar intake in their daily diets. The North American food system has been industrialized, and processed foods are abundant in grocery stores and chain restaurants. Low-cost, processed foods such as sugary beverages, snacks, and convenience foods add to the number of calories consumed. Research has demonstrated how the modern food environment is strongly shaping the eating behavior of individuals. Key determinants of such eating behavior include the availability of grocery foods, food marketing policies, and the price of processed foods. Individuals' intake of sugary drinks and processed foods in North America has also increased due to the environment.

In the Canadian food environment, added sugars were estimated to contribute approximately 11%–13% of total daily energy intake (Brisbois et al., 2014, p. 10). Soft drinks were also identified as one important source of added sugars, particularly among adolescents and adults (Brisbois et al., 2014, pp. 6–7).

Furthermore, excessive sugar intake seems to be strongly influenced by the overall dietary environment, and altering diets requires complex psychological factors. Previous research reports that changing dietary habits is difficult due to the fact that eating behaviors are closely associated with daily routines, emotional experiences, and habits formed over time, making it difficult to enact short-term lifestyle change. Dietary management has also been described as one of the most difficult aspects of diabetes self-management. Health knowledge doesn't determine food choices; food choices are also shaped by ingrained habits, emotions, and lifestyle patterns.

The theory of habit formation addresses why it has often been challenging to decrease sugar intake. The relationship between diet, stress, and mental health is often mutual: changes in diet may influence mood, while psychiatric or emotional difficulties can also lead to changes in eating habits (Bremner et al., 2020, p. 3). Consuming sweets gradually automates eating behaviors, which are often reinforced by emotional comfort and immediate gratification. This eating practice becomes a relatively stable habit that people come to rely on after a while, even though they know that eating sugar is harmful to their health. Physiological factors do not alone account for the consumption of food. How habits develop and persist, then, is affected by stress, mood regulation, and daily routines. One such example is emotional eating. Stress may act through the brain to increase overeating, including binge eating, and reduce exercise, which can contribute to obesity and metabolic syndrome (Bremner et al.,

2020, p. 3). Individuals also gravitate toward sugary foods for temporary comfort or relief from discomfort when facing negative emotions, and this coping mechanism itself further reinforces existing unhealthy eating patterns.

Accordingly, it is important to understand the psychological underpinnings of diet-related behavioral changes, which are necessary to help sustain the long-term change to eating behaviors. Digital health tools can be used to offer continuous feedback and motivation, behavioral assistance, or customized dietary advice to support ongoing, actionable lifestyle changes and make users realize their own eating behaviors and, with time, build healthier habits.

Recent years have seen digital health products gradually become important tools in diet management and chronic disease management, showing significant application potential. Digital tools, including digital health applications, wearable devices, and online health platforms, give users means of recording their dietary behaviors and obtaining personalized feedback. By means of continuous monitoring and real-time feedback, digital products can, to some extent, enhance users' awareness of their own dietary status and behavioral patterns, and support them in forming healthier lifestyles. Digital health products are generally highly convenient to use, can reach a wider user base, and provide more possibilities for inclusive design practices.

Most of the current digital health tools have self-monitoring and recording features (e.g., calorie tracking, food recording, reminders). In diet management application design, personalization, disease-specific education, progress tracking, reminders, and reinforcement based on user feedback have been identified as important features by dietetic interns (Joshi et al., 2019, p. 1). One example of these diet tracking applications, which allow users to record their daily food intake and further assess its nutritional value to help people understand how they eat. Digital tools are also commonly adopted in diabetes management to measure blood sugar levels, track carbohydrate intake, and assist users in conducting daily self-management. Mobile health applications have also been designed for “chronic diseases and associated comorbidities,” as well as “weight loss, fitness advice, nutrition counseling, overall health and wellness” (Joshi et al., 2019, p. 2). These functions can “collectively support disease management and lifestyle behavior change” (Joshi et al., 2019, p. 2).

Existing digital health tools provide abundant information tracking, but their applications in helping to cultivate a dietary habit that continues for the long run are still relatively weak. Existing literature also indicates that the effectiveness of diet-related apps “remains unclear,” and that gaps still exist between user needs and the services provided by these apps (Joshi et al., 2019, p. 2). Therefore, further evidence is needed to understand which combinations of

app features, behavior change techniques, and user input can improve user engagement and intervention effectiveness (Joshi et al., 2019, p. 2). This is due to the lack of adequate functionality on several fronts. Firstly, most digital products do not provide users with continuous aid in fostering long-term habit, which makes it difficult to help the user slowly develop regular, healthy eating patterns. Second, traditional digital products do little to address psychological factors and emotional fluctuations that shape users' eating behaviors (e.g., stress, anxiety, emotional eating). Third, some digital health products still have room for improvement in accessibility and information presentation, which does not effectively help the user to alleviate the cognitive load when confronted with health knowledge, nutritional information, and lifestyle decision-making.

2.0.1 Research Gap

The findings of earlier studies would further help to further the understanding of the study design and the design aspects of the product. While these digital health tools to track diet and manage chronic diseases are increasingly becoming established, some shortcomings in existing research and product design require further attention. While on the one hand, most of the current diet management applications are mainly based on quantitative monitoring functions like calorie counting, blood glucose monitoring, nutritional data statistics, etc., they do not adequately support the psychological mechanisms that influence eating behavior. As stated earlier, rational judgement alone does not determine eating behavior, it is also influenced by mood, habit formation, and the external eating environment.

Digital diet management products that only focus on data recording and monitoring often fail to truly support users in forming long-term and stable behavioral changes. Therefore, related product functions need to incorporate considerations for behavioral support.

Many digital health tools do not adequately address the differences in users' cultural backgrounds, health literacy levels, and daily living conditions. Existing research shows a close link between eating habits and cultural experiences and social environments. When a diet plan is inconsistent with a user's familiar cultural eating habits, users often find it more difficult to adhere to it long-term. This means that existing products, when providing dietary advice, may still suffer from insufficient cultural adaptation, and inadequate consideration for the inclusivity of different user groups.

Existing digital diet management tools often pay less attention to the emotional factors users experience during the diet management process. Emotional eating, stress-related food intake, and psychological motivations all significantly influence an individual's eating behavior and

habit maintenance. Although these factors have been repeatedly mentioned in existing research, the development of products that address this gap remains relatively limited, Co-design may help address this limitation because involving users in the design process can support higher levels of empowerment and engagement (Kwan et al., 2023, p. 2). “the active involvement of users in the creation of innovative products” (Kwan et al., 2023, p. 2).

Based on these shortcomings, this study argues that it is necessary to further explore a digital diet management approach that integrates behavioral insights, emotional support, and inclusive design principles. Addressing these research and design gaps will not only help improve the practical support role of digital tools in diet management but also help drive products from single data tracking tools to more comprehensive behavioral support systems. This research focuses on a core question: how to design an inclusive, user-centric digital product that helps individuals manage sugar intake more effectively through personalized dietary insights, emotional support, and sustainable habit formation mechanisms.

3.0 Methodology

This research employs a mixed-method approach, combining qualitative and quantitative research with a co-design workshop to gain a more comprehensive understanding of the target users' real experiences in dietary management.

The main objective of this research design is to gather and analyze data of different types to understand target users' pain points, user needs, and user behavioral patterns. From this, the research findings will be transformed into a user-centric digital product design solution.

This research design enabling researchers to explore both patterns of user behavior and to gain a better understanding of users' actual experiences and psychological needs in the dietary management process. Using quantitative data collected via online surveys, researchers can learn common user behavior patterns, user difficulties, and user needs. The qualitative data collected in one-on-one interviews allowed researchers to explore users' real experiences and psychological factors more deeply. By undertaking this user research process, the research team aims to understand users' needs and pain points in the process of dietary management, enhancing the completeness and credibility of the design solutions.

A distinctive feature and innovation of this research design is the implementation of a co-design workshop methodology. The research team structured the co-design workshop to maximize interaction with participants and allow them more direct participation in the formation of design concepts. Co-design workshops help researchers collect more contextual and participatory research data and better reflect the principles of user-centered design.

The co-design workshop is a crucial link connecting research findings with design transformation in this study. Based on research data obtained through online surveys and one-on-one user interviews, the research team will work with participants in the co-design workshop to analyze problems, discuss user needs, and explore potential design directions. In this way, research data is no longer confined to the analytical level but can be transformed into design solutions that align with the user needs .

Therefore, this study employs a mixed-method approach, combining quantitative research, qualitative research, and co-design workshops. This research design helps the research team understand users' behavioral patterns, practical difficulties, and potential design needs in diet management from different perspectives and further translates these research findings into user-centered digital product designs.

3.1 Literature Review

The literature review in this study is to help researchers identify research gaps. This research does not simply repeat existing studies on diet management applications or digital health products but rather aims to further explore whether current digital diet management tools, which generally emphasize data recording and behavioral monitoring, are neglecting emotional support, cultural adaptability, comprehensibility, and inclusive design. Through a systematic review of the literature, researchers can clearly see what existing research and products primarily focus on and what they overlook, and from which angles this research can raise new design questions and research value. Therefore, the literature review is not only a process of knowledge accumulation but also a key step in clarifying the entry point and establishing the necessity of this research.

The advantages of this method are mainly reflected in the following aspects. First, a literature review helps researchers quickly establish a holistic understanding of the relevant field in the early stages of a project, reducing the problem of overly vague research directions or a lack of theoretical support. Second, it provides a theoretical reference for subsequent questionnaire design, interview outline development, and co-design workshop activity design, making the setting of research tools more targeted, rather than relying entirely on the researcher's subjective judgment. Third, literature review helps researchers understand the academic background of their research from a more macro perspective, including the connections between digital health research, dietary behavior research, psychological and emotional support research, and inclusive design research, thereby enhancing the academic rigor of the research. Finally, the theoretical framework established through the literature review can also help researchers interpret research findings with more evidence when analyzing user data and developing design directions, rather than merely remaining at the level of superficial phenomenon descriptions.

3.2 Online survey

The first phase of the research involved conducting an online survey. The research team chose online surveys as their methodology because it is a common method in user research. It is convenient, easy to disseminate, and well-suited for quickly and systematically collecting a sufficient amount of research data, allowing for efficient understanding of user behavior patterns, needs, and pain points.

Online surveys are relatively simple in their question design, consisting mostly of multiple-choice questions and a small number of subjective questions. Online surveys aim to efficiently collect a sufficient amount of quantitative data, preventing cognitive overload for participants completing the survey. Furthermore, compared to one-on-one interviews, surveys can collect more research data from participants in a shorter time, making them more suitable for analyzing the overall behavioral patterns of the target users and gaining a preliminary understanding of the research question.

The research team used the Microsoft Forms platform designated by OCAD University to create and publish online surveys. Participants were recruited through the public social media platform called Red Notes. The team posted recruitment notices on Red Notes, specifying the research topic and requirements for participants. Interested potential participants would then contact the research team, and they would screen them.

The research team selected Red Notes, a publicly accessible social media platform, for the recruitment, since a specific number of Asian participants were needed to participate in this study. Red Notes is a publicly accessible social media platform developed in China, with users primarily composed of Chinese, including overseas Chinese. Thus, the research team could effectively recruit participants from China residing in North America. The benefits of attracting participants using publicly available social media are broad user coverage and high recruitment effectiveness, as well as easy access to a particular target audience. For people interested in diet management, blood sugar management, and healthy living, social media is a good platform for obtaining information and experiences, and thus a good choice for research and recruiting. In addition, social media recruitment helps to make participating in the study more convenient and accessible, as potential participants can learn more about the research project and decide whether to join in more conveniently. Red Notes is a completely anonymous social media platform and therefore guarantees participant confidentiality better than other social media platforms, e.g., Facebook and Instagram.

To participate in the study, participants needed to meet the following criteria: have a habit or experience in dietary management, have a need and experience in controlling sugar intake, be over 18 years of age, and currently live in Canada or the United States. I recruited a total of 10 participants to complete the online survey.

3.3 One-on-one user interview

A one-on-one user interview is part of the research design. User interviews are a qualitative

research methodology that provides qualitative data. By interviewing users, researchers can explore their real-life experiences, emotional changes, and specific contexts. This level of detail in data is very hard to get through online surveys.

User interviews ask questions such as: Why do users do this? What are users' feelings? How do users understand their difficulties and needs? What are the contextual factors behind certain user behaviors? Obtaining this information is crucial for user-centered design because user-centered design requires understanding from the user's perspective how the problem arises, in what context it occurs, and what it means to the user.

The research team conducted online user interviews using the Microsoft Teams platform designated by OCAD University. Each one-on-one interview lasted approximately 40-50 minutes, during which users were asked about 20 questions related to the research topic. These user interviews were not recorded; instead, data was recorded through note-taking to better protect participants' privacy.

Participant recruitment for this part of the study was conducted through a social media platform called Red Notes. The research team posted recruitment notices on Red Notes, specifying the research topic and participant requirements. Interested potential participants would then contact the research team for screening. To participate, participants needed to meet the following criteria: have a habit or experience in dietary management, have a need and experience in controlling sugar intake, be over 18 years of age, and currently live in Canada or the United States. Two participants were recruited for one-on-one user interviews. The research team will conduct thematic analysis and data coding on the interview data after the user interviews. Qualitative data obtained from the user interviews will be used for the design of subsequent co-design workshop sessions.

However, user interviews have limitations. While they can provide in-depth and rich qualitative insights and user-centric data, their limitation lies in the relatively limited sample size. Therefore, the results are more suitable for exploring user experience and generative design insights than for statistical analysis.

Furthermore, interview data relies on participants' self-reports and may be influenced by memory bias, differences in expressive ability, or social expectations. At the same time, the data analysis process has a degree of subjective interpretability; therefore, researchers need to maintain rational thinking as much as possible to minimize subjective bias.

3.4 Co-design Workshop

The co-design workshop session is a core component of this project's research design and one of its highlights. Based on the inclusive design principle, this project aims to integrate inclusive design throughout the entire research process. Ultimately, this research hopes to demonstrate the characteristics and value of inclusive design in digital health product design.

This co-design workshop combines the methodologies of user experience design and co-design. Through this approach, participants could not only express their real experiences, needs, and obstacles in diet control and sugar management, but also participate in the formation of design direction and decisions. Therefore, the co-design workshop not only extended and validated preliminary research results but also became a crucial link between the research and the final design output. This section will further explain the workshop's workflow, data collection methods, and data processing and analysis techniques, while also discussing the limitations of this methodology to more clearly present the specific implementation process of this research method.

Similar to the online survey and user interview methods used in the previous section, participants were recruited through public social media – Red Notes. The research team posted recruitment notices on Red Notes, specifying the research topic and requirements for participants. Interested potential participants would then contact the research team, who would screen them. To participate in the study, participants needed to meet the following criteria: have a habit or experience in dietary management, have a need and experience in controlling sugar intake, be over 18 years of age, and currently live in Canada or the United States. I recruited one participant for the co-design workshop.

The research team conducted thematic analysis and data coding on the interview data after the co-design workshop. The qualitative data obtained from the user interviews will be used in the design of subsequent sessions of the co-design workshop.

3.4.1 Co-design Workshop Activity Plan

The research team chose affinity mapping as the core activity of this co-design workshop. Affinity diagrams are a method for organizing and visualizing data, and their basic approach is to classify and group information according to underlying themes. Affinity mapping was chosen as the main activity of this workshop because it can effectively build upon the research data collected in the previous user-centered research and help researchers and

participants jointly organize, summarize, and discuss this data.

From the perspective of user-centered research, the advantage of affinity maps lies in the fact that they are not unilaterally hierarchical data assigned by researchers. Instead, they are collaboratively organized and constructed by participants and researchers, transforming users' roles in the research process from information providers to co-participants in the meaning of construction. This process helps reduce biases arising from researchers' ranking based solely on personal interpretation, making research results closer to users' real experiences and cognitive patterns. Affinity maps not only facilitate the visualization and organization of the hierarchical structure of research data but also enhance participant engagement and user-centricity in the research process.

Furthermore, the affinity map is suitable for this study because it provides a research foundation for subsequent design decisions. In this project, the affinity map was divided into three parts: user pain points, user needs, and design solutions. This structure not only helps to identify users' difficulties and needs in real life but also encourages participants to transform these issues into potential design opportunities. Through this process, the research data obtained from the initial user-centered research is gradually transformed into more actionable design bases, thereby supporting the generation of subsequent design directions and the development of a digital health product.

The user pain points section primarily identified the main obstacles and difficulties participants encountered in managing their diet and controlling sugar intake. The user needs section further refined to include users' core needs for support, information, and functionality in real-life situations. The design solutions section, building upon the results of the first two stages, guided participants to collaboratively consider possible design responses and opportunities.

For each of the three parts mentioned above, the research team developed a separate affinity map to guide participants and researchers in organizing, classifying, and summarizing the data obtained from the preliminary questionnaires and user interviews during the collaborative process. Prior to the co-design workshop, the research team had already completed preliminary data analysis on the research data obtained from the online survey and user interviews. Based on this, the team extracted key information from the relatively complex quantitative and qualitative data from the preliminary work, transforming it into concise words or sentences, and further creating pain point cards, user needs cards, and design solution cards. These cards, along with their corresponding affinity maps, were all

created and displayed on the Miro platform.

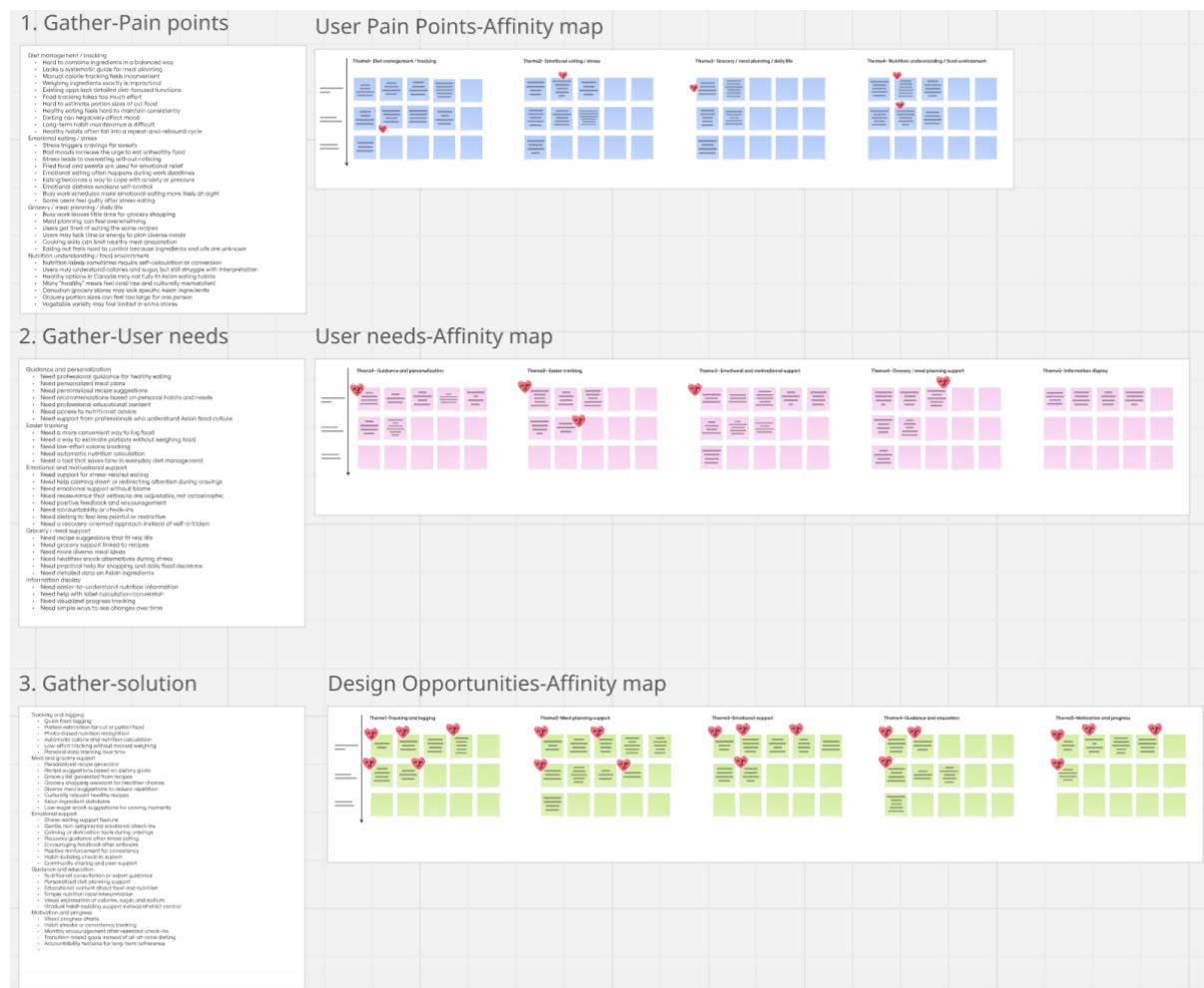


Figure 1. The affinity diagram generated from the co-design workshop.

The activity was a collaborative effort between participants and researchers. In the process, researchers and participants jointly placed three types of cards into corresponding affinity maps, categorizing, summarizing, and naming them based on their content. The three types of cards corresponded to user pain points, user needs, and design solutions, respectively, with each type accompanied by a separate affinity map to help participants discuss and organize content across different levels. During the categorization process, participants could adjust, supplement, and reorganize the card content based on their own experience, while researchers were responsible for guiding the discussion, recording the results, and assisting in clarifying the relationships between different themes. Meanwhile, the cards were arranged from top to bottom on the affinity map, with the top representing content that participants considered relatively more important and the bottom representing relatively less important content.

Through this collaborative process of construction, classification, and prioritization, researchers can gain a clearer understanding of users' core issues, actual needs, and potential

design directions in diet management and sugar control. This also provided a more hierarchical basis for subsequent design decisions. Participants can confirm, supplement, and revise previous research findings, and, under the researcher's guidance, further clarify the relationships and priorities between different topics. This activity helped to gradually transform fragmented research data into structured design insights, providing a foundation for subsequent contextual discussions, design direction development, and design decision generation.

4.0 Data Collection and Analysis

This research design comprises three research methods: online survey, user interview, and co-design workshop. These three methods correspond to different data collection methods and serve different functions in the research process. By combining multiple data collection methods, the research team was able to understand participants' behavioral patterns, personal experiences, user needs, practical challenges, and expectations regarding potential design opportunities for digital tools from different perspectives.

The online survey mostly collected general user data to first assess trends for general dietary management, sugar control, tool use, and daily behavior habits of participants. The user interview aimed to gather richer qualitative data to enable the research team to understand users' particular experiences, cognitive processing, emotions, and needs in practical terms. The co-design workshop further promoted participation: it was designed for participants to co-organize questions, communicate their needs, and work to identify potential design directions and design solutions through co-creation activities. This provides the research team with the option to use multiple data collection techniques, which can encourage them to thoroughly investigate their users for a more extensive depth of the dataset, thereby leading to deeper insights into the research question. A comprehensive research design such as this will not only increase the completeness of the research findings but also provide enhanced evidence-based support for future design directions and the subsequent production of digital product solutions.

4.0.1 Online Survey

The online survey for this study will be designed, published, and used for data collection through the Microsoft Forms platform. The questionnaire will be distributed to eligible

participants and will primarily collect basic information related to diet management and sugar control to understand their basic behavioral patterns, common difficulties, actual needs, and use of digital tools in their daily diet management.

The questionnaire will cover multiple aspects, including participants' diet management habits, daily behaviors related to sugar control, the impact of emotions on eating behavior, their level of attention to nutritional information, and their expectations for the functions of digital health tools. The questionnaire will primarily consist of multiple-choice questions to collect relatively clear quantitative data; however, a small number of open-ended questions will also be included to supplement participants' more specific personal experiences and perspectives, thus providing richer reference information for subsequent research.

This study chose Microsoft Forms as the questionnaire platform because it is the online work and research platform designated by OCAD University, helps to better protect participant privacy during data collection. The questionnaire data will be automatically recorded and saved through Microsoft's online platform so that the research team can organize, summarize, and analyze the data in subsequent stages.

4.0.2 One-on-One User Interview

User interviews will be done as part of this study to obtain in-depth qualitative data. The main purpose of the interviews is to explore participants' lived experiences, emotions, challenges, coping, and possible needs of digital health tools involved in diet management and sugar control. User interviews allow participants more time to respond to their questions, and more emphasis on foundational research questions like user experience.

Interviews are expected to be conducted online, and each participant interview will take around 40 to 60 minutes. Participants' behavioral patterns in daily diet management, understanding of nutritional information, difficulties in managing sugar, emotion, and eating behavior, and expectations regarding the support provided by digital health tools will be the main objectives of the interview. This study will help us understand users' needs and pain points further from a more varied perspective. This research will not record interviews, promote less discomfort for participants, and better protect their privacy.

Interview data will be recorded only in written notes by researchers for later analysis and processing. This method is useful for obtaining critical qualitative data pertaining to the research topic while taking care of the comfort and privacy of study participants.

4.0.3 Co-design Workshop

This research will also collect feedback and design ideas from participants during the collaborative design process through a co-design workshop. This approach aims to enable participants not only to provide personal experience as research subjects but also to participate as co-designers in the generation of potential solutions. The workshop will focus on participants' pain points and needs in diet management, as well as their expectations for the functionality and user experience of digital products.

This co-design workshop will be held offline, with related design activities created and showcased on the Miro platform. Participants will complete the corresponding design activities on computers provided by the research team. During the workshop, participants will collaborate with researchers to complete several design tasks, such as classifying, discussing, prioritizing, and ranking user pain points, user needs, and design solutions. They will also express their understanding and ideas about the characteristics of ideal digital tools through simple co-creative design activities.

The Miro platform will automatically save the outputs of the design activities completed by participants and researchers, such as affinity maps and interface design results. Researchers will use these outputs for subsequent analysis. Through the activity data obtained from the co-design workshop, the research team can more specifically identify the priority of user needs, potential design opportunities, and the direction of subsequent design decisions.

4.0.4 Ethical Statement

All participants must read and sign an informed consent form before formally participating in the research. Participation in this research is entirely voluntary. Participants may choose to skip questions they do not wish to answer or withdraw from the research at any stage without incurring any consequences. Survey data, interview records, and materials from the co-design workshop collected during the research process will be kept confidential by the research team. Only members of the research team can access the relevant research data, and all data will be used solely for data analysis and research purposes in this study.

All personally identifiable information will be strictly kept confidential and will be anonymized or de-identified when presenting research results to protect participant privacy.

Through these measures, this research aims to conduct ethically sound research activities while ensuring participants' right to know, autonomy, and privacy.

4.1 Collection Methods

This research design includes three methodologies: online survey, one-on-one user interviews, and a co-design workshop. The different methods and different data collection approaches each contribute to a separate role that plays a different part during each stage of research. Overall, the research team was able to gain insight into the attitudes, experiences, needs, and concerns, as well as their expectations towards potential prospects for using digital diet management tools.

The online survey gathered a wide scope of quantitative data for the research team to explore insights of participants' responses to diet management, sugar management, affective consequences, and previous digital tool use. User interviews offered detailed qualitative data to understand participants' specific user experiences, emotions, and practical challenges that participants face in daily life. In an additional step, the research team set up the co-design workshop. This was intended to highlight participants' participation in the design process by allowing the research team to co-work with participants to investigate possible design paths and approaches. A combination of multiple data collection methods helped the research team connect broad data collection with in-depth user exploration, thus providing a more complete understanding of our research questions. Through this research design, this research aims to provide a more stable research basis for future design development.

4.2 Analytic approach and procedure

In this research, different analytic approaches were used for the online survey and user interview data based on the nature of each dataset.

For the online survey, open-ended responses were analyzed using thematic analysis. This approach was chosen because it helps identify recurring ideas, common concerns, and shared experiences across participants' responses. The analysis started by reading all the survey responses several times in order to get familiar with the data. To that end, key phrases and meaningful units were drawn up and given preliminary codes. Similar codes were then clustered into broader categories, and we elaborated these into themes about users' dietary management experiences, perceived barriers, emotional challenges, and desired forms of support.

Data was analyzed in user interviews using qualitative coding methods. Interview transcripts were scrutinized to ensure all key statements had been analyzed and line-by-line coded around participants' experiences, behaviors, difficulties, and expectations regarding diet management. The coding was aimed at capturing pain points, needs, emotional responses, and everyday decision-making.

After the initial coding stage, similar codes were compared and clustered into larger thematic groups. These themes were then interpreted to build a deeper understanding of how users experience dietary management in daily life.

By combining these two analytic processes, the study was able to compare broader patterns from the survey data with deeper and more detailed insights from the interview data. This helped strengthen the understanding of users' needs and supported the development of design directions for the digital diet management tool.

For the co-design workshop, the study did not treat the session as a conventional data collection process followed by a separate stage of analysis. Instead, the workshop functioned as a participatory design activity in which analysis and design generation happened at the same time. Based on the findings from the online survey and user interviews, the research team prepared pain point cards, user needs cards, and design solution cards in advance. During the workshop, participants and the researcher collaboratively organized these cards into different affinity maps, grouped related ideas, discussed priorities, and identified connections between user pain points, user needs, and possible design responses. Through this process, the workshop directly produced structured design insights and potential design solutions. Therefore, the co-design workshop in this study served not only to validate and refine earlier findings but also as a method for transforming research findings into user-informed design directions.

4.2.1 Online Survey

A total of 12 participants completed the online survey through Microsoft Forms. The survey was designed to explore participants' motivations for diet control or sugar reduction, barriers to maintaining healthy eating habits, the influence of emotions on eating behavior, and preferences for digital product support features. These survey responses provided insights into user needs, user pain points, and user expectations.

The research team prepared 10 questions for the online survey. After data analysis, the team selected four representative questions to present the descriptive results of this study. At the end of this chapter, the research team will provide the original file of all the survey answers.

Question 2: What is your main reason for trying to manage your diet or reduce your sugar intake?



Figure 2. Screenshot of selected questions from the online survey used for data collection in this research.

The survey results showed that the most common reason participants controlled their sugar intake was to achieve health goals, lose weight, or improve physical fitness. Of the 12 participants, 6 (50.0%) chose "To achieve health goals" and "To lose weight or improve fitness." This indicates that participants' primary motivation for sugar or diet management stemmed from their concern for their overall health and was also related to weight control and improved physical condition. This suggests that for many users, diet control is not only about appearance management, but also long-term behavior related to physical health.

Improving lifestyle was also a prominent motivation among participants. Four participants (33.3%) chose "To improve my lifestyle." This result indicates that some participants understand diet management as a broader adjustment to a healthy lifestyle, such as establishing more regular eating habits, improving daily condition, or pursuing a healthier pace of life.

In contrast, the proportion of participants controlling their diet for the purpose of managing

medical conditions was lower. Of the 12 participants, only one (8.3%) selected "To manage a medical condition." This indicates that in this study sample, most participants' reasons for dietary management were focused on health improvement, lifestyle improvement, and fitness management, rather than directly on a specific medical need. The target users of this study may be more inclined towards those in the daily self-management or early health intervention stages. The result of this question further supports the design direction of this study, namely, exploring a user-centered digital product that can serve users in daily health management, emphasizing personalized dietary support and sustainable behavioral change.

Question 3: What barriers make it challenging for you to maintain healthy eating habits?

1	anonymous	Food is so delicious
2	anonymous	Lack of motivation and Social pressure
3	anonymous	Personally, it takes strong willpower to even start healthy eating habits. I am a huge fan of fried chicken, burgers, and fries. It actually took me years to finally manage my calorie intake and shift towards a healthier, more nutrition-balanced diet. In terms of maintaining healthy eating habits, it's challenging to stay consistent. For example, I may succeed in making healthy meals for a week, but then can't help eating snacks the following week. It really needs time and willpower to maintain healthy eating habits.
4	anonymous	These healthy foods taste nothing like my usual natural foods.
5	anonymous	I don't want to make meals myself every day so I often have some takeaways or fast food.
6	anonymous	Too many restaurants nearby
7	anonymous	Convenience and time to actively make healthy choices.
8	anonymous	I am craving sugar since it's my energy boost, and it is my stress relief. I feel like I might lose emotional health without that lol. Also, if you live with someone who isn't dieting, it can be hard to stick to your diet because their eating habits will influence you. This is especially true if you live with family members; preparing "Diet meals" can put an extra burden on the person cooking, since they have to make a separate meal.
9	anonymous	tasty food/dessert
10	anonymous	Emotional eating, hormone fluctuation during menstrual cycle

Figure 3. Screenshot of selected questions from the online survey used for data collection in this research.

The most frequent challenge reported by users was food cravings, particularly those of sweet treats and high-calorie food. Six in ten participants (60%) reported in this dilemma that they do not have enough willpower to control any of their cravings. This shows that although

individuals crave a healthy diet, in practice, there are more delicious foods and plentiful places to eat, further undermining their ability to follow a diet.

Secondly, no energy for eating well during busy lives is also a common problem. Three participants (30 per cent) reported that they could not arrange recipe preparation and food preparation on time, or also that their hours were short. So, they were more likely to take out the more convenient choices of takeout and restaurants. It seems that when keeping up healthy eating habits, it's a matter of time versus convenience. The absence of self-control is frequently emphasized for participants as well, and the inability to keep long-standing eating behaviors was also mentioned by the participants. Three out of ten responses (30%) specified that participants did not have the motivation to manage their diet, and their willpower was not high enough.

Users can engage in dietary management in the short term, but it becomes challenging for them to sustain healthy eating behaviors in the future. This shows the fact that dietary management is not a one-time or short-term decision but a dynamic practice of habit formation, which can be one of the key dilemmas for many users.

Emotions and physical states were used in some of the respondents in feedback. Two of the respondents (20%) reported that they either consume sugar or engage in emotional eating because of stress, emotional fluctuations, or menstruation to manage their mood. This implies that eating is not only a function of rational thought and the capacity for emotional regulation but is intimately linked to an individual's emotional regulation and physical state. Hence, digital instruments that take users' emotional needs into consideration are more effective at assisting users in adopting healthy eating practices.

This question reflects the participants' responses to the issue, indicating that the challenges users experience in maintaining healthy eating behaviors are complex and driven by several factors, which encompass dietary habits, working on a daily schedule, self-control, social context, and emotional disposition. Thus, diet management is a multifaceted phenomenon based on user behavior, feelings, and life contexts. It further enhances the exploration of more inclusive, personalized, emotionally resilient, and psychologically supportive design directions for digital health products in this study.

Question 6 : What features would you find most helpful in a digital tool designed to support diet control?

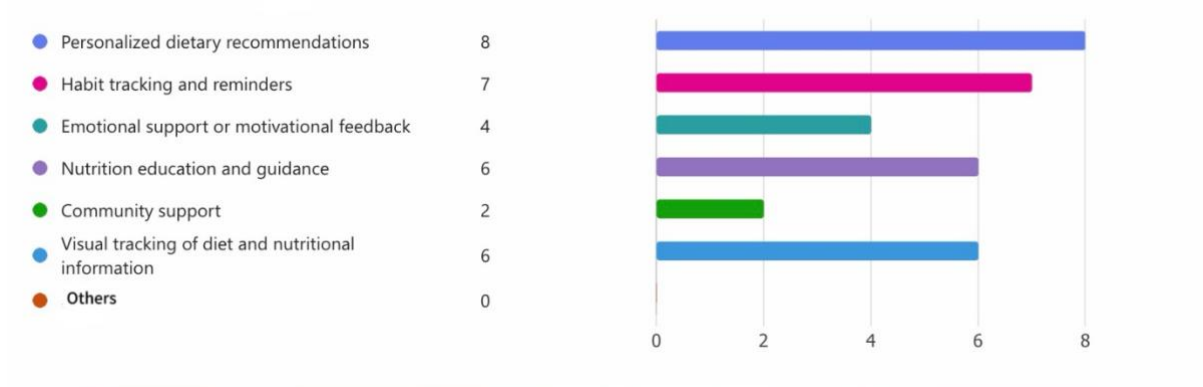


Figure 4. Screenshot of selected questions from the online survey used for data collection in this research.

This was a multiple-choice question. The survey results showed that the most desired feature for digital diet management products among participants was personalized dietary recommendations. Of the 12 participants, 8 (66.7%) selected the "Personalized dietary recommendations" feature. This indicates that most participants hope digital diet management tools can provide more personalized dietary guidance based on individual circumstances, rather than just providing general information. This result shows that users have a high demand for the "personalized support" feature in the process of dietary management, which also reflects that many current digital dietary management tools may be insufficient in providing advice based on individual differences.

Secondly, habit tracking and reminder features are also among the features that participants generally value. A total of 7 participants (58.3%) selected the "Habit tracking and reminders" feature. This result indicates that, in addition to obtaining dietary advice, many users also hope to use digital diet management tools to remind themselves to maintain daily healthy habits, such as recording their implementation, receiving reminders, and maintaining behavioral consistency in the long term. This shows that users' expectations for digital diet management tools extend beyond information obtained to include daily behavioral support and habit formation.

Nutritional education and guidance features are also selected. 6 participants (50.0%) selected the "Nutrition education and guidance" feature. This indicates that half of participants believe digital diet management tools should help them better understand professional nutritional knowledge, such as food composition and how to make more rational food choices. This result suggests that users, in the process of diet management, not only need digital diet management tools to provide scheduling and reminder features but also hope to obtain clearer

and more understandable professional dietary knowledge from them to enhance their judgment and decision-making abilities.

Visual tracking of diet and nutritional information features was also a popular feature among participants. A total of 5 participants (41.7%) selected "Visual tracking of diet and nutritional information" features. This indicates that some participants hope to manage their diet and nutrient intake in a simpler, more intuitive, and easier-to-understand way.

Emotional support or motivational feedback is also an important design direction. Of the 12 participants, 4 (33.3%) selected "emotional support or motivational feedback" features. This indicates that approximately one-third of participants hope that digital diet management tools not only provide diet management features but also offer emotional support and encouragement during the diet management process. For some participants, diet management is closely related to their emotional state, leading to emotional eating and stress-induced eating behaviors.

The results of this question show that participants value the practicality and targeted support features of digital diet management tools most. Personalized dietary recommendations (66.7%), habit tracking and reminders (58.3%), and nutrition education and guidance (50.0%) were the three most popular features. This suggests that users expect digital diet management tools to not only help them plan their diet management process but also help them maintain healthy eating habits long-term and provide inclusive support throughout the process. The choice of "emotional support or motivational feedback" (33.3%) indicates that diet management tools that appropriately respond to users' emotional fluctuations are more conducive to users achieving long-term, sustainable behavioral changes. The data analysis results further support the design direction of this study for digital diet management tools: to more comprehensively respond to users' needs in the diet management process by integrating personalized guidance, behavioral support, knowledge education, and emotional care.

4.2.2 One-on-one User Interview

One-on-one user interviews were conducted with two participants. The duration of the research was about forty to sixty minutes. The interview materials had approximately 20 questions, covering five broad themes, which were designed to capture participants' actual experiences, pain points, desires, and expectations for digital diet management tools.

Data collected through a semi-structured interview format was collected in this study. That is, researchers did not ask every participant all of the questions in the interview script; instead, they flexibly changed the questions based on the depth and richness of the participant's experience. For instance, if a participant was not providing relevant information or any added perspectives on a given topic, researchers could decrease follow-up questions about that subject; on the other hand, if the participant gave a richer experience or insight, the researcher would follow up with a wider range of questions for understanding. This approach to interviewing contributes to an understanding of participants' life scenarios and contexts, which enables the research focus to be preserved. From this user interview, the qualitative data were analyzed through a thematic analysis method by the research team. The researchers recorded data for this user interview using note-taking. Researchers meticulously record participants' responses and transform them into electronic material. Initial coding on these documents is performed, creating a coding list. These codes are then grouped and analyzed to develop higher-level themes and sub-themes, summarized, and then reorganized in order to respond to the research questions. This identifies the participants' pain points and essential needs related to the diet and sugar intake management process, including, but not limited to, recipe selection, emotional support, long-term habit maintenance, and adaptation to culture.

Participants 1

The following are the findings from the thematic analysis of quantitative data generated from user interviews conducted by the research team on participant 1.

The research team's coding analysis of participant 1's interview data generated six themes: participants' motivation for sugar control and diet management; information and practice barriers encountered in the self-management process; interference of emotional eating on sugar control behavior; instability in the process of developing healthy habits; expectations for more supportive digital tools; and the influence of cultural background on diet support design. These themes reveal the need for digital health products to focus on developing functions such as diet tracking, emotional support, long-term habit formation, and personalized health solutions.

Theme	Sub-themes
Motivations and self-management context for sugar control	Health and fitness motivations for dietary control; Everyday food management through home cooking and controlled recipe choices; Existing self-tracking routines in daily diet
Knowledge gaps and barriers in making appropriate dietary decisions	Uncertainty in ingredient selection and food combination; Practical burdens in food logging and nutrition calculation; Difficulties interpreting and applying nutrition information
Emotional eating is a major disruption to sugar-control process	Stress and negative emotions trigger cravings; Guilt, self-blame, and compensatory behaviors after stress eating; Need for immediate emotional coping support during vulnerable moments
Challenges in sustaining healthy habits over time	Healthy habit formation is unstable and cyclical; Need for gradual adjustment rather than sudden change; Desire for accountability and encouragement in long-term behavior change
Expectations for a more supportive and personalized digital tool	Value of current tracking functions and data-based guidance; Need for more personalized, practical, and intelligent dietary support; Desire for emotional support features that make dieting less painful; Interest in socially engaging and motivating experiences
Need for culturally inclusive and context-sensitive dietary support	Mismatch between mainstream diet solutions and Asian eating habits; Need for culturally informed professional and recipe support; Need for ingredient data and food knowledge that reflect diverse diets

Theme 1: Motivations and self-management context for diet control

Participant 1 began to focus on their diet based on health. Participant 1 reported that their physical examination showed blood sugar levels above the average for their age, so they

focused on managing their sugar intake. Weight maintenance was another reason for their dietary control.

Participant 1 is more inclined to buy groceries and cook for themselves to help with their personal diet management. It is difficult for Participant 1 to confirm exactly what foods were consumed and to identify the ingredients and seasonings when eating in a restaurant. Moreover, Participant 1 has already developed some fundamental management behaviors of their own, including modifying their meal structure and applying calorie-tracking applications to monitor their nutritional intake.

Theme 2: Knowledge gaps and barriers in making appropriate dietary decisions

Participant 1, who was willing regarding food intake control and sugar intake, had difficulty with dietary planning. They had difficulties in structured access to expert knowledge and advice about ingredient selection and recipe mixing. Hence, participant 1 requires support from professionals instead of personal experience during the process of diet management and recipe planning.

Second, participant 1 also struggled with daily nutrition documentation. In current digital diet management products, users must typically enter relatively accurate food weights, which is not intuitive in real life. For instance, Participant 1 struggled to measure the weight when eating cut fruit. Furthermore, even if participant 1 actively checked nutrition labels, further calculations were still needed, which increased the barrier to the use of digital tools and the cognitive burden of diet management.

Theme 3: Emotional eating as a major disruption to sugar-control efforts

Participant 1's emotional state heavily affected their plan of dietary management. Participant 1 had higher cravings for sweets or high-calorie foods from stress, mood fluctuations, or work deadlines, and reported that they would eat as a method of coping with emotional distress when feeling vulnerable. Meaning, participants' mood alterations play a large role in their eating patterns.

Following the stress eating, Participant 1 generally expressed intense negative emotions but tried to compensate with lower overall food intake. This shows that stress eating, in general,

besides short-term use impacting users' actions about specific foods, also may stimulate a series of emotional responses, which may aggravate the emotional stress during diet management.

Theme 4: Challenges in sustaining healthy habits over time

Participant 1 found it difficult to maintain stable, long-term healthy eating habits, exhibiting significant fluctuations and cyclical patterns. Participant 1 searched for healthy eating information on social media to help establish and maintain healthy eating habits. However, the process of forming healthy eating habits is often difficult to sustain in the long term.

For instance, following a period of dietary management, a sudden emotional eating episode disrupts the original dietary plan and triggers the recurrence of "establishment-interruption-reestablishment." Participant 1 also stated that developing healthy eating habits is not a quick goal but a gradual process with an adaptation period. Therefore, digital diet management products should have a purpose based on gradual goal setting and continuous feedback mechanisms, rather than being result-oriented and requiring users to quickly change their behavior in a short period.

Theme 5: Expectations for a more supportive and personalized digital tool

Existing digital diet management products already provide comprehensive food databases, personal data storage, and data tracking, providing basic support for diet management to a certain extent. However, Participant 1 pointed out that existing digital diet management products still have significant shortcomings in personalized support.

Participants 1 wish that digital diet management products may have more intelligent and practical features, such as personalized recipe recommendations, estimation of ingredient quantities, photo-based nutritional information recognition, and professional nutritionist support. Participant 1 also feels that digital diet management products need to be able to release feelings of emotional fluctuations when it comes to controlling their diet (e.g., not to be a mechanical part of the diet management) and to be able to assist the users to carry out diet management in a more relaxed and fun way. The ideal digital diet management product for users would not merely be an everyday calorie recording tool; it is a comprehensive platform that combines practicality, companionship, motivation, and personalized support.

Theme 6: Need for culturally inclusive and context-sensitive dietary support

Participant 1 stated that the design of digital diet management products needs to reflect the wide-ranging cultural backgrounds and unique eating habits of the users. For example, Asian diets are more carbohydrate-dense. Even if digital diet management tools exist to provide healthy eating plans for users, those plans may not necessarily translate to other cultural backgrounds of users.

On the other hand, Participant 1 mentioned specific requirements for cultural adaptation within the digital diet management products. Participant 1 believed that digital diet management tools would bring them access to the information of Asian food culture, for example, the offer of well-balanced recipes from professionals who were attuned to Asian appetites and dietary patterns to better adhere to Asian dietary patterns of consumption, and that the digital diet management product needs to develop a better nutritional information database on Asian ingredients. This result indicates that the design of inclusive digital diet management products should be grounded in an understanding of diverse food cultures and reflect the real requirements of multicultural users functionally and content-wise.

Participants 2

The following are the findings from the thematic analysis of quantitative data generated from user interviews conducted by the research team on participant 2.

The research team's coding analysis of the interview data from participant 2 generated the same six themes: participants' motivation for sugar control and diet management, information and practice barriers encountered in the self-management process, interference of emotional eating on sugar control behavior, instability in the process of developing healthy habits, expectations for more supportive digital tools, and the influence of cultural background on diet support design.

The quantitative data collected from interviewing Participant 2 were analyzed by the researcher. Participant 2's diet management was affected by the following factors: personal health status, emotional state, daily schedule changes, and the shortcomings of existing digital health tools. Participant 2 showed good health consciousness and self-management

competencies. However, participant 2 feels maintaining long-term and sustainable healthy eating behavior is challenging. Participant 2 was easily influenced by emotional stress, busy daily schedules, and external environmental factors, which could interfere with participant 2's diet management behavior.

Therefore, digital diet management products should not only focus on calorie recording or data tracking, but should also integrate emotional support, personalized dietary guidance, habit formation mechanisms, and practical support functions related to shopping and meal preparation. Based on thematic analysis, this research eventually identified six themes.

Theme	Sub-theme
Motivations and self-management context for sugar control	Diet control motivated by weight management and health risk awareness; Active self-management in everyday diet practices
Knowledge gaps and barriers in making appropriate dietary decisions	Difficulty sustaining diet control for a long time; Time, energy, and lifestyle barriers; Burden of meal planning and cooking
Emotional eating is a major disruption to the sugar-control process	Negative emotions triggering sweet cravings and stress eating; Emotional fluctuation and self-adjustment after stress eating; Need for no critical emotional support
Challenges in sustaining healthy habits over time	Build a healthy living environment to support healthy habits; Maintaining habits through flexibility rather than strictness; Visual feedback as a source of motivation
Expectations for a more supportive and personalized digital tool	Existing tools are focused more on fitness features and lack diet support features; Need for a more convenient method for diet tracking; Expectation for personalized diet management features; Expectation for nutrition knowledge support and professional guidance
Need for culturally inclusive and context-sensitive dietary support	Challenges related to ingredient portion sizes and solo cooking; Limited support for Asian

	dietary preferences
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Theme 1 : Motivations and self-management context for diet control

Participant 2 was primarily motivated to manage diet and reduce sugar intake due to health concerns. Participant 2 hoped to lose weight through dieting. In addition, the rationale for participant 2 limiting sugar consumption was a family history of diabetes. Participant 2 understands health risks and is more concerned and motivated than before to improve health and reduce the risk of diabetes by modifying eating habits. Participant 2 wanted to use a more efficient digital diet management tool to manage diet and prevent diabetes.

This suggests that participant 2 has dietary management as motivation, not only for fitness management but also to stick to long-term maintenance. Participant 2 took a lot of initiative in their dietary management process; for example, participant 2 used the Keep app to recorded calories intake, participant 2 maintained a daily caloric deficit, independently planned meal plans and combinations.

Although Participant 2 already has some dietary management skills, Participant 2 needs a more efficient digital dietary management tool to assist in maintaining long-term habits and optimizing the dietary management process.

Theme 2: Knowledge gaps and barriers in making appropriate dietary decisions

Participant 2 encountered several implementation barriers in the actual process of diet management. Participant 2 mentioned that long-term adherence was one of the greatest difficulties in diet management. Participant 2 mentioned several user pain points. Participant 2 observed that it is hard to maintain healthy eating habits over time and often breaks their self-established diet management routine. Participant 2 works full-time and doesn't have enough time to cook, grocery shop, and plan healthy meals. Thus, during busy times, Participant 2 tends to have irregular eating habits and order takeout food. Participant 2 thinks it may be hard to arrange healthy meals independently in daily life. Participant 2 is getting bored with having the same healthy recipes, but participant 2 does not have enough cooking skills, that increases the burden of diet management.

The research results indicate that the diet management process is influenced by the user's time, lifestyle, and food preparation time. Therefore, digital diet management products need to simplify operation and increase usability as much as possible to reduce the cognitive burden on users during the actual implementation of diet management.

Theme 3: Emotional eating as a major disruption to sugar-control efforts

Participant 2 mentioned that their emotional state easily influences their eating habit, primarily reflected as stress eating. When participant 2 is feeling depressed, anxious, or under significant stress, they tend to crave sweets or fast food and use eating as a method to distract attention and relieve stress. Participant 2 reflected that stress eating is also related to their daily routine. As participant 2 has a busy work schedule during the day, they only have relaxing time in the evening, so eating becomes a method to release stress from work.

Participant 2 reported that in the wake of stress eating, they did not overly blame themselves; rather, they preferred to take some time to recover and return to their usual eating habits. This means that instead of enforcing rules, offering correction and supervision of users, the user feedback and motivation sections of the digital diet management product provide gentler and non-judgmental emotional support points that will help users reestablish an eating rhythm after emotional fluctuations.

Theme 4: Challenges in sustaining healthy habits over time

Participant 2 believed that establishing a new eating habit usually takes about a month. During this process, participant 2 will take ownership of their dietary habit and will make changes in their living environment, proactively facilitating the development of new eating habits. Participant 2 will avoid buying and storing snacks or desserts at home and will keep fresh ingredients in the refrigerator for preparing healthy meals. It shows that developing healthy eating habits is also related to the ability of users to construct a supportive living environment.

Participant 2 mentioned that maintaining dietary habits long-term is quite difficult, and they often find themselves in a cycle of "establishing—giving up—re-establishing." Participant 2 believes that overly strict self-discipline can easily lead to a backlash in dietary management. Therefore, compared to high-pressure self-monitoring, a gentler and more flexible monitoring

method may be more conducive to maintaining long-term habits. Participant 2 believes that visual feedback charts, such as weight change curves or body circumference change curves, can provide motivation. This indicates that digital health products should be designed to support gradual habit formation and enhance users' long-term motivation through gentle feedback mechanisms and visual tracking.

Theme 5: Expectations for a more supportive and personalized digital tool

Participant 2 showed dissatisfaction with the Keep app that they had used in the past. The reason is that the digital tool provided a focus primarily on fitness management and did not give enough digital features and in-depth support towards diet management. Participant specifically requested a personalized diet recommendation feature, which includes developing dietary plans suited to a user's personal health needs, and suggesting recipes based on the user's own diet requirements.

Participant 2 also wished that digital diet management products could have features that include personalized recipe functionality, professional knowledge sharing, and automatic conversion of recipes into shopping lists.

This can be interpreted as the user's expectation that a digital diet management product is not only the data recording tools but is also provides personalized dietary insights, knowledge assistance, and nutrition monitoring ,such as diet guidance and assistance.

Theme 6: Need for culturally inclusive and context-sensitive dietary support

Participant 2 stated that their dietary management was affected by the surrounding food environment and cultural context. Compared to grocery stores in southern China, Canadian grocery stores offered a relatively limited variety of vegetables, and some Asian ingredients were not readily available in stores. In addition, Canadian grocery stores present ingredients that were typically packaged in larger quantities, and users had trouble portioning their food for only one person when it was already prepared. This shows how the processes by which users manage their diet are shaped by their living environment. While users may be highly motivated towards dietary management, they will still be constrained by life circumstances.

Meanwhile, Participant 2 mentioned that they proactively check nutrition labels when grocery shopping, focusing on calorie and sugar information, and plan and estimate nutritional needs according to food categories before shopping. This indicates that participant 2 actively makes nutritional judgments and dietary decisions during diet management and possesses a certain degree of planning. However, limitations of the living environment and food system can still affect this process. Therefore, digital diet management products should be designed to consider users' cultural eating habits, food availability, and grocery conditions, rather than assuming that all users are in the general food environment.

4.2.3 Co-design Workshop

This co-design workshop was based on preliminary research data obtained from an online survey and user interviews. Participants were tasked with creating affinity mappings based on three components: user pain points, user needs, and design opportunities. The main purpose of this activity was to collaboratively organize, discuss, and prioritize the research findings from the previous phase (survey, user interviews) with researchers. The co-creation of affinity maps identified high-priority user needs and potential design directions. Compared to researchers analyzing preliminary data independently, affinity mapping allows participants to directly engage in the information construction process, resulting in design solutions that are more user-centric and aligned with the core principles of user-centered and inclusive design. In this co-design workshop, researchers first organized the user pain points, user needs, and potential design opportunities extracted from the preliminary survey and interviews, creating workshop materials. Subsequently, participants and researchers prioritized the three sections: user pain points, user needs, and design opportunities. Within each section, they further identified their top 5 most important projects.

Therefore, this section will present the main results of the affinity diagram activity, categorized into user pain points, user needs, and design opportunities. Each section will analyze the information most relevant to participants, based on the affinity diagram's classification and prioritization, and discuss how these findings can be translated into design insights and a basis for subsequent digital health product design.

User Pain Points Affinity Map

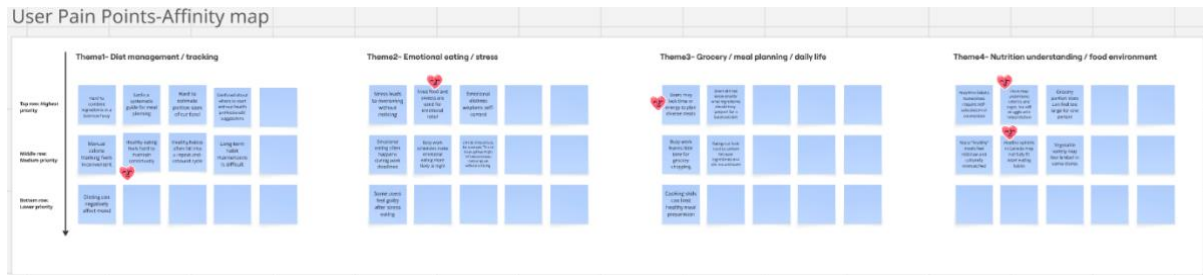


Figure 5. The user pain points affinity diagram generated from the co-design workshop showcases potential design opportunities jointly selected by participants and researchers.

This affinity diagram illustrates the results of participants and researchers collaboratively categorizing, summarizing, and prioritizing user pain points during a co-design workshop. Based on data analysis from preliminary surveys and user interviews, researchers created cards representing the user pain points extracted from the research data. When creating the affinity diagram, participants and researchers jointly categorized and summarized the user pain points into four themes: Diet management and tracking, Emotional eating and stress, Grocery and meal planning, and Nutrition understanding and food environment. Subsequently, participants and researchers further collaborated to select the five user pain points most worthy of priority in diet management and sugar control, marking them with red hearts. The results showed that the high-priority user pain points jointly selected by participants and researchers included: difficulty in maintaining a healthy diet long-term; fried foods and sweets often being used as a way to relieve stress; users may lack the time and energy to plan a diverse diet in their daily lives; although users understand basic concepts such as calories and sugar, they still have difficulty judging and interpreting nutritional information; and existing healthy eating options in Canada may not be suitable for Asian dietary habits.

These results indicate that users face multiple obstacles in the process of dietary management, such as cultivating long-term habits, regulating their own emotions, managing daily life stress, accessing professional nutritional information, and adapting to existing dietary habits. The high-priority user pain points of difficulty in maintaining a healthy diet long-term and using high-sugar, high-fat foods to alleviate emotions suggest that the dietary management process is closely related to users' emotional state and lifestyle. Meanwhile, the user pain points of difficulty in understanding nutritional information and insufficient adaptation to Asian dietary habits suggest that future digital health product design should pay attention to the clarity of information expression, the cultural diversity of dietary advice, and the sustainability of long-term habit cultivation.

User Needs Affinity Map

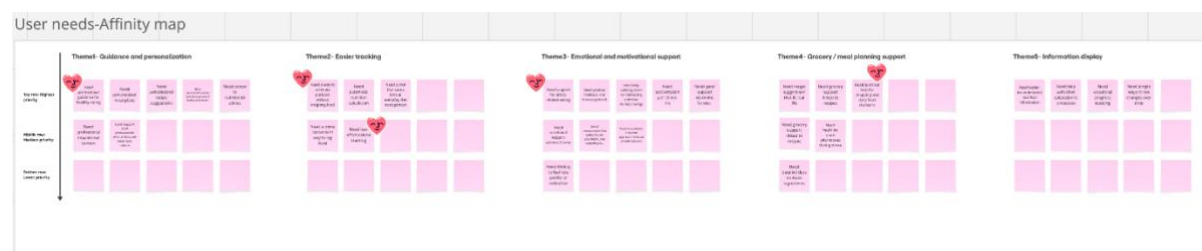


Figure 6. The user needs affinity diagram generated from the co-design workshop showcases potential design opportunities jointly selected by participants and researchers.

This affinity diagram presents the results of participants' and researchers' collaborative categorization, thematic summarization, and prioritization of user needs during a co-design workshop. Based on data analysis from preliminary surveys and user interviews, researchers created cards outlining the user needs extracted from the research data. During the creation of the affinity diagram, participants and researchers jointly categorized and summarized the user need cards into themes.

Participants and researchers divided user needs into five themes: Guidance and personalization, Easier tracking, Emotional and motivational support, Grocery and meal planning support, and Information display.

Participants and researchers selected the five most prioritized user needs from the information and marked them with red hearts. The results showed that the user needs jointly selected as high priority included: the need for professional healthy eating guidance, the need for a way to estimate food portions without weighing, the need for a low-burden calorie tracking method, the need for support for stress-related eating behaviors, and the need for more practical assistance in grocery shopping and daily food choices.

These results indicate that users' needs for digital health tools extend beyond clearer and more user-friendly data recording functions. They also require access to professional nutritional knowledge and emotional support. Participants desire professional nutritional information and clear, professional dietary management guidance.

The use of digital tools not only enables them to gain professional knowledge related to dietary management but also helps them make informed choices related to dietary management in real-life situations. Moreover, participants hope digital tools will be able to

address their needs regarding the estimation of ingredients. Using a data-capturing process is not need to be too complex or time-consuming for the participants. The characteristics of these digital dietary management products include professionalism, simplicity of use, emotional support, and support in daily decision-making.

Design Opportunity Affinity Map

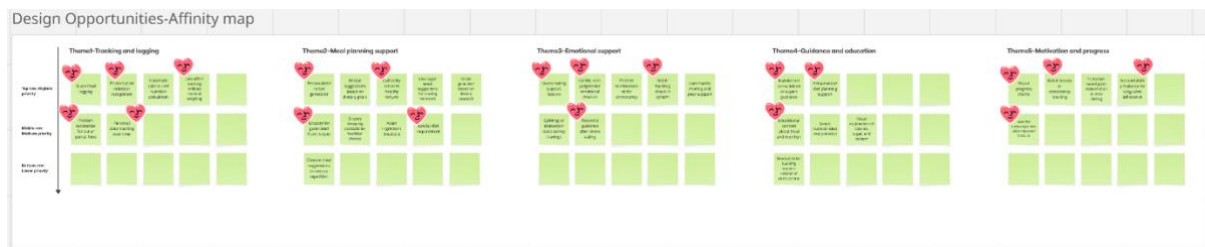


Figure 7. The design opportunity affinity diagram generated from the co-design workshop showcases potential design opportunities jointly selected by participants and researchers.

The research team believes that a more open selection method is more appropriate for the design opportunities section. Compared to the user pain points and user needs sections, the design opportunities section needs to maintain a broad range of choices to explore the potential design directions of digital diet management tools in different directions, avoiding limiting the design direction to a few solutions.

Participants and researchers collaboratively categorized and summarized the cards representing potential design opportunities, labeling each category. These potential opportunities were primarily divided into five themes.

The theme of the first group is tracking and logging, which includes potential design opportunities related to schedule management, dietary reminders, and food intake tracking. Design opportunities included quick food logging, photo-based nutrition recognition, low-effort tracking without manual weighing, portion estimation for cut or partial food, and personal data tracking over time. These opportunities reflected participants' desire for faster, more efficient data recording functions that could adapt to complex dietary scenarios in daily life.

The theme of the second group is meal planning support, which focuses on potential design opportunities and recipe planning, dietary recommendations, and ingredient purchasing. Design opportunities include personalized recipe generators, culturally relevant healthy

recipes, grocery lists generated from recipes, and special diet requirements. Participants expect digital tools to help generate daily recipes more efficiently and provide more effective multicultural dietary advice.

The theme of the third group is emotional support, which identified potential design opportunities related to supporting users' emotional well-being. Design opportunities included stress-eating support features, gentle, non-judgmental emotional check-ins, habit-building check-in systems, and recovery guidance after stress eating. Participants considered obtaining emotional support as a crucial factor in maintaining long-term dietary management.

The theme of the fourth group is guidance and education, which focuses on potential design opportunities related to access to professional nutritional knowledge and dietary guidance. Design opportunities include nutritionist consultations or expert guidance, personalized diet planning support, and educational content about food and nutrition. This reflects participants' need for professional nutritional knowledge and personalized dietary guidance.

The theme of the fifth group is motivation and progress, which focuses on potential design opportunities and user incentive mechanisms related to cultivating long-term eating habits. Design opportunities include visual progress charts, habit streaks or consistency tracking, accountability features for long-term adherence, and monthly encouragement after repeated check-ins. This indicates that participants need incentive mechanisms that can help them maintain long-term habit formation and eating behavior changes.

The research findings from the Co-design workshop indicate that participants expected digital diet management products to be inclusive. Digital diet management products should possess diverse features, integrating data recording, diet planning, emotional support, professional guidance, and long-term motivation mechanisms. Therefore, the functionality of digital diet management products should not be limited to basic diet data recording but should aim to have inclusive, comprehensive, and flexible digital features.

Users should be able to choose the features used in the digital diet management products based on their own dietary and health needs, or flexibly select and adjust the features used according to their lifestyle and specific circumstances. The design and user interaction flow of digital diet management products should not be constant.

Therefore, the potential direction of digital health product design explored in this research is a diversified, inclusive, and user-centric comprehensive digital product, aiming to comprehensively respond to the diverse needs of users in the diet management process.

5.0 Conclusion

The research aims to develop a user-centered, all-inclusive digital health product helping users with long-term diet management and healthy living habits. The researchers adopted four research methods—literature review, online survey, one-on-one user interviews, and co-design workshops—and conducted a comprehensive analysis of the research data. Researchers, through this process, collected insights on the main pain points of users, core needs, and salient potential design orientations for the diet management process.

In the first part of this MRP study, we explored potential design directions and laid the foundation for subsequent user research methodologies by searching relevant literature and conducting literature reviews. In the user research section, we employed a mixed-method approach, aiming to obtain both quantitative and qualitative data. Research methods included online surveys, one-on-one user interviews, and co-design workshops.

In the second part of this MRP, researchers analyzed the research data, employing different data analysis methods for each research approach. The data analysis results show that the problems users face in the process of diet management and blood sugar control exhibit significant diversity. Difficulty in maintaining healthy eating habits long-term, emotional eating, lack of time and energy for planning healthy eating, lack of access to professional nutritional information, and the need for diverse dietary habits are all prominent user pain points. This indicates that the diet management process is closely related to people's emotional state, lifestyle, and food culture.

Data analysis shows that participants were looking for professional advice on healthy eating, easy tracking of calories, guidance in portion estimation without weighing, emotional support for stress-related eating, and practical help during grocery shopping and daily food choices. It appears that users expect more than just more accurate data tracking through digital diet management solutions; they want a more accessible, inclusive, and integrated experience in the digital tool that is suitable for their daily life.

Through affinity diagram analysis of design opportunities in the co-design workshop, the user pain points and needs were further transformed into more specific potential functional directions. The design functions ultimately prioritized included: quick food logging, photo-

based nutrition recognition, low-effort tracking without manual weighing, portion estimation, personalized recipe and meal planning support, culturally relevant healthy recipes, stress-eating support, gentle emotional check-in, nutritionist or expert guidance, visual progress charts, and habit-building and consistency tracking. These functions were prioritized because they directly address key user concerns regarding the burden of recording, dietary decisions, mood regulation, and long-term adherence, and align better with the inclusive, low-cognitive-load, and user-centered design principles emphasized in this research.

This research indicates that digital diet management tools should not be limited to data recording and tracking, but should focus on broader and more inclusive potential design directions. Digital diet management tools can be designed as comprehensive tools that integrate personalized dietary guidance, emotional support, dietary decision assistance, and sustainable habit formation. The analysis results and priority functional directions of this study provide a basis for the subsequent development and design practice of digital product concepts, and also offer further references for the application of inclusive design in the field of digital health.

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Appendix A: Online Survey Script

Research on Digital Health Product Design for Dietary Sugar Intake Management

You are invited to take part in a research study conducted as part of a Major Research Proposal at OCAD University. The purpose of this study is to explore how an inclusive, user-centered digital product can support people in managing their daily diet habits, especially sugar intake. This study aims to better understand participants' daily routines, needs, challenges, and experiences related to diet control. The findings will help inform the design of a more accessible and supportive digital tool.

Participants are not required to respond to all questions and may choose to skip any question at any time.

1. How old are you? (Single-choice questions)
 - ☐ 18-24
 - ☐ 25-34
 - ☐ 35-44
 - ☐ 45-54
 - ☐ 55+
2. What is your main reason for trying to manage your diet or reduce your sugar intake? (Multiple-select questions)
 - ☐ To lose weight or improve fitness
 - ☐ To achieve health goals
 - ☐ To manage a medical condition
 - ☐ To improve my lifestyle
 - ☐ Others
3. What barriers make it challenging for you to maintain healthy eating habits? (Open-ended survey questions)
4. Have you ever used a mobile app or digital tool help you to track your diet, calories, or sugar intake? (Single-choice questions)
 - ☐ Yes
 - ☐ No
5. If yes, please provide the name of the tool or app you use for diet or sugar tracking. (open-ended survey questions)
6. What features would you find most helpful in a digital tool designed to support diet control? (Multiple-select questions)
 - ☐ Personalized dietary recommendations
 - ☐ Habit tracking and reminders
 - ☐ Emotional support or motivational feedback
 - ☐ Nutrition education and guidance
 - ☐ Community support
 - ☐ Visual tracking of diet and nutritional information
 - ☐ Others
7. Have you ever experienced your emotions (e.g., stress, sadness, or anxiety) influencing your eating habits? (Single-choice questions)
 - ☐ Yes
 - ☐ No
8. If yes, what types of support would help you when you experience stress eating? (Open-ended questions)

9. Did you check nutrition labels before purchasing food at the grocery store while controlling your diet? (Single-choice questions)
- ☐ Yes
- ☐ No
10. Did you experience any difficulties with meal planning or grocery shopping during periods of diet management? Please explain what challenges you faced. (Open-ended questions)

Appendix B: One-on-one User Interview Script

Introduction/ Opening Script

Hi, thank you for joining me today.

My name is Yiwen Huang, and I'm conducting a research study as part of my Major Research Project at OCAD University. The purpose of this interview is to better understand people's daily sugar-related habits, their experiences when making food choices, and any emotional or practical challenges they encounter.

There are no right or wrong answers. I'm interested in learning about your personal experiences. Everything you share will remain confidential and will only be used for research purposes. You are not required to respond to all questions and may choose to skip any question at any time.

The interview will take approximately 30 to 40 minutes.

Before we begin, I'd like to go over consent.

You should have received and reviewed the Consent Form describing the purpose of the study, what participation involves, and your rights as a participant.

I want to confirm a few things:

1. Have you had the chance to read the Consent Form?
2. Do you have any questions about the study or your participation?
3. Do you agree to sign the Consent Form?

4. And with your permission, may I take notes on your responses?

User Interview Questions Script

Section 1: Daily Eating Routine

Could you tell me about your experience with dieting or reducing sugar intake? What initially motivated you to start, and what has your journey been like so far?

During this time, how did you typically manage your meals and food choices?

What were the biggest challenges you faced, and what kind of support or resources do you wish had been available to you for diet management?

Can you share your typical daily eating routine when you are on a diet or control sugar intake?

Have you ever experienced any difficulties during the process of diet management or sugar intake management? Can you share the experience?

What barriers make it challenging for you to maintain healthy eating habits? Can you share the experience?

Section 2: Digital Health Tools

Have you ever used a mobile app or digital tool to help you to track your diet, calories, or sugar intake? please provide the name of the tool or app you use for diet or sugar tracking.

What features would you find most helpful in a digital tool designed to support diet control? or if there is a new tool, what feature you want most

Did you meet any difficulties while using the tools before? Can you share the experience? How can it be improved?

Section 3: Emotional Factors

Did you experience stress eating before? Can you share your experience?

What kind of emotional support or motivation would help you maintain a healthier relationship with food after experiencing stress eating?

If you use a digital tool to help you, what type of feature you think can help you that?

How do emotions affect your eating habits or sugar cravings?

When you experience stress or emotional discomfort, do you tend to reach for certain types of food? Why?

What situations or times of day do you find yourself most likely to crave sweet foods or beverages?

During a period of dieting or sugar control, have you ever felt emotion change after breaking the rules? Can you share your thoughts?

Section 4: Habit Formation

Could you share your experience with building a healthy eating habit? What challenges did you encounter, and what would have made it easier?

How long does it usually take before you feel a new habit becomes part of your daily routine?

What kind of feedback or progress tracking do you find most motivating when forming new habits?

Section 5: Canada Food Environment

How would you describe the availability of healthy, low-sugar options in Canadian grocery stores or restaurants?

Have you noticed any misleading food labels or marketing (e.g., “low-fat,” “natural”) that

affect your perception of sugar content ?

If you could change one thing about the current Canadian food system to support healthier habits, what would it be?

When purchasing food, do you check the nutrition label? If so, do you find it easy to understand? Please share your experience. If you face any challenges, what kind of support would be helpful?

(For Asian participants) As an Asian living in North America, what challenges have you faced regarding your diet or eating habits? What support do you feel you need?

Please share an experience of buying ingredients at a supermarket or prepared food from a store. How did you ensure that your purchase aligned with your sugar control or dietary goals? What difficulties did you encounter, and what assistance would have been useful?

Closing Script

Thank you for sharing your thoughts. Before we finish, is there anything else you'd like to add about your experience with sugar intake or habit-building? Thank you again for your time and insight.

Appendix C: Co-design Workshop Script

1. Opening Script

Hello, and thank you for participating in this co-design workshop.

My name is Yiwen Huang, and I am conducting this session as part of my Major Research Project at OCAD University.

This workshop is based on findings from the earlier stages of this research, including the online survey and user interviews. In today's session, we will work together to organize and reflect on these findings through affinity map building.

The workshop will focus on three areas:

- User pain points
- User needs
- Design opportunities

The purpose of this session is to better understand which issues, needs, and potential design

directions are most meaningful from the participant's perspective in the context of sugar management and healthy eating.

Before we begin, I would like to confirm that you have reviewed and signed the consent form.

2. Workshop Overview Script

This workshop will take approximately 60 to 90 minutes to complete.

The session includes the following parts:

- Introduction and activity overview
- Affinity map building for user pain points
- Affinity map building for user needs
- Affinity map building for design opportunities
- Priority selection and brief closing reflection

There are no right or wrong answers in this activity. Please share your thoughts freely. You may also skip any question or activity at any time if you do not feel comfortable.

3. Activity Script: Affinity Map Building

Activity Introduction

In this activity, we will review a set of prepared cards based on previous survey and interview findings. These cards represent different user experiences, challenges, needs, and possible design ideas related to sugar management and healthy eating.

We will go through three sections in sequence:

1. User pain points
2. User needs
3. Design opportunities

For each section, we will work together to:

- read through the cards
- group similar cards into clusters
- discuss why certain ideas belong together
- assign a label or theme name to each cluster
- review and revise the structure if needed

For the **user pain points** and **user needs** sections, participants will also be invited to identify the **Top 5** items they consider most important.

For the **design opportunities** section, participants and the researcher will keep a broader range of possible features rather than narrowing the selection to only a few items. This is

intended to preserve wider design possibilities at this stage of the research.

Participants are welcome to move cards, rename themes, combine categories, or suggest additional cards if needed.

Guiding Prompts

The following prompts may be used to support discussion during the activity:

- Which of these points feel most relevant to your real-life experience?
- Which pain points seem the most difficult or most significant?
- Which needs feel the most important for daily support?
- Are there any cards that seem closely related and should be grouped together?
- Are there any cards that feel unclear, unnecessary, or missing?
- Which design ideas would be most useful in everyday life?
- Are there any additional features or needs that should be added?

Section-Specific Facilitation

A. User Pain Points

In this section, participants will review and group cards related to difficulties or barriers experienced in sugar management and healthy eating. After clustering and labeling the ideas, participants will be invited to select the five pain points they consider most important.

B. User Needs

In this section, participants will review and group cards related to desired forms of support in daily sugar management. After clustering and labeling the ideas, participants will identify the five needs they consider most important.

C. Design Opportunities

In this section, participants will review and group cards related to potential digital product features and support functions. Rather than selecting only a limited number of items, participants and the researcher will retain a broader set of design opportunities to support later concept development.

4. Closing Script

Thank you very much for your participation and thoughtful contributions today. Your input is very valuable to this research.

Before we conclude, I would like to ask:

- Are there any final thoughts or ideas you would like to add?
- Is there anything you feel should be emphasized more in the future design of a digital sugar-management product?

Thank you again for your time and insight.

