

Stakeholders' Perceptions of the Persuasive Features Supporting Continuous Engagement in Weight-Management Applications

Elena Vlahu-Gjorgievska^{1,*†}, Phyu Thant Hlaing Khin^{1,†} and Khin Than Win^{1,†}

¹ University of Wollongong, Northfields Ave Wollongong, NSW 2522, Australia

Abstract

The paper presents the young adults' and health professionals' perspectives on the app's design features that can enhance the continuing engagement and adoption of behaviour changes, encouraging healthy eating habits and physical activities in young people. To identify the stakeholders' needs and requirements, 15 interviews were conducted. The data analysis outlined 3 main themes (Behavioural Aspects, Health Education, and App Design Features) with 11 subthemes. The findings were translated into the app design requirements and mapped into the Persuasive Systems Design principles of Tailoring, Self-monitoring, Reminders, Suggestions, Rewards, Liking, Social facilitation, Trustworthiness, and Verifiability. This resulted in a set of design features that can support continuous engagement in weight-management applications for young people by promoting and facilitating behaviour change.

Keywords

mHealth apps, weight management, continuous engagement, behaviour change support, healthy eating habits and physical activity, Persuasive Systems Design

1. Introduction

More than a quarter of the young population has weight problems [1], which can further deteriorate with the increased consumption of junk food and sugary drinks, as well as the decrease in physical activities [2, 3]. Weight problems can also cause serious health issues and psychological effects [4, 5]. Behaviour, biological, emotional, cognitive, environmental and social factors influence achieving and maintaining a healthy weight [6], with self-regulation and health behaviours being core elements to meet this goal [7, 8]. Health behaviours vary over time depending on the context [9, 10], making weight management complicated and requiring the implementation of sustainable and feasible approaches [10].

The use of digital tools, such as mobile health applications (mHealth apps), to promote healthy lifestyles has become a popular trend nowadays [11-14], especially for young people, helping them to maintain weight sustainably by overcoming time and place barriers [15]. The mHealth apps can support the delivery of behaviour change interventions towards food intake and physical activities; however, not only the adoption, but the continuation of use of these apps is the one impacting the overall efficacy of the intervention and enhancing positive outcomes [16-18]. Many barriers are impacting the app's adoption and continuation of use [19, 20], with literature showing most users cease mHealth app activity within a few uses [16, 21, 22]. Therefore, designing a solution that will support young people's continuous engagement in behaviour change can help in long-term weight management.

The user-centred design plays a crucial role in the development of the mHealth apps, since the interactive design highly influences the adherence to the digital interventions [23, 24]. Focusing on

BCSS 2026: The 14th International Workshop on Behavior Change Support Systems, March 10, 2026, Hakodate, Japan

* Corresponding author.

† These authors contributed equally.

✉ elenavg@uow.edu.au (E. Vlahu-Gjorgievska); doctorphyuthanthlaingkhin@gmail.com (P. T. H. Khin); win@uow.edu.au (K. T. Win)

ORCID 0000-0001-6160-5343 (E. Vlahu-Gjorgievska); 0000-0002-7810-6388 (K. T. Win)



© 2026 Copyright for this paper by its authors. Use permitted under Creative Commons License Attribution 4.0 International (CC BY 4.0).

users' experiences [25, 26], developed applications can persuade people to adopt behavioural changes and achieve targeted outcomes [26-29]. For that purpose, the involvement of the stakeholders in the process of the design and development of the mHealth apps is important [26, 30]. This includes understanding stakeholders' needs and requirements and incorporating their feedback in the design [28, 31-34].

Persuasive Systems Design (PSD) model emerged as a comprehensive approach to evaluate and understand persuasive systems and their influence on user behaviour through non-coercive means, enhancing user experience, engagement and usability [35]. The PSD model is comprised of four categories, including primary task support (supporting users' core activities), dialogue support (carrying out computer-human dialogue support and feedback to aid users to keep moving their targeted behaviours or goals), social support (increasing social influences to motivate users), and credibility support (being more credible to be more persuasive). Incorporating persuasive design features with behavioural techniques can facilitate continued and sustainable behaviour change in users [15, 29, 31, 36]. The literature have shown that the adoption of PSD principles in the digital interventions can help in managing chronic health conditions, encouraging medication adherence, reducing alcohol and tobacco usage, and promoting physical activity [37-41].

The aim of this paper is to identify the design requirements and feature preferences for the weight-management application targeted at young people. Fifteen interviews with health professionals and young adults were conducted to explore their perceptions, feedback, and recommendations regarding application features that can support self-management and promote healthy eating habits and physical activity. The identified design requirements were mapped into PSD principles to define app features that should enable the adoption of healthy behaviours among young adults by supporting and enhancing continuous engagement.

2. Methodology

To identify the needs and preferences for the mHealth app for weight management, semi-structured online interviews, with a set of questions developed by the authors, were used to collect data. The semi-structured interviews allow more flexibility for follow-up questions and clarification of responses, enabling a more comprehensive information [42].

The interviews were conducted with eight young adults (as direct), and seven health professionals (as indirect stakeholders). The study used a purposive sampling strategy, with the eligibility criteria for the young adults being between 18 and 30 years old, and for the health professionals to be physicians, nurses, dietitians, psychologists, exercise physiologists/physiotherapists, or fitness and personal coaches/trainers with experience in weight management. To widen the scope and gather opinions from young adults who have used a weight-management app and those who have not, it was not required that participants have such experience. However, during the interviews, participants were asked about their experience with a weight-management app and their motivations and reasons to begin, drop out, or continue to use the app. The participants were recruited via digital advertisements posted online (LinkedIn, X) and sent to email lists and communication channels of health professionals' groups/networks, and paper-based fliers distributed at public boards across the Illawarra region. The recruitment stopped when the results started to be saturated, and no new codes were identified.

The semi-structured interviews were conducted online using Zoom. The interviews were recorded, ensuring participants' anonymity, and the automatically generated transcripts were manually checked and corrected. The transcripts were analysed using NVivo 14 software. The interview data were coded and organised into themes, sub-themes and codes that reflect stakeholders' perceptions, feedback, thoughts, and recommendations on the app's requirements (content and features). The coding was independently done by 2 authors and cross-checked by all authors. Any disagreements were solved through discussion and consensus of all authors.

The study was approved by the Health and Medical Research Ethical Committee of the University of Wollongong. The Consolidated Criteria for Reporting Qualitative Research (COREQ) [43] was used to report the study (Appendix A).

3. Results

Eight young adults, 4 females and 4 males, participated in the interviews. The age-range was 20 to 26 years, with half of the participants (50%) being 20 years old. Seven health professionals (4 females and 3 males with working experience spanning 3 to 17 years) participated in the study, including dietitians (n=3), medical doctors (n=1), nurses (n=1), and exercise science professionals (n=2). The interviews lasted on average 36 minutes. The data analysis identified 3 main themes: Behavioural Aspects, Health Education, and App Design Features.

3.1. Behavioural Aspects

The first theme, Behavioural aspects (Table 1), includes the perceptions of the factors influencing the mHealth app adoption and use. Three codes were identified: Attitude, Motivations and Barriers. Young adults expressed that using mHealth apps is advantageous because they can easily set their goals in the apps [YP1]. The app can be helpful in tracking their eating or exercise patterns and the alignment with their goals, so that they can modify or change their actions if necessary [YP4]. The health professional also agreed that the mHealth apps can be beneficial, especially because young people are highly familiar with the technology [HP1, HP2, HP3, HP6]. But, they also expressed concern that digital tools can be consumed obsessively [HP6]. Young adult participants expressed that the motivation to use the app is supported by the features included, such as calculating calories, looking for new recipes, food and exercise suggestions, and rewards [YP1, YP2]. Additionally, the health professionals suggested that the mHealth app should be simple to use with user-friendly and personalised features, guiding and educating users in achieving their goal [HP2, HP4, HP5]. Unlike the health professionals who did not provide a strong perception regarding the barriers, young adults stated that the costs for the subscriptions and the high number/details of information required to be entered (meals, exercises) can be challenging in the continuation of use of the app [YP1, YP2, YP4].

Table 1
Behavioural aspects theme

Subtheme	Codes	Examples of references from the interview transcripts
Perceptions of the factors influencing mHealth adoption and use	Attitude	"...like my weight and how much weight I want to lose and what type of food I want..." [YP1] "Some young adults are really passionate about this, use digital tools." [HP1]
	Motivations	".. add new outcomes or like trophies, results, then I think it could be like exciting..." [YP2] "...an app that is simple but specific enough to provide enough information to users to guide them and educate them..." [HP4]
	Barriers	"I paid for so many subscriptions,... it wasn't cheap, so I just cancelled it..." [YP1]

3.2. Health Education

The Health Education theme (Table 2) includes subthemes Content and Presentation of that content within the app. More information regarding the Health Education Content needed, Frequency for Update and use of Credible and Trustworthy Sources were given by the health professionals. While both, health professionals and young adults, participants noted similar formats for the Presentation of the health educational content (Video, Text&Links and Multimedia).

Table 2

Health Education theme

Subtheme	Codes	Examples of references from the interview transcripts
Content	Information needed	<p>“A lot of facts about health, a lot of talks about the different foods that you eat as well” [YP7]</p> <p>“It might be around how to build a healthy, balanced meal that has protein, carbs, vegetables, fibre,..” [HP6]</p>
	Frequency for content updates	<p>“But if you made any kind of educational videos or materials, I would just check the content every year...” [HP3]</p>
	Credible and Trustworthy sources	<p>“I think it would be good to include evidence based like videos or something” [YP4]</p> <p>“Australian dietary guidelines are really good... anything that's released by the World Health Organisation is good” [HP7]</p>
Presentation of the health education contents	Video	<p>“I like videos because they're just easy to follow” [YP8]</p> <p>“I think videos are really good, but short videos, not keeping things too long. I think people's attention spans, especially these days, are very short.” [HP7]</p>
	Text & Links	<p>“I would definitely go for text.” [YP6]</p> <p>“...links to like taste.com, where there are recipes or a healthy food guide. ... healthyfood.com where they get recipe ideas ...” [HP3]</p>
	Multimedia – text, video, images, graphs	<p>“So it looks good. It sounds good, it's quick, and it's short.” [HP5]</p> <p>“But I think also, like infographics where it's got a bit of text, a little bit of like some pictures, also draws people's attention ... keeping it simple and not overdoing it.”[HP7]</p>

Generally, all participants stated that health education content should holistically cover both aspects of healthy eating and physical exercise. Information should aim not only for educational purposes but also for behaviour change [HP1], entailing a comprehensive definition of weight management, including underlying reasons, unhealthy behaviours, and consequences [HP2]. The inclusion of life skills such as meal planning, grocery shopping, and budgeting, alongside information to improve movement in everyday life, should be added [HP3]. Healthcare professionals also highlighted that the information should be personalised according to users'

educational level, with an emphasis on simplicity [HP4, HP7]. They also noted that the term “balanced eating” is more feasible to be replaced with the term “diet” as the latter conveys negative connotations, and the focus should be shifted from counting calories to promoting dietary diversity with healthy and balanced meals [HP5, HP6].

The health professional participants discussed that the educational contents do not need to be very frequent; however, the frequency should vary according to the content [HP3, HP4, HP6]. Basic health information, such as macronutrients and healthy food sources, can remain unchanged for a certain period, whereas changes for educational materials, such as videos, may be reviewed on an annual basis [HP3]. Meanwhile, more frequent updates may be appropriate for recipes or practical tips [HP5].

Some young adult participants also highlighted that the information should contain proof of evidence that it was collected from trustworthy and reliable sources and providers, as stated in [YP1, YP4]. On the other side, the credible sources mentioned by the healthcare professionals included the Australian dietary guidelines, national activity guidelines and sedentary behaviour guidelines, as well as peer-reviewed journal articles, university-funded websites and materials created by accredited practising dietitians [HP1, HP2, HP3, HP5, HP7].

Participants expressed different types of formats to present the educational content; the video option was the most popular. Young adult participants preferred videos to any other formats as they can learn and see the information more clearly [YP3, YP4]. Similarly, health professionals mentioned that the videos can be highly appropriate for young adults because of their less overwhelming nature compared to text. The shorter videos are most preferred [HP3, HP5, HP7], although longer ones may be alternative options in certain situations [HP5], but it is important to simplify the message [HP2]. Additionally, for the text format, participants stated that the text should be as short as possible, as lengthy text might not be read in full [YP6, HP2]. When discussing the text format, some participants mentioned that links to evidence-based articles and helpful websites (e.g. healtyfood.com) can be beneficial as well [YP4, YP8, HP3]. The multimedia with text and infographics was another format identified by the participants [HP5, HP6, HP7]. In general, every format that keeps the presentation simple and presents the information in a more creative way to engage the users can be applied.

3.3. App Design Features

The theme App Design Features (Tables 3, 4, 5, and 6) included subthemes of Customisation, Self-Monitoring, Recommendations, Notifications, Goal-setting, Gamification, Social support and Integration with other Devices/Apps. For these subthemes, a number of codes were identified.

While healthcare professionals did not highlight the need for customisation (Table 3), the young adults noted that the app should provide a certain level of autonomy to customise the features and make the app more appealing to users. Some of the young adults' participants noted that colour, font, mode (light/dark), and screen positions are some of the app features that should be customisable [YP1, YP3, YP4, YP6]. Although others clarified that customisation is not very important and, in some cases, can be a distraction [YP3, YP7].

The self-monitoring theme (Table 4) includes 6 codes: Meal/Calorie/Hunger, Weight, Physical activities, Water/Fluid, and Sleep/Stress/Feelings. All participants expressed the importance of the self-monitoring feature in helping users to achieve their goals, encouraging them to self-evaluate health-related behaviours and enhancing motivation. The young adults were more focused on the calorie, meal and physical activities tracking. They highlighted that having meal plan options in the app, in addition to calorie tracking features, is important because the majority of people will have less time to plan what to eat in a day, or they can have different eating patterns, and having this planner option will help them to prepare their meals easily [YP5, YP7]. Some young adult participants emphasised that the apps should calculate calories once the users enter their meals. Likewise, regarding exercises, they would prefer the app to include different options for the

exercises, including duration and intensity, and to calculate the calorie burns based on the completed exercises [YP2, YP4, YP7].

Table 3

App Design Features theme (Customisation)

Subtheme	Codes	Examples of references from the interview transcripts
Customisation	Colour	“... you can make the whole app pink if you want, or blue...” [P4] “just like a bit of customisation options with the colours” [P6]
	Font	“If you let the people customise the way it looks and stuff, and like the font and the colours...” [P4]
	Mode	“..change the mode of the app into darker.” [P3]
	Screen position	“Maybe a little bit of the features might be personalised to your own taste, like the positions of the screen...” [P3]

However, health professionals strongly suggested that for healthy eating, it is the food that needs to be tracked. The calorie tracking can be misleading since it does not give the information about the nutritional values [HP1, HP2, HP3, HP5]. Closely related to the food tracking is also the portion size [HP7]. The health professionals mentioned that tracking hunger can be beneficial as well, since it will make the user aware whether they are eating because they are hungry, or they are going beyond their fullness [HP5]. Another parameter to be tracked is weight. The health professionals highlighted that tracking weight and body measurements can be motivational for the users since they can see their progress over time, and thus should be prioritised [HP1, HP4, HP7]. However, the weighting should not be more than once a week, even once a month, to avoid misperception [HP3]. Regarding the physical activities, health professionals believe that tracking physical activities will make users more aware of the exercises they do daily and whether those are within the recommended physical activity guidelines [HP5, HP7]. Other parameters to be tracked include water/fluid intake (especially for users who may be at risk of poor hydration), stress, sleep and feelings, which are closely related to a healthy lifestyle and can negatively influence the eating habits.

The goals can lead to encouragement and behaviour change, so participants strongly agreed that having the goal-setting feature will motivate the users to work towards achieving their goals. Both young adults and health professionals participants agreed that the goal-setting feature should provide simple, achievable and measurable goals, including various aspects of diet and physical exercises [YP2, YP4, YP8, HP1, HP5].

The participants indicated that the recommendation feature (Table 5) should be included to help users in achieving their weight management goals on a day-to-day basis. Most of the young adults mentioned that guidance about personalised meal plans and exercises, the number of steps to be taken per day, calorie consumption and burning throughout the day, are the main content that they would like to receive as a recommendation from the app. Some also highlighted that recommending new recipes and more diverse physical activities would increase motivation for the users to try out new things [YP8]. The health professionals also confirmed that recommending participants to take physical exercises regularly and a healthy eating, including snacks, is important [HP2, HP3, HP4, HP6]. Recommending AI-generated workout plans with specified frequency was also mentioned [HP3, HP4]. The healthcare professionals agreed that the

recommendations should be positive and that the level of personalisation with integrated educational content can enhance validity and reliability [HP2, HP3, HP4, HP7].

Table 4
App Design Features theme (Self-monitoring & Goal-setting)

Subtheme	Codes	Examples of references from the interview transcripts
Self-monitoring	Meal/ Calorie/Hunger	“...calories of different meals would be something I would be more interested in...” [YP6] “I think the most effective way is actually tracking food rather than calories ...because you eat food.” [HP1]
	Weight	“...push them more towards making those healthy changes, and then seeing the weight over months rather than every single day having that reminder.” [HP7]
	Physical activities	“...logging how many steps you did in the day, or like the person goes to the gym, what kind of exercises they did.” [YP4] “...whether it's cardio resistance, say, it's Pilates and having a range of different types of exercise. I think durations are really important.” [HP7]”
	Water/Fluid	“It could be like a water tracker. ..just getting them to track their water” [HP3]
	Sleep/ Stress/Feelings	“So monitoring things like stress levels and sleep...” [HP7] “...rating of perceived exertion, or you know how they feel...” [HP6]
Goal-setting	Goals’ perception	“...need to really specify achievable, simple, easy goals to achieve...” [YP2] “...if they can be quite specific goals, like specific and measurable, then the person can meet them more easily” [HP5]

The Notifications subtheme (Table 5) included two codes related to the content and frequency of the notifications. Many of the participants (both young adults and health professionals) suggested that notifications should be more like reminders with a positive, encouraging tone and instructions associated with achieving users’ goals. Content can include reminders for meal preparation, drinking water, eating healthy snacks and meals, physical exercises, or simply checking in with how the users are doing. The opinions about the frequency of the notifications varied from 3-4 times a day to once a week, or only when detected that the user hasn’t used the app for many days. The participants noted that users should have the option to turn off the notification and schedule the notifications at their preferred day/time [YP1, YP6, HP4, HP5]. The health professional acknowledged that the generic notifications can be annoying for the users, limiting the ability to capture users’ attention and proposed context-sensitive follow-up reminders [HP3, HP4].

Participants strongly agreed that the inclusion of gamification features (Table 5) could increase users’ motivation and continuous engagement. The gamification can include rewards implemented as trophies, badges, leaderboards, avatars or incentives such as unlocking additional app features [YP1, YP4, YP5, YP7]. Unlike young adults who expressed different options for the implementation

of gamification features, healthcare professionals did not discuss this in detail, but agreed that gamification feature plays an important role in enhancing users' engagement [HP3, HP7].

Table 5

App Design Features theme (Recommendations, Notifications, Gamification)

Subtheme	Codes	Examples of references from the interview transcripts
Recommendations	Food recommendation	<p>"...nutrition advice like 'Have you had like this many fruits today and things like that?'" [YP4]</p> <p>"...you could tell them that maybe, instead of having picking up that soda to drink, maybe they can just substitute it with some water." [HP2]</p>
	Physical activities	<p>"...recommendation could be to incorporate exercises that improve that aspect of your health." [YP8]</p> <p>"...recommend that you do 7,000 steps a day, because it increases your chances of longevity and overall health..." [HP7]</p>
Notifications	Content	<p>"I would prefer a notification that says drink water." [YP1]</p> <p>"...notification would be, 'hey, let's pack lunch, and it'd be the night before, like might be 8 o'clock.'" [HP3]</p>
	Frequency and timing	<p>"...if it's worded in a more positive way, for example, you're halfway through your exercise goal today..." [YP5]</p>
Gamification	Gamification Features	<p>"... little avatars, little profiles... cool colours for the application, they can unlock if they do certain things for the application." [YP7]</p> <p>"...but something in the app where you get a trophy... like some sort of reward..." [HP7]</p>

Participants agreed that having social features (Table 6), such as forums, group chats and sharing achievements, would create a sense of community among users since they can communicate with friends or a wider community. Health professionals highlighted that the community could have a very positive effect; however, they raised concerns regarding the privacy, negative comments, and sharing of information or practices that are not based on evidence [HP2, HP3]. For this purpose, they propose some sort of a help line to be included [HP2]. Young adult participants agreed that it is beneficial to include forums, small group chats (where users could share information only with chosen users or only with their friends to create a sense of security), or a private messaging option [YP4, YP5, YP7, YP8]. Meanwhile, participants noted that sharing achievements with friends or small groups can increase users' motivation [YP2, YP3, YP8, HP2], but sharing with a wider community could lead to a sense of competition and decrease users' engagement [YP2]. Some of the young adults also highlighted that having healthcare professionals or personal trainers in the chat groups would be beneficial for the users [YP7, YP8].

All participants agreed that incorporating functionality that will enable app synchronisation with other smart sensors, widgets or smart watches will be beneficial, since the users do not need to re-enter the data about the health and physical activities gathered by these devices (Table 6). Young adult participants had divided opinions regarding the features supported by artificial

intelligence (AI). Some were happy to have an AI assistant promptly answering their questions [YP6], while others raised ethical concerns and questioned the reliability of AI [YP4, YP8]. Similar concerns were raised by the healthcare professionals [HP2, HP5], but they also agreed that AI can be used to generate recipe ideas or shopping lists [HP3].

Table 6

App Design Features theme (Social support & Integration with other devices)

Subtheme	Codes	Examples of references from the interview transcripts
Social support	Forums	"...it's beneficial to speak to other people who are going through the same thing as you go through the forums and just being able to have something in common and feel like you're on the journey with others is beneficial." [YP5]
	Group chat	"...allow them to maybe private message each other, that could be good..." [YP4] "...a lot of people tend to engage better when it's in a group, like you could have a whole family." [HP2]
	Sharing achievements	"..instead of sharing with the entire population, or the entire participants of the app, share that result with your peer groups..."[YP2] "I think it is because a big part of fitness, especially for me, is community... Then it's good to be able to talk about this, and share your achievements." [YP8]
Integration with other devices	Smart sensors and devices	"I'm having a smart watch which could just easily give you update on what you've been doing. It should be nice to have it connected." [YP3]
	Use of artificial intelligence	"I think it just depends on how you use AI, because I know that AI isn't super reliable for advice, and they can say false things that might lead people down an unhealthy path..." [YP4]

4. Discussion

In order to deliver an mHealth application that will support the adoption of behaviour changes in the long term, it is imperative to take into account stakeholders' opinions and prioritise their preferences [44]. The findings of this study outline that motivation for continuation of use is highly related to the app's features and their alignment with the users' goals. Designing the app to be easy to use, while educating and guiding the users in achieving their goal, will facilitate continuing engagement in healthy eating habits and physical activities.

The subthemes identified in the interview data analysis are well aligned with the Persuasive Systems Design Model principles. The mapping of the identified design requirements into the persuasive systems design principles is presented in Table 7. In general, the findings highlighted nine persuasive principles that can guide the design of features for a weight management application for young people.

The **Tailoring** and **Self-monitoring** are the main principles supporting the primary task. Providing tailored educational content for weight management can support user motivation and continuing engagement in healthy behaviours [45, 46]. The content should cover the aspects of healthy eating and physical exercise, and should be presented as short videos, brief text with

images, or multimedia. These formats are highly preferred by young people because they reduce the cognitive load, increase engagement through dynamic visuals, and align with their fast-paced digital lifestyles [47]. The health educational content should be from credible sources, such as “Australian Dietary Guidelines” [49], including links to the source materials for further reading. This also aligns with the PSD principles of **Trustworthiness** and **Verifiability** [38, 40].

Self-monitoring has been shown to facilitate the adoption of healthier habits and to support continuing improvements in eating and physical activity behaviours [40, 48]. This feature should allow users to monitor their progress towards achieving their goals. In this context, self-monitoring is related to the goal-setting feature, which will allow users to define simple, concise and measurable goals. The analysis identified several aspects that require ongoing monitoring. The main disagreement between the young adults and health professionals was the perception regarding calorie tracking. This concept was highly supported by the young adults; however, the health professionals strongly suggested that calorie tracking can be misleading and can lead to harmful beliefs and associations. Tracking the food intake through the number of serves of fruit, vegetables, proteins, as well as healthy snacks is in line with the dietary patterns recommended in the Australian Dietary Guidelines [49]. This approach makes the recording of the intake more seamless, gives a clear overview of the food choices made by users, and fosters healthy eating habits. Besides the food intake, the application should include options for tracking the weight, physical activities, water and sleep. The self-monitoring feature should allow users to either automatically import their data from synchronised sensors and devices (such as smart watches) or manually enter and update their records. This approach can support the continuing engagement by increasing the usability of the application and user satisfaction.

From the Dialogue Support Category, four principles (**Reminders**, **Suggestion**, **Rewards** and **Liking**) were identified. The Reminders principle corresponds to the identified subtheme of Notifications. The Reminders should be context-sensitive notifications delivering positive and encouraging messages about the healthy meals, meal preparation, physical exercises, and well-being checks. It is important that the messages are associated with users' goals and targeted behaviour [23, 35]. Including options that will enable the users to schedule reminders according to their personal preferences (time and type), as well as to disable them entirely. These options can help in addressing user dissatisfaction associated with intrusive reminders, which may affect continuation of use [48, 50].

Another feature that can influence users' continuing engagement, by guiding the user towards achieving their goals and sustainable behaviour change, is Recommendations (PSD principle of Suggestion) [29]. The application should provide personalised recommendations for recipes and meal plans, and physical exercises. It can be considered for this feature to be supported by artificial intelligence, so the users can have access to a pool of diverse recommendations. However, the safe and appropriate use of AI in mHealth applications is imperative [51], so the inclusion of such feature requires transparency, rigorous validation of the used AI algorithms, as well as quality assessment of the generated recommendations.

Rewards are often used to stimulate motivation and adherence [24, 41]. The application should include gamification elements, such as rewarding badges or trophies, or rewards in the form of unlocking app features or achievement levels to boost user motivation and continuing engagement.

Liking is an essential principle supporting application adoption and continuation of use. Enabling the users to change the colours in the app with an additional option of light and dark mode and adapt the font size will make the application visually attractive and more appealing to the users [35, 52]. It is important to note that such customisations, including scheduling customised reminders, can also contribute to enhanced application accessibility and promote user autonomy by aligning with individuals' specific needs and personal preferences [41, 44].

Social facilitation can motivate the users to pursue a targeted behaviour, enabling users to engage by encouraging and supporting each other to reach their goals [38, 40, 53]. The application should provide a Social-Space feature where users can communicate and share their achievements. The sharing option should be restricted based on users' individual preferences (sharing with an

individual, group or wider community). This way, the users will be empowered to share their achievements, as well as their concerns, without the constraint of being judged by unknown people. Another feature to be considered is providing options for the users to connect with health professionals. This can be in the form of a helpline or chat where users can directly contact the health professionals.

The proposed design features represent a core set of functionalities that stakeholders believe can enhance users' motivation and engagement, encourage continued app use, and support the maintenance of healthy behaviour changes.

Table 7
Mapping of the design requirements into the PSD principles

Design requirements	PSD principles
<i>The app should...</i>	
-provide information about healthy eating in the form of short text, videos & multimedia.	Tailoring
-provide information about physical exercises in the form of short text, videos & multimedia.	Trustworthiness
-provide recipes and practical tips for healthy and balanced meals.	Verifiability
-provide evidence-based health information from credible sources.	
-allow the user to define simple and measurable goals.	Self-monitoring
-provide users with simplified tracking of their food in-take.	
-allow the user to track their physical activities.	
-allow the user to track their weight.	
-allow the user to track their water intake.	
-allow the user to track their sleep.	
-be able to synchronise with smart watches and other monitoring devices.	
-allow the user to schedule reminders with a positive, encouraging message for healthy meals.	Reminders
-allow the user to schedule reminders with a positive, encouraging message for the physical exercises.	
-allow the user to schedule reminders with a positive, encouraging message for the water intake.	
-provide recommendations about healthy meals and snacks.	Suggestions
-provide recommendations about new recipes.	
-provide recommendations about diverse physical exercises.	
-provide rewarding badges or trophies for achieving a particular goal.	Rewards

-allow the user to unlock an app feature when a particular goal is achieved.

-be easy to use and visually appealing.

Liking

-allow the user to change the colours.

-allow the user to change the font.

-allow the user to change the light/dark mode.

-provide an option for the user to communicate with their friends and family.

Social
facilitation

-provide an option for the user to share their achievements with friends and family.

-provide an option for the user to connect with health professionals.

The presented study has some limitations. The intention of the study was to gather the stakeholders' opinions regarding the mHealth app for weight-management, without focusing on a specific application. This can limit the findings, since the implementation of the features plays a crucial role in the app's usability and continuation of use. Therefore, further research is needed to explore users' perceptions and the long-term sustainability of the weight-management app after they have engaged with the app over an extended period.

5. Conclusion

This qualitative study explored the young adults' and health professionals' opinions and perceptions of the design features required in an mHealth app supporting behaviour change and sustainable weight management. The identified design requirements were mapped into PSD principles of Tailoring, Trustworthiness, Verifiability, Self-monitoring, Reminders, Suggestions, Rewards, Liking, and Social facilitation.

The future research should evaluate the app's effectiveness during long-term use. Additionally, although the use of artificial intelligence in the mHealth app was discussed with the participants, further research is needed to explore the role of AI and its potential to enhance personalisation in mHealth apps for weight management. For the future development of AI-supported features, it is important to examine users' perceptions, their willingness, expectations, and possible constraints regarding the acceptable design and implementation of AI-enabled personalisation.

Acknowledgements

This work was funded by the University of Wollongong, Advancement & Equity Grants Scheme for Research (AEGiS 2024 Grant).

Declaration on Generative AI

During the preparation of this work, the authors used Grammarly for grammar and spelling check. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the publication's content.

References

- [1] World Health Organization, Obesity and overweight, 2025. URL: <https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight>.
- [2] M. Safaei, E. A. Sundararajan, M. Driss, W. Boulila, A. Shapi'i, A systematic literature review on obesity: Understanding the causes & consequences of obesity and reviewing various machine learning approaches used to predict obesity, *Comput. Biol. Med.* 136 (2021) 104754. doi:10.1016/j.compbimed.2021.104754.
- [3] F. Lehmann, G. Varnaccia, J. Zeiher, C. Lange, S. Jordan, Influencing factors of obesity in school-age children and adolescents—a systematic review of the literature in the context of obesity monitoring, *J. Health Monit.* 5.Suppl 2 (2020) 2.
- [4] L. J. Ells, M. Ashton, R. Li, J. Logue, C. Griffiths, G. Torbahn, J. Marwood, J. Stubbs, K. Clare, P. J. Gately, Can we deliver person-centred obesity care across the globe?, *Curr. Obes. Rep.* 11.4 (2022) 350–355.
- [5] M. Blanco, S. Solano, A. Alcántara, M. Parks, F. Román, A. Sepúlveda, Psychological well-being and weight-related teasing in childhood obesity: a case–control study, *Eat. Weight Disord. Anorex., Bulim. Obes.* 25.3 (2020) 751–759.
- [6] L. Montesi, M. El Ghoch, L. Brodosi, S. Calugi, G. Marchesini, R. Dalle Grave, Long-term weight loss maintenance for obesity: a multidisciplinary approach, *Metab. Syndr. Obes.* (2016) 37–46.
- [7] S. Pedersen, F. F. Sniehotta, K. Sainsbury, E. H. Evans, M. M. Marques, R. J. Stubbs, B. L. Heitmann, L. Lähteenmäki, The complexity of self-regulating food intake in weight loss maintenance. A qualitative study among short-and long-term weight loss maintainers, *Soc. Sci. Med.* 208 (2018) 18–24.
- [8] P. J. Teixeira, E. V. Carraça, M. M. Marques, H. Rutter, J.-M. Oppert, I. De Bourdeaudhuij, J. Lakerveld, J. Brug, Successful behavior change in obesity interventions in adults: a systematic review of self-regulation mediators, *BMC Med.* 13 (2015) 1–16.
- [9] C. Greaves, L. Poltawski, R. Garside, S. Briscoe, Understanding the challenge of weight loss maintenance: a systematic review and synthesis of qualitative research on weight loss maintenance, *Health Psychol. Rev.* 11.2 (2017) 145–163.
- [10] D. Kwasnicka, S. U. Dombrowski, M. White, F. Sniehotta, Theoretical explanations for maintenance of behaviour change: a systematic review of behaviour theories, *Health Psychol. Rev.* 10.3 (2016) 277–296.
- [11] A. J. Lentferink, H. K. Oldenhuis, M. de Groot, L. Polstra, H. Velthuisen, J. E. van Gemert-Pijnen, Key components in eHealth interventions combining self-tracking and persuasive eCoaching to promote a healthier lifestyle: a scoping review, *J. Med. Res.* 19.8 (2017) e277.
- [12] L. van Gemert-Pijnen, S. Kelders, H. Kip, R. Sanderman, *EHealth research, theory and development*, Routledge Oxford, New York, 2018.
- [13] K. J. Thomas Craig, L. C. Morgan, C.-H. Chen, S. Michie, N. Fusco, J. L. Snowdon, E. Scheufele, T. Gagliardi, S. Sill, Systematic review of context-aware digital behavior change interventions to improve health, *Transl. Behav. Med.* 11.5 (2021) 1037–1048.
- [14] S. Michie, L. Yardley, R. West, K. Patrick, F. Greaves, Developing and evaluating digital interventions to promote behavior change in health and health care: recommendations resulting from an international workshop, *J. Med. Res.* 19.6 (2017) e232.
- [15] R. A. Asbjørnsen, J. Wentzel, M. L. Smedsrød, J. Hjelmæsæth, M. M. Clark, L. Solberg Nes, J. E. Van Gemert-Pijnen, Identifying persuasive design principles and behavior change techniques supporting end user values and needs in eHealth interventions for long-term weight loss maintenance: qualitative study, *J. Med. Res.* 22.11 (2020) e22598.
- [16] I. Vaghefi, B. Tulu, The continued use of mobile health apps: insights from a longitudinal study, *JMIR mHealth uHealth* 7.8 (2019) e12983. doi:10.2196/12983.
- [17] S. Schoeppe, S. Alley, A. L. Rebar, M. Hayman, N. A. Bray, W. Van Lippevelde, J.-P. Gnam, P. Bachert, A. Direito, C. Vandelanotte, Apps to improve diet, physical activity and sedentary

- behaviour in children and adolescents: a review of quality, features and behaviour change techniques, *Int. J. Behav. Nutr. Phys. Act.* 14.1 (2017) 1–10. doi:10.1186/s12966-017-0538-3.
- [18] D. P. Ghelani, L. J. Moran, C. Johnson, A. Mousa, N. Naderpoor, Mobile apps for weight management: a review of the latest evidence to inform practice, *Front. Endocrinol.* 11 (2020) 412.
- [19] L. M. König, C. Attig, T. Franke, B. Renner, Barriers to and facilitators for using nutrition apps: systematic review and conceptual framework, *JMIR mHealth uHealth* 9.6 (2021) e20037.
- [20] M. Milne-Ives, E. Rahman, H. Bradwell, R. Baines, T. Boey, A. Potter, W. Lawrence, M. Helena van Velthoven, E. Meinert, Barriers and facilitators to parents' engagement with and perceived impact of a childhood obesity app: A mixed-methods study, *PLOS Digit.* 3.3 (2024) e0000481.
- [21] D. Curry, Health & Fitness App report: Revenues, demographics and data points, Report, 2024.
- [22] E. Vlahu-Gjorgievska, A. Burazor, K. T. Win, V. Trajkovik, MHealth apps targeting obesity and overweight in young people: app review and analysis, *JMIR mHealth uHealth* 11 (2023) e37716. doi:10.2196/37716.
- [23] S. M. Kelders, R. N. Kok, H. C. Ossebaard, J. E. Van Gemert-Pijnen, Persuasive System Design Does Matter: A Systematic Review of Adherence to Web-Based Interventions, *J Med Res* 14.6 (2012) e152. doi:10.2196/jmir.2104.
- [24] R. A. Asbjørnsen, M. L. Smedsrød, L. Solberg Nes, J. Wentzel, C. Varsi, J. Hjelvesæth, J. E. van Gemert-Pijnen, Persuasive system design principles and behavior change techniques to stimulate motivation and adherence in electronic health interventions to support weight loss maintenance: scoping review, *J. Med. Res.* 21.6 (2019) e14265.
- [25] M. Hassenzahl, N. Tractinsky, User experience—a research agenda, *Behav. Inf. Technol.* 25.2 (2006) 91–97.
- [26] Y. Rogers, J. Preece, H. Sharp, Interaction design, *Interact. Des.* (2004).
- [27] B. J. Fogg, Persuasive technology: using computers to change what we think and do, *Ubiquity* 2002.December (2002) 2.
- [28] C. I. Reis, C. Pernencar, M. Carvalho, P. Gaspar, R. Martinho, R. Frontini, R. Alves, P. Sousa, Development of an mHealth platform for adolescent obesity prevention: user-centered design approach, *Int. J. Environ. Res. Public Health* 19.19 (2022) 12568.
- [29] N. A. Wahab, N. N. Norhisham, A. H. Mohammed, A. Osman, N. Ibrahim, S. S. M. Ilyas, HealthyMe: A persuasive obesity care management application, in: *Proceedings - 2022 2nd international conference on electronic and electrical engineering and intelligent system, ICE3IS 2022*, pp. 213–218. doi:10.1109/ICE3IS56585.2022.10009043.
- [30] T. Hone, R. Palladino, F. T. Filippidis, Association of searching for health-related information online with self-rated health in the European Union, *Eur. J. Public Health* 26.5 (2016) 748–753.
- [31] Y. Al Naabi, N. Ibrahim, J. S. Dhillon, Designing sustainable mobile weight management applications: information technology (IT) experts perspectives, *Mhealth* 10 (2024).
- [32] J. Barnett, M. Harricharan, D. Fletcher, B. Gilchrist, J. Coughlan, myPace: an integrative health platform for supporting weight loss and maintenance behaviors, *IEEE J. Biomed. Health Inform.* 19.1 (2014) 109–116.
- [33] A. L. Knoblock-Hahn, Technological support tools for pediatric obesity self-management: A user-centered design approach for overweight and obese adolescents age 12–17 years, Thesis, 2013.
- [34] E. Agyei, H. Oinas-Kukkonen, V. Nyman, T. Virkkula, N. Oikarinen, H. Merikallio, M. Savolainen, J. Hukkanen, Assessing interventional components in a weight loss app, in: *Proceedings of the annual Hawaii international conference on system sciences*, pp. 2953–2962. URL: <https://www.scopus.com/inward/record.uri?eid=2-s2.0-85152137810&partnerID=40&md5=0ada717c0e05bd2d9eeeb5796d850b9c> .
- [35] H. Oinas-Kukkonen, M. Harjumaa, Persuasive systems design: key issues, process model, and system features, *Commun. Assoc. Inf. Syst.* 24 (2009).
- [36] R. A. Asbjørnsen, J. Hjelvesæth, M. L. Smedsrød, J. Wentzel, M. Ollivier, M. M. Clark, J. E. W. C. van Gemert-Pijnen, L. Solberg Nes, Combining persuasive system design principles and

- behavior change techniques in digital interventions supporting long-term weight loss maintenance: Design and Development of eCHANGE, *JMIR Hum Factors* 9.2 (2022) e37372. doi:10.2196/37372.
- [37] N. Almutairi, E. Vlahu-Gjorgievska, K. T. Win, Persuasive features for patient engagement through mHealth applications in managing chronic conditions: A systematic literature review and meta-analysis, *Inform. Health Soc. Care* 48.3 (2023) 267–291.
- [38] T. Lehto, H. Oinas-Kukkonen, Persuasive features in web-based alcohol and smoking interventions: a systematic review of the literature, *J. Med. Res.* 13.3 (2011) e1559.
- [39] S. Sittig, A. McGowan, S. Iyengar, Extensive review of persuasive system design categories and principles: behavioral obesity interventions, *J. Med. Syst.* 44.7 (2020) 128. URL: <https://link.springer.com/article/10.1007/s10916-020-01591-w>.
- [40] J. Matthews, K. T. Win, H. Oinas-Kukkonen, M. Freeman, Persuasive technology in mobile applications promoting physical activity: a systematic review, *J. Med. Syst.* 40.3 (2016) 72.
- [41] S. A. Altwayrib, M. Freeman, N. Almutairi, K. T. Win, Persuasive design principles for a medication adherence app for chronic arthritis conditions, in: N. Baghaei, R. Ali, K. Win, K. Oyibo (Eds.), *Persuasive Technology*, Springer Nature Switzerland, pp. 42–53.
- [42] E. Perjons, P. Johannesson, *An introduction to design science*, Springer Nature, 2022.
- [43] A. Tong, P. Sainsbury, J. Craig, Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups, *Int. J. Qual. Health Care* 19.6 (2007) 349–357.
- [44] N. Almutairi, E. Vlahu-Gjorgievska, K. T. Win, mHealth asthma management app’s content creation, stakeholders’ values and design features, *Int. J. Hum.–Comput. Interact.* 41.5 (2025) 3352–3368.
- [45] S. Michie, M. Richardson, M. Johnston, C. Abraham, J. Francis, W. Hardeman, M. P. Eccles, J. Cane, C. E. Wood, The behavior change technique taxonomy (v1) of 93 hierarchically clustered techniques: building an international consensus for the reporting of behavior change interventions, *Ann. Behav. Med.* 46.1 (2013) 81–95.
- [46] K. T. Win, N. M. Hassan, A. Bonney, D. Iverson, Benefits of online health education: perception from consumers and health professionals, *J. Med. Syst.* 39.3 (2015) 27. doi:10.1007/s10916-015-0224-4.
- [47] N. S. Shemy, Digital infographics design (static vs dynamic): Its effects on developing thinking and cognitive load reduction, *Int. J. Learn., Teach. Educ. Res.* 21.5 (2022) 104–125.
- [48] R. S. C. de Oliveira, S. Nabwire, S. Rantaiso, H. Merikallio, M. J. Savolainen, J. Hukkanen, H. Oinas-Kukkonen, Mobile weight self-monitoring adherence and eating behavior changes: A secondary analysis of a 12-month RCT, *Digit. Health* 11 (2025) 20552076251395530.
- [49] National Health and Medical Research Council, *Australian dietary guidelines: Summary*, 2013.
- [50] S. Nabwire, R. SC de Oliveira, H. Merikallio, M. J. Savolainen, J. Hukkanen, H. Oinas-Kukkonen, Evaluating persuasive reminders and suggestions in a weight management mhealth intervention, in: *Proceedings of the 59th Hawaii international conference on system sciences*, Hawaii International Conference on System Sciences.
- [51] K. Lekadir, A. F. Frangi, A. R. Porras, B. Glocker, C. Cintas, C. P. Langlotz, E. Weicken, F. W. Asselbergs, F. Prior, G. S. Collins, *FUTURE-AI: international consensus guideline for trustworthy and deployable artificial intelligence in healthcare*, *bmj* 388 (2025).
- [52] W. Chumkasian, C. Petsoglou, E. Vlahu-Gjorgievska, K. T. Win, Investigation of the eye donor aust app’s persuasiveness, in: *International conference on persuasive technology*, Springer, pp. 176–187.
- [53] E. Vlahu-Gjorgievska, A. S. Alkorbi, M. M. Nushayli, K. T. Win, *Persuasive social support features in diabetes self-management mHealth applications*, 2019.

A. Appendix A

Consolidated criteria for reporting qualitative research (COREQ) checklist.

No. Item	Guide questions/description	Reported on Manuscript
Domain 1: Research team and reflexivity		
<i>Personal Characteristics</i>		
1. Interviewer/facilitator	Which author/s conducted the interview or focus group?	The first author conducted the interviews.
2. Credentials	What were the researcher's credentials?	The interviewer has a PhD.
3. Occupation	What was their occupation at the time of the study?	The interviewer was a Senior Lecturer.
4. Gender	Was the researcher male or female?	Female
5. Experience and training	What experience or training did the researcher have?	The interviewer has experience in qualitative and quantitative research methodologies.
<i>Relationship with participants</i>		
6. Relationship established	Was a relationship established prior to study commencement?	There was no prior relationship.
7. Participant knowledge of the interviewer	What did the participants know about the researcher?	The participants were informed about the study objectives and the interviewer's role through the Participant Information Statement (sent to the participants before the interview) and a short introduction at the beginning of the interview.
8. Interviewer characteristics	What characteristics were reported about the interviewer/facilitator?	The interviewer made a conscious effort to remain impartial and neutral during the conversations with the participants.
Domain 2: Study design		
<i>Theoretical framework</i>		
9. Methodological orientation and Theory	What methodological orientation was stated to underpin the study?	Thematic Analysis
<i>Participant selection</i>		
10. Sampling	How were participants selected?	Purposive sampling
11. Method of approach	How were participants approached?	The participants were recruited via digital advertisements posted online (LinkedIn, X) and sent to email lists and communication channels of health professionals' groups/networks, and paper-based fliers distributed at public boards across the Illawarra region.
12. Sample size	How many participants were in the study?	15 participants: 8 young adults and 7 health professionals
13. Non-participation	How many people refused to participate or dropped out? Reasons?	All participants who provided consent completed the study.
<i>Setting</i>		
14. Setting of data collection	Where was the data collected?	The semi-structured interviews were conducted online using Zoom.
15. Presence of non-participants	Was anyone else present besides the participants and researchers?	No, only the researchers and the participants were present during the interviews.
16. Description of sample	What are the important characteristics of the sample?	Eight young adults, 4 females and 4 males, participated in the interviews. The age-range was 20 to 26 years, with half of the participants (50%) being 20 years old. Seven health professionals (4 females and 3 males with working experience spanning 3 to 17 years) participated in the study, including dieticians (n=3), medical doctors (n=1), nurses (n=1), and exercise science professionals (n=2).
<i>Data collection</i>		
17. Interview guide	Were questions, prompts, guides provided by the authors? Was it pilot tested?	The research team developed the questions, prompts, and guides. The interview guide was not pilot tested.
18. Repeat interviews	Were repeat interviews carried out? If yes, how many?	No.
19. Audio/visual recording	Did the research use audio or visual recording to collect the data?	The interviews were recorded. However, only audio recordings were obtained to allow accurate transcription and data reporting. All recordings were transcribed with no identifiable information.
20. Field notes	Were field notes made during and/or after the interview or focus group?	The interviewer maintained notes for each interview, and verbatim transcripts were created after the interviews.
21. Duration	What was the duration of the interviews or focus group?	The interviews lasted between 28 and 48 minutes (36 minutes on average).
22. Data saturation	Was data saturation discussed?	The final sample size was determined by code saturation.
23. Transcripts returned	Were transcripts returned to participants for comment and/or correction?	No
Domain 3: analysis and findings		
<i>Data analysis</i>		
24. Number of data coders	How many data coders coded the data?	Two authors conducted the analysis, and all authors discussed and agreed on the identified themes, subthemes and codes.
25. Description of the coding tree	Did authors provide a description of the coding tree?	No
26. Derivation of themes	Were themes identified in advance or derived from the data?	Themes were derived from the data.
27. Software	What software, if applicable, was used to manage the data?	NVivo 14, and Microsoft word
28. Participant checking	Did participants provide feedback on the findings?	No
<i>Reporting</i>		
29. Quotations presented	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified?	Yes, selected quotations are presented to illustrate the research findings.
30. Data and findings consistent	Was there consistency between the data presented and the findings?	Yes
31. Clarity of major themes	Were major themes clearly presented in the findings?	Yes, the major themes are summarised in the results section.
32. Clarity of minor themes	Is there a description of diverse cases or discussion of minor themes?	Yes, the subthemes are discussed in the results and discussion section.