

# Mhealth Apps Targeting Obesity and Overweight In Young People: Review Article

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## Abstract

**Background:** Overweight and obesity have been linked to several serious health problems and medical conditions. With more than a quarter of the young population having weight problems, the impacts of overweight and obesity on this age group are particularly critical. Mobile health (mHealth) apps that support and encourage positive health behaviors have the potential to achieve better health outcomes. These apps represent a unique opportunity for young people (age range 10-24 years), for whom mobile phones are an indispensable part of their everyday living. **Aim:** The aim of this research was to review and analyze mHealth apps targeting obesity and overweight, **Methods:** We made study of MEDLINE by PubMed & Web of Science [Science Citation Index Expanded], Social Sciences Citation Index, & Emerging Sources Citation Index] of all scientific literature published from May2020until April 2023, A search for apps was conducted in Google Play Store using the following search string: ["best weight loss app for obese teens 2020"] OR ["obesity applications for teens"] OR ["popular weight loss applications"]. The most popular apps available in both Google Play and Apple App Store that fulfilled the requirements within the inclusion criteria were selected for further analysis. **Summary:** mHealth interventions can have a positive impact on weight loss among university students. One potential benefit of mHealth interventions is increased self-monitoring of weight and physical activity. These interventions can help students to track their weight and physical activity in real-time, which can improve self-monitoring and self-regulation of weight management. **Keywords:** behavior change techniques; user interface design patterns; mHealth apps; obesity; lifestyle; mobile app; mobile health; mobile phone.

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## Introduction

Obesity has nearly tripled in the last 30 years, with the World Health Organization estimating that around 340 million or 27% of the world's children and adolescents are overweight or obese. Overweight and obesity have been linked to several serious health problems and medical conditions, including an increase in the risk for non-communicable diseases such as cardiovascular diseases, diabetes, musculoskeletal disorders, endometrial cancers as well as other types of cancers <sup>(1)</sup>.

Excessive weight and obesity can lead to not only physiological medical complications but also severe psychological effects. The social and emotional well-being and self-esteem of young people are especially impacted during this important developmental phase of life, with these negative consequences tracking well into an individual's later life <sup>(2)</sup>. Further, there is a general reduction in the intake of certain food groups and nutrients and an increase in the consumption of junk food and sugary drinks, as well as a significant decrease in engagement in moderate-to-vigorous physical exercises during this transition period between adolescence and adulthood. Therefore, targeting young people (age range 10-24 years) is very important <sup>(3)</sup>.

The assumption that nutrition and physical activity behaviors are mediators of body weight provides the basis for behavioral interventions for obesity, which are largely derived from the principles of classical conditioning and social theories. A person's behavior is predominantly responsible for maintaining health and plays an important role in the prevention, management, and treatment of overweight and obesity <sup>(4)</sup>.

Behavior change techniques (BCTs) are descriptors (replicable components of an intervention) designed to enable behavior change by addressing important targets of capability, opportunity, and motivation. The refined taxonomy of BCT—Coventry, Aberdeen, and London-Refined (CALO-RE)—is specifically tailored toward the change of physical activity and promotion of healthy eating behaviors <sup>(1)</sup>.

Mobile phone ownership is ubiquitous, especially among young people. Based on the media use report, 91% of youth between 12 and 15 years of age own a mobile device. The mobile devices are carried by their owners most of the time and are rarely switched off; therefore, they can provide notifications to the users at particular moments, thereby enhancing the engagement and adoption of certain behaviors <sup>(5)</sup>. These devices can also be used for collecting and analyzing user data, which facilitate the capability to automate certain processes, consequently reducing a user's cognitive load in navigation and selection activities. These characteristics make mobile phones good candidates for delivering digitally supported obesity interventions <sup>(6)</sup>.

Mobile health (mHealth) apps present a unique opportunity, particularly for young people, to revolutionize the way health behavior change interventions are delivered <sup>(7)</sup>. However, despite the potential for improved engagement in long-term interventions, health interventions delivered by

these devices are short-lived. Literature shows that most users cease mHealth app activity within a few uses, and a quarter of mHealth apps are found to be used only 1 time after installation <sup>(8, 9)</sup>.

The factors that impact the adoption of mHealth apps are well-researched, and there is no significant evidence to suggest that adoption alone can improve an individual's health. The continuation of use where technology supports user engagement in behavior change is the area that can enhance positive outcomes. Thus, the continuation of use of mHealth apps greatly impacts their overall efficacy and potential for success <sup>(8, 9)</sup>.

The user interface and experience of mobile apps strongly influence users' perception and satisfaction and have a strong impact on the app's adoption and continuation of use. The user interface design patterns (UIDPs) are descriptions of the best practices within user interface design. They are general reusable solutions to commonly occurring problems and can ensure that user interfaces flow well and are easy and enjoyable to use. In addition, UIDPs can reduce the cognitive load and improve the overall performance of the app <sup>(10)</sup>.

Furthermore, literature suggests that the overall "look and feel" of apps impacts the adoption by young people, while the perception that health apps were designed primarily for adults was found to be a barrier in using the app. In this context, applying well-known user interface design principles and patterns can improve the efficacy of mHealth apps and contribute toward its continuation of use <sup>(11)</sup>.

The aim of this research was to review and analyze mHealth apps targeting obesity and overweight.

## Obesity

Obesity, as a consequence of nutritional transitions and particularly the 'westernization' of lifestyles, is a growing epidemic and a public health concern since obesity is usually associated with other serious comorbidities, such as type 2 diabetes mellitus, insulin resistance and ischemic cardiovascular disease <sup>(12)</sup>.

## Weight Management

The cornerstone of obesity treatment relies on lifestyle measures that contribute to balancing energy to prevent weight gain or creating an energy deficit to achieve weight loss. These lifestyle factors including both physical activity and nutrition are cornerstone modalities to achieve these results <sup>(13)</sup>.

Many people with a BMI of less than 25 have gained substantial weight since they were young adults and are also at increased risk of these diseases, even though they are not technically overweight. For most people, unless obviously malnourished as an adolescent or young adult, bodyweight should ideally not increase by more than 2 or 3 kilograms after age 20 to maintain

optimal health. Thus, a desirable weight for most people should be within the BMI range of 18.5 to 25.0, and preferably less than 23 <sup>(14)</sup>.

Additional valuable information can be obtained by measuring waist circumference, which reflects abdominal fat accumulation. In the meantime, increases of more than 5 centimeters can be used as a basis for recommending changes in activity patterns and diet <sup>(15)</sup>.

University students can prevent weight gain by making healthy food choices. This may include following a diet that is rich in fruits, vegetables, and whole grains, and limiting processed and high-calorie foods, added sugars and sodium. Planning meals and snacks in advance and keeping healthy options on hand can also help to support healthy eating habits. Also, Regular physical activity is essential for preventing weight gain and maintaining overall health. University students can make time for physical activity by incorporating it into their daily routine, such as walking or biking to class, joining a sports club or gym, or taking a fitness class <sup>(16)</sup>.

### **Mobile health (mHealth) and Body Composition in an Overweight and Obese Population**

Over the last decade, mobile technology has emerged as a potentially useful platform to facilitate weight management and tackle the current obesity epidemic. Clinicians are being more frequently asked to give advice about the usefulness of mobile apps and many individuals have already integrated apps into their attempts to manage weight. Hence, it is imperative for clinicians involved in weight management to be aware of the latest developments and knowledge about available mobile apps and their usefulness in this field. A number of newly published studies have demonstrated promising results of mobile-based interventions for weight management across different populations, but the extent of their effectiveness remains widely debated <sup>(17)</sup>.

Mobile health (mHealth) could be an excellent strategy for PCPs to implement with their patients to help them maintain lifestyle changes. Information and communication technologies (ICTs) have the potential to standardize and improve the quality of treatment provided and increase resources for prevention activities <sup>(18)</sup>. They also allow PCPs to address barriers through enhancing self-monitoring of the patient by registering progress or symptoms, which could improve feedback communication and enable PCPs to spend less time gathering routine data and more time engaging with patients. This means of interaction might enhance treatment outcomes as well as improve follow-up of some chronic diseases while optimizing PCP time and reducing costs <sup>(19)</sup>.

Every year, thousands of mobile apps are developed with the purpose of improving lifestyles. To ensure that these tools are able to have a positive influence, more studies are needed because most apps available are suboptimal in quality, meaning that they have inadequate scientific coverage and accuracy of weight-related information <sup>(20)</sup>. Compared with usual practice, the use of ICTs in

the primary care context might help patients to achieve significant weight loss, including patients who are socioeconomically disadvantaged, thereby increasing egalitarian access to treatment <sup>(21)</sup>.

However, further research is needed to determine the optimal use of technology in weight loss, since the inclusion of small sample sizes, and the variability in study designs, follow-up times, and interventions, may hinder replication and comparison of results, leading to unclear conclusions in this regard <sup>(22)</sup>.

At present, mobile health (mHealth) applications (apps) have been highlighted as effective tools for body weight management. Such mHealth apps provide sufficient information on body weight management and the success of specific eating and physical activity behaviors for body weight loss <sup>(23)</sup>.

In addition, mHealth apps offer opportunities for the self-monitoring of body weight, physical activity, and diet, all of which are the most influential factors in body weight reduction. Many previous studies have demonstrated that mHealth app-based interventions are acceptable and effective in promoting body weight loss in overweight and obese individuals <sup>(24)</sup>.

However, a lower effectiveness in achieving 5%–10% body weight reduction has been reported among overweight or obese adults. In addition, information about the time needed to achieve a 5% body weight reduction among mHealth app users is scarce. Similarly, little is known about the factors that influence this period of time <sup>(25)</sup>.

### **Factors Influencing the Use of Mobile Applications for Weight Management**

To date, there have been many studies examining different aspects of applications for weight management and from the standpoint of both users and healthcare providers. Many of these are reviews which look into stakeholder perspectives and experiences, rather than collecting quantitative data. While they represent a small proportion of aspects to consider when using and designing weight management applications, the information extracted from these studies is nonetheless important <sup>(17)</sup>.

### **Acceptability and Perceived Benefit**

Mobile applications for weight management often have similar features that include self-monitoring of diet and physical activity, allowing users to set goals in specified time frames, feedback on daily activities, and reminders to input data into the application in the form of in-app reminders or text messages. To gauge the general opinion of mHealth application users, a study interviewed adults who had used smartphone applications to examine the perceived effectiveness of such an aid in managing diet <sup>(26)</sup>.

Some participants found the entry process much faster with a mobile application (compared to paper records or websites), yet others found it time consuming and discontinued its use. Additionally, some participants used the applications when they noticed poor habits and

discontinued their use when they felt they were back on track, while others had more consistent use. Self-motivation was found to be an important factor for effective application use and behavior change, particularly given that the use of these applications required effort and organization, and that adherence was often difficult to maintain. Other factors including achieving positive results, identifying streaks in data recording, and even paying for the app were shown to motivate individuals to continue using them <sup>(17)</sup>.

### **Information Provision**

The nature of information provided by mHealth applications covers a range of topics required to lead a balanced lifestyle. These include advice on dietary intake, importance of different food groups, physical exercise, energy expenditure, recipes, consequences of not having a healthy life, and everyday tips and tricks to manage weight. Many applications go a further step and include instructions for meditation or mindful living. Furthermore, some applications can provide the users with information on their body mass index (BMI) or body fat percentage and help them track changes <sup>(27)</sup>.

In addition, many of these applications bypass the physical examinations conducted by the doctors, making the legal implications of such a means highly questionable. There are also legal implications of these gaps in content accuracy and information dissemination that need to be considered. While there are currently regulations from governing authorities in place for mHealth applications, there does not seem to be enough enforcement <sup>(28)</sup>.

### **Behavior Change**

In a study evaluating the features of weight management applications, the formula for a successful weight-loss application to lead to behavioral change was broken down into twenty features that the application must incorporate. These features include: weight-loss goal, dietary goal, calorie balance, physical activity goal, exercise safety, benefits of healthy diet and physical activity, food pyramid, stimulus control, portion control, lifestyle activity, target heartrate, problem solving, stress reduction, relapse prevention, negative thinking, social cues, developing a regular pattern of eating, time management, and nutritional label reading <sup>(17)</sup>.

### **Usability and Social Validity**

Another key strategy that has been highlighted is the social validity of the application in question which revolves around the user's perception and response to the application <sup>(29)</sup>. Levels of satisfaction and engagement are key measurement parameters. High engagement levels of the application correlate to higher levels of adherence as well as resultant weight loss from the intervention. The effectiveness of a given application is therefore seen as equally important to its social validity and the overall user experience <sup>(30)</sup>.

A “supportive” application included providing information, monitoring consumption, rewards, prompts and reminders, and personal compliance review with the program, while a “static” application only provided recipes and weight loss information. When the applications were independently used along with personal support, the “supportive” application had lower attrition rates, but no difference in weight loss between the groups <sup>(17)</sup>.

### **Social Engagement**

A largely successful feature seen in some popular applications such as BodySpace is the inclusion of a platform resembling social media within the application. These applications, together with the normal features including goal setting and monitoring diet and activity, are based upon a platform where application users can “follow” other users who were in similar situations as themselves, reducing feelings of isolation that people often experience at the beginning of a weight-loss journey. There is also an “inspirational” feature where users can follow others on the application whom they found motivational. The social media aspect also allowed users to share their progress as well as other content within the community <sup>(31)</sup>.

### **Barriers to Using Mobile Applications for Weight Management**

A common theme in most RCTs on using mobile applications for weight management is the high attrition rate due to participants discontinuing or decreasing use of the application. While monitoring physical activity is shown to be an easier process with the use of inbuilt motion sensors and pedometers, monitoring diet is much more difficult, accounting for a high proportion of the attrition. It is posited that the low adherence is largely due to the considerable effort required to self-monitor diet <sup>(17)</sup>.

Each item needs to be individually entered into the application, and a greater variety in the diet requires more information to be entered, thus taking up more time. When entering nutritional data, consumers prefer to scan a barcode or have suggested food lists. In addition, many applications have too little choice of pre-entered meals in their databases, which often do not include ethnic foods <sup>(26)</sup>.

On the other hand, some applications have too much choice and become confusing, making it difficult for users to choose the right meal item that they consumed. Hence, it is argued that compared with manual paper-based records, having an application which enables manual digital entry of consumed foods adds limited value to the field, especially for subsets of the population such as the elderly. While having an application makes it easier to calculate nutritional information, there are now greater software advancements, including being able to photograph a meal to replace the manual entry of data. However, the accuracy of this latter method remains under debate <sup>(32)</sup>.

### Future Directions

While the studies conducted thus far have brought the field a long way in understanding the impact of mHealth applications on the ever-increasing burden of obesity, there is still much to be done. Based on the findings of the studies above, the first step required moving forward would be to break down and analyze those traditional weight-loss programs which were successful, in order to uncover the different aspects that applications can attempt to replicate to ensure efficiency. Most trials examined have shown that mobile applications were effective or had great potential to be effective for weight management. However, low user adherence hinders our ability to adequately assess these applications, since the results never seem to reach their full potential. One key aspect that needs to be replicated is evoking the motivation and accountability that is seen in interactions from personal trainers <sup>(17)</sup>.

A need for further, and more widely known applications catering toward the needs of groups with socio-economic restrictions has become apparent. Furthermore, mHealth applications need to be approved and certified by relevant health authorities before they can be integrated into routine medical management within clinical practice. Except for a few countries, there is currently a lack of acknowledgment of the role of mHealth in weight management guidelines and national policies with no established regulations on the use of mobile applications by clinicians. Where the use of smartphone technology has been incorporated into national health programs as part of the slow shift toward digital health, they are used more as a means of providing information than a tool to encourage behavior change <sup>(33)</sup>.

In future, mobile applications for weight management should be expanded to other groups of people who could benefit from them, including post-menopausal women and individuals with cancer or diabetes, with research suggesting lifestyle modifications as first-line treatment <sup>(34, 35)</sup>.

### Conclusion

In summary, the use of mHealth interventions for weight management is an emerging field for both research and clinical care. The evidence presented, while mostly positive, remains unclear. Although some studies report that mHealth technology is a step forward in upscaling interventions and bringing them to the public, others argue that these applications have limited use and add little value to current intervention options. One of the pressing problems in the use of these applications appears to be in identifying effective ways to promote behavior change and increase motivation in the subset of the population with poor adherence or for whom the applications have not been effective. Arguably, those population groups who are difficult to reach may be at most risk and innovative strategies are thus needed within mobile applications to target these individuals. Behavioral components in particular, including self-monitoring and tailored feedback, are key in any weight management intervention (face to face or mHealth), and optimizing these would make the existing technology go much further in managing weight than

any technical improvement. Reducing the effort required to self-monitor would also be required in order to effectively target those populations.

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