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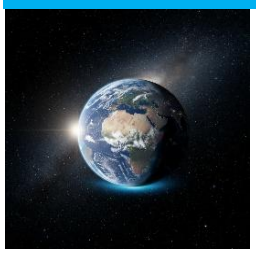

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The Efficacy of Calorie-Counting Mobile Applications in Weight Loss: A Comparative Review

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Abstract

Background: Mobile health (mHealth) applications have become the dominant tool for self-monitoring dietary intake. However, their clinical efficacy compared to traditional methods remains a subject of debate.

Objective: The aim of this review is to evaluate the efficacy of calorie-counting apps in weight loss, analyzing factors influencing their success, particularly adherence and technological features.

Methods: A narrative review was conducted based on a literature search in the PubMed database (2013–2025) using the following query: "*(mobile application OR app OR health) AND (calorie counting OR food tracking) AND (weight loss OR weight management)"*. The analysis included 23 studies, comprising Randomized Controlled Trials (RCTs) and systematic reviews, to evaluate the clinical efficacy of app-based self-monitoring compared to traditional methods and to assess the impact of user adherence on weight outcomes.

Results: Evidence suggests that while apps outperform paper-based methods in the short term (Flores Mateo et al., 2015), their long-term advantage is uncertain without sustained engagement (Metzendorf et al., 2024). Recent trials from 2025 (Bertoli et al., 2025) highlight that "high-adherence" users achieve significant weight loss (-7.0 kg), whereas low engagement leads to negligible results.

Conclusions: mHealth technology is a potent facilitator of self-monitoring but not a standalone solution. Efficacy is strictly dose-dependent (frequency of use) and optimized when combined with behavioral support or advanced feedback mechanisms (e.g., biofeedback).

Keywords: weight loss, mHealth, calorie counting, mobile application, food tracking

1. Introduction

Obesity and being overweight are currently considered one of the most critical public health challenges worldwide. According to many reports, the number of people with excessive body mass is growing every year, which leads to serious chronic diseases such as type 2 diabetes, cardiovascular problems, and metabolic syndrome. Because traditional treatments, like personal visits to dietitians or specialized clinics, are often expensive and time-consuming, there is a strong need for more accessible solutions. In recent years, technology has offered a new way to fight this epidemic: mobile health, also known as mHealth.

For decades, the "gold standard" in weight loss therapy was self-monitoring using paper diaries. Patients had to manually write down everything they ate and calculated calories using books or tables. This method was effective but also very difficult to maintain for a long time because it was boring and burdensome. However, the rapid development of smartphones changed everything. Today, mobile applications for weight management are among the most popular downloads in health categories. As noted by Flores Mateo et al., (2015), these digital tools have become a convenient alternative to paper methods because they allow users to track their diet in real-time, scan barcodes of products, and get immediate feedback about their energy balance.

The theoretical background for using these apps is the Behavioral Change Theory. The core mechanism is simple: "self-monitoring". When a person regularly logs their meals, they become more aware of how many calories they consume versus how many they burn. This awareness is supposed to help them make better food choices and reduce portion sizes. Modern applications are not just calculators; they often include features like goal setting, reminders, and even social support, which are designed to keep the user motivated.

Despite the popularity of these apps, the scientific evidence regarding their long-term effectiveness is mixed. While early studies suggested that apps are superior to traditional methods, newer research provides more complex results. For example, a recent review by Metzendorf et al., (2024)suggests that the benefits of using smartphone apps might diminish over time, especially after one year. Moreover, there is a phenomenon called "digital fatigue," where users stop logging their data after a few weeks. Pagoto et al., (2021) showed that without external pressure or support, engagement with apps drops significantly.

Therefore, the main problem is not whether the technology works, but how to make people use it regularly. Some researchers, like Islam et al., (2020), argue that there is a "dose-response" relationship - meaning the more frequently a user logs data, the more weight they lose. This

review aims to compare different studies to answer the question: are calorie-counting apps truly effective tools for weight loss, and what factors determine their success in the long run?

2. Aim of the Study

The primary aim of this comparative review is to evaluate the effectiveness of calorie-counting mobile applications in reducing body weight among overweight and obese individuals, especially when compared to traditional weight loss methods like paper diaries or standard medical care.

Because the scientific literature shows different results depending on how the apps are used, this paper also has a few specific objectives to understand this topic better. Specifically, the study focuses on the following secondary aims:

- **To analyze the role of user adherence and engagement:** The review wants to check if there is a "dose-response" relationship, which means checking if logging meals more frequently directly leads to better weight loss results.
- **To identify the limitations of mHealth:** The study aims to explore the problem of "digital fatigue" and why patients often stop using standalone apps after a few months, which can reverse their weight loss progress.
- **To compare simple apps with advanced interventions:** Finally, the paper aims to see if combining calorie-counting apps with other elements, such as physical trackers (wearables), human coaching, or specific diet models (like ketogenic biofeedback), gives significantly better results than using a basic app alone.

By answering these questions, this review hopes to summarize if mobile applications are an independent and sufficient solution for the obesity epidemic, or if they are just a supportive tool that requires human motivation and extra features to be truly effective in the long term.

3. Material and Methods

To write this comparative review, a comprehensive search of scientific literature was conducted. The main goal was to find and compare high-quality studies that test the effectiveness of mobile applications in weight management.

3.1 Data Sources and Search Strategy The articles were collected mainly using popular academic databases, such as PubMed Central (PMC) and the Cochrane Library. Furthermore, many papers were sourced directly from specialized journals focusing on digital health, especially the *Journal of Medical Internet Research* (JMIR) and the *Journal of the Academy of*

Nutrition and Dietetics. The search process used combinations of keywords, including: "mobile applications", "smartphone apps", "weight loss", "calorie counting", "mHealth", "self-monitoring", and "obesity".

3.2 Inclusion and Exclusion Criteria

To make sure the bibliography is rich and relevant, specific inclusion criteria were established. The selected studies had to meet the following conditions:

- **Population:** The participants had to be adults or adolescents diagnosed with overweight or obesity (usually BMI > 25).
- **Intervention:** The primary intervention had to involve a smartphone application used for dietary self-monitoring (like counting calories, tracking meals, or taking food photos).
- **Study Design:** The review included Randomized Controlled Trials (RCTs), real-world retrospective studies, systematic reviews, and large meta-analyses (including umbrella reviews) to provide both specific clinical examples and general statistical evidence.
- **Timeframe:** To show the most updated trends in mobile health technology, the chosen articles were published between 2013 and 2025, with a strong focus on recent research from the last five years.

Studies were generally excluded if they focused only on physical activity without any dietary tracking, or if the intervention was based only on traditional websites without a mobile smartphone component.

3.3 Data Extraction and Analysis

After the selection process, a total of 23 key scientific papers were qualified for the final analysis. During the reading phase, specific data were extracted into a comparison matrix. The extracted information included the author and year, the type of study, the number of participants, the duration of the intervention (ranging from 1 month to 24 months), and the main clinical outcomes (especially weight loss in kilograms or BMI reduction). Moreover, special attention was given to finding information about "adherence" and "engagement", which means how often the participants actually opened the app and logged their meals.

4. Results (Review of the Literature)

Based on the analysis of 23 scientific articles, the results of using calorie-counting mobile applications for weight loss can be divided into several main categories. The literature shows

that while technology offers great potential, its effectiveness depends heavily on how the users interact with it over time.

4.1. Digital vs. Traditional Methods: Are Apps Better?

The first important question in the reviewed literature is whether smartphone apps are actually superior to traditional paper-based methods . The evidence strongly suggests that digital tools have an advantage. A classic meta-analysis by Flores Mateo et al. (2015), which included over 1,000 participants, proved that mobile app users lost on average **1.04 kg more** than control groups using paper diaries or standard care . This finding is supported by the newest umbrella review by Couto & de Almeida (2025), which analyzed over 62,000 participants . Couto confirmed that mHealth (smartphone apps) interventions result in significant weight reduction (**-1.32 kg**), whereas passive web-based interventions do not work .

The mechanism behind this success seems to be consistency in self-monitoring. Turner-McGrievy et al. (2013) compared app users to paper diary and website users, finding that the app group was significantly more consistent in self-monitoring their diet and physical activity . This higher level of adherence and engagement with the digital tool was the primary factor leading to more successful weight management outcomes over the 6-month period .

However, technology is not magic. A short-term randomized controlled trial (RCT) by Ahn et al. (2020) in South Korea showed an interesting paradox. Over a 6-week period, participants using a paper diary lost slightly more weight (**-1.4 kg**) than those using a modern app called "Well-D" (**-0.4 kg**), although the difference was not statistically significant . This shows that in the short term, if a patient is highly motivated, the old-school paper method can be just as effective because the core mechanism is exactly the same .

4.2. The Role of Adherence: The "Dose-Response" Relationship

The most repeated conclusion in the analyzed studies is that apps only work if people use them. There is a strong "dose-response" relationship. A comprehensive meta-analysis by Islam et al., (2020) which synthesized data from 12 randomized controlled trials involving 1,479 participants, found that app-based interventions resulted in a statistically significant weight reduction of **1.07 kg** compared to control groups. These results underscore that the clinical value of mHealth is directly tied to the frequency of user interaction.

But what does "active user" actually mean? Turner-McGrievy et al., (2019) defined it clearly: tracking at least two eating occasions per day is the best predictor of weight loss success. You do not have to be perfect and log every single gram. Interestingly, when scientists tried to make

the apps even easier by tracking only "red" high-calorie foods instead of all calories, it did not improve user adherence. Nezami et al., (2022) proved that standard, full calorie counting gives better and more predictable weight loss results (-5.9 kg) than simplified methods (-3.5 kg).

Moreover, apps act as a reminder. Sakane et al., (2023) showed that patients using the KENPO app weighed themselves and measured their blood pressure much more regularly (79.3% of days) than the control group. The importance of engagement is perfectly summarized by the DEMETRA trial from Bertoli et al., (2025). In this study, the overall results between a full digital therapy app and a "placebo" app (where you only type numbers with no feedback) were similar. However, when looking only at *highly engaged* users, the full app users lost an impressive 7.02 kg compared to 3.50 kg in the placebo group. This proves the "Engagement Gap" - the software is only as good as the user's behavior.

4.3. The Problem of Digital Fatigue and Long-Term Effectiveness

While short-term results are very optimistic, the long-term effectiveness of mobile apps is highly questionable. Chew et al. (2022) in their meta-analysis noticed a declining trend: the peak of weight loss happens at 3 months (-2.18 kg), but by 12 months the effect drops to (-1.63 kg). The main reason for this drop is "**digital fatigue**," where users lose interest in consistent logging over time. A critical feasibility trial by Pagoto et al. (2021) evaluated a specialized application called **Slip Buddy**, designed to track dietary lapses and their psychological triggers. The results showed that engagement with the app declined sharply over the 6-month period, proving that even targeted behavioral features struggle to sustain user interaction without external support.

This skepticism is supported by the highest level of evidence - a Cochrane review by Metzendorf et al. (2024). They concluded that the certainty of evidence for app effectiveness is low, and after 12 to 24 months, smartphone apps might not provide any clear advantage over minimal interventions. Furthermore, when patients reach the "maintenance phase" (after initial weight loss), adding extra psychological features to an app increases the time spent on the phone but does not help to maintain the weight better than a basic tracking app, as shown by Brindal et al. (2019).

4.4. Evolution and Hybrids: Wearables, AI, and Biofeedback

Because simple calorie counting causes digital fatigue, modern mHealth is evolving. The literature proves that "hybrid" models work best. Antoun et al., (2022) showed that combining an app with a physical tracker (like a smartwatch) and human behavioral coaching almost doubles the effectiveness (-3.77 kg at 6 months). Similarly, the EVIDENT 3 study by Lugones-

Sanchez et al., (2022) confirmed that combining an app with a Xiaomi Mi Band provides better results than standard counseling, but the weight loss stops when patients take off the devices.

There is also a shift from "Quantity" to "Quality". Falkenhain et al., (2021) compared a standard calorie-counting app (Weight Watchers) with a modern app (Keyto) that uses a ketogenic diet and a breath acetone biofeedback device. The Keyto group lost significantly more weight (-5.6 kg) than the traditional counting group (-2.5 kg). Also, new artificial intelligence technologies are being tested, like the image-recognition app for teens in the study by Oei et al., (2024). While taking photos of food instead of typing calories is very well-liked by young people, technical problems currently limit its clinical superiority.

4.5. Psychological Aspects, Safety, and Special Populations

Finally, it is important to look at how these apps affect mental health and specific groups of patients. A common fear is that counting calories causes eating disorders (ED). However, an RCT by Hahn et al., (2021) on 200 young women proved that using *MyFitnessPal* for a month does not increase anxiety or ED risk. But it also showed that logging food without a specific goal does not change eating habits at all.

For special populations, the goals of using an app might be different than just lowering the BMI. For busy mothers, Huang et al., (2025) found that an app significantly reduced visceral (abdominal) fat and diabetes risk, even if the overall weight in kilograms did not change much. For patients with Binge Eating Disorder (BED), Moghimi et al., (2021) demonstrated that eHealth interventions successfully reduce binge episodes and heal the psychological relationship with food, even if they do not cause immediate weight loss. Lastly, for teenagers with obesity, gamification and collecting points in an app do not work automatically; Tugault-Lafleur et al., (2023) proved that the intervention only reduces BMI if the parents are fully engaged in the digital process together with the child.

5. Discussion

The main finding of this comparative review is that calorie-counting mobile applications are generally effective tools for weight loss, especially when compared to traditional paper diaries or standard medical advice. However, the literature shows a very clear difference between how apps work in ideal clinical trials and how they perform in the real world.

The biggest debate in the analyzed literature is the "Tool versus Solution" problem. Many people believe that simply downloading an app will cure their obesity. Meta-analyses, like the one by Flores Mateo et al., (2015) and the umbrella review by Couto & de Almeida, (2025),

create an optimistic picture that apps are superior. But when we look closer at studies conducted in primary care settings, like the research by Pagoto et al., (2021), we get a reality check. Pagoto showed that prescribing *MyFitnessPal* to normal patients without extra support resulted in almost zero weight loss because users simply stopped opening the app. This proves that a smartphone app is not a standalone medical treatment. It is merely a digital mirror that reflects the user's motivation. If the user does not look in the mirror, it will not change anything.

This leads to the most critical factor discussed in all studies: adherence, which means regular engagement. The research by Islam et al., (2020) and Turner-McGrievy et al., (2019) confirms a strong dose-response relationship. What is very interesting is that the app's advanced algorithms are probably not the main reason for weight loss. The DEMETRA trial Bertoli et al., (2025) perfectly highlighted this by showing that even a "placebo app" caused a 4 kg weight loss. This suggests that the physical habit of logging meals and thinking about food is what truly creates the caloric deficit, not the technology itself.

However, the human brain gets tired of constant monitoring. This phenomenon, often called "digital fatigue", is the biggest enemy of mHealth. As Chew et al., (2022) and the Cochrane review by Metzendorf et al., (2024) pointed out, the peak of effectiveness happens around 3 to 6 months. After a year, the benefits often disappear. Because counting every single calorie is a huge burden for the user, scientists and developers are trying to find new ways to keep patients engaged.

One of the solutions is moving towards "hybrid models". The evidence from Antoun et al., (2022) clearly shows that combining a dietary app with a physical wearable (like a smartwatch) or human coaching gives much better and longer-lasting results. When the app is connected to an external device Lugones-Sanchez et al., (2022), the user feels more controlled and supported.

Another solution is changing the paradigm from "Quantity" to "Quality". The impressive results of the Keyto app compared to traditional Weight Watchers (Falkenhain et al., 2021) suggest that the future of apps might not be in counting calories at all, but in using biological feedback (like measuring breath ketones) to guide diet choices. Similarly, using AI to recognize food from photos (Oei et al., 2024) could solve the problem of manual logging, although this technology still needs technical improvements.

Finally, we must discuss the limitations of a "one-size-fits-all" approach. For the general population, counting calories is safe and does not cause eating disorders, as shown by Hahn et al., (2021). But for specific clinical groups, the focus should be different. For example, for patients with Binge Eating Disorder (Moghimi et al., 2021), the success of an app should be measured by the reduction of psychological distress and binge episodes, not by changes in BMI.

Also, the study by (Huang et al., 2025) proves that we should not only look at the scale; reducing visceral fat and the risk of diabetes is a massive success of mHealth, even if the total body weight stays the same.

In summary, the literature proves that while the mechanism of digital self-monitoring works perfectly in theory, its long-term practical application is limited by human psychology. Therefore, mobile applications should be viewed as a powerful supportive tool, but not as an independent replacement for comprehensive lifestyle therapies.

Authors' Contributions:

Conceptualization was done by Weronika Lech; methodology by Weronika Lech and Monika Jedwabnik; checking by Stanisław Ścigała; formal analysis by Adrianna Dobrosielska; investigation by Iga Woźniakowska; resources by Maja Zambrzycka; data curation by Krzysztof Peszuk; writing-rough preparation by Ola Misarko; writing-review and editing by Viet Krajewski; supervision by Adrianna Dobrosielska; project administration by Bartosz Olszewski; All authors have read and agreed with the published version of the manuscript.

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