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USE OF MOBILE HEALTH APPLICATIONS AND WEARABLE DEVICES IN PREVENTIVE HEALTH BEHAVIORS: A LITERATURE REVIEW

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ABSTRACT

Background: Mobile health applications and wearable devices are increasingly recognized as tools that can support preventive health behaviors by enabling behavioral monitoring, real-time feedback, tailored recommendations and intervention delivery outside conventional in-person healthcare settings. Their preventive relevance is closely related to the fact that many major chronic diseases are strongly associated with modifiable risk factors, including physical inactivity, sedentary behavior, unhealthy diet, obesity, insufficient sleep and poor cardiometabolic control.
Aim: The aim of this narrative review was to examine how mobile health applications and wearable devices are used to support preventive health behaviors, with particular attention to physical activity, sedentary behavior, diet, weight management, diabetes prevention, cardiovascular prevention, sleep, user engagement and behavior change mechanisms.
Methods: This paper was prepared as a narrative literature review based exclusively on the available evidence base, including systematic reviews, meta-analyses, umbrella reviews, scoping reviews, narrative reviews and selected review-oriented empirical papers addressing mHealth, eHealth and wearable interventions. The findings were synthesized narratively and organized into major preventive domains, including physical activity, sedentary behavior, nutrition, obesity, type 2 diabetes risk, cardiovascular prevention, sleep, personalization, behavior change techniques and implementation barriers.
Results: The literature suggests that mobile and wearable technologies most consistently improve physical activity, reduce sedentary behavior, support selected dietary improvements, assist weight control and improve sleep-related outcomes, whereas their effects on anthropometric, functional and some metabolic endpoints are often more modest or heterogeneous. The most promising interventions usually combine self-monitoring with feedback, goal setting, personalization, additional behavioral support and, in some cases, gamification or social features. At the same time, many reviews emphasize that effectiveness depends not only on the device or application itself, but also on intervention quality, sustained engagement, follow-up duration, data accuracy, usability, privacy, interoperability and equity of access.
Conclusion: Mobile health applications and wearable devices represent valuable tools for supporting preventive health behaviors, but their role is strongest when they function as part of a broader, behaviorally informed intervention strategy rather than as stand-alone technological solutions. Current evidence supports their usefulness particularly in physical activity promotion, dietary behavior change, weight management and sleep support, while also highlighting the need for further research on long-term effectiveness, sustainability, personalization, data protection and equitable implementation.

KEYWORDS

mHealth, eHealth, Wearable Devices, Preventive Health Behaviors

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1. Introduction

Mobile health applications and wearable devices are increasingly positioned in the literature as important components of preventive health practice because they allow part of prevention-oriented support to move from clinics and healthcare institutions into daily life [1,2,3]. In this context, they are not merely technical add-ons, but tools capable of structuring, reinforcing and sustaining health-related behaviors through continuous access to information, ongoing monitoring and timely feedback [2,4,5]. These technologies include a broad spectrum of tools, such as mobile applications, websites, SMS-based systems, telemonitoring platforms, smartwatches, wrist-worn trackers, pedometers and other wearable sensors, as well as, in some settings, more advanced systems such as continuous glucose monitoring and remote care platforms designed to support intervention tailoring [6,7,8].

Their importance in prevention is closely tied to their relationship with modifiable risk factors [2,3,9]. Across the literature, physical inactivity, excessive sedentary time, poor diet, obesity, insufficient sleep and suboptimal cardiometabolic control are repeatedly identified as major contributors to chronic disease, including type 2 diabetes, cardiovascular disease, hypertension and other noncommunicable conditions [2,3,10,11]. As a result, mobile and wearable technologies are generally examined not as treatment tools in a narrow sense, but as instruments that may support earlier intervention, everyday self-regulation and the long-term maintenance of healthier patterns of living [2,5,12].

The growing interest in digital prevention is also connected to the practical limitations of traditional lifestyle interventions [3,12,13]. Many conventional programs are effective, yet they are also time-consuming, labor-intensive, difficult to scale and often challenging to maintain under real-world conditions [9,11,13]. Mobile and wearable tools are therefore often described as more accessible and flexible channels through which reminders, feedback, self-monitoring and health guidance can be integrated into daily routines [3,4,11]. However, the literature does not portray these technologies as inherently effective simply because they are digital [4,5,13,14]. Their effects depend on intervention quality, user fit, sustained engagement and the extent to which technology is embedded in a coherent behavioral strategy [4,5,12,13].

For this reason, the central question in this field is no longer simply whether digital tools work, but rather for whom they work, under what conditions, in which preventive domains and within what type of intervention design [13,15,16]. This includes differences between children, adolescents, adults and older adults, differences between tools directed at physical activity, diet, or sleep and differences between using a single device and participating in a broader intervention that combines monitoring with coaching, reminders, social support and goal-oriented behavior change strategies [10,14,15,17]. Such a perspective is particularly important in a review article because it allows the evidence to be interpreted in a way that reflects its real complexity rather than reducing it to generalized claims about “digital health” as a single, uniform category [2,3,13].

The purpose of the present review is therefore to examine in detail the use of mobile health applications and wearable devices in preventive health behaviors [2,3,5]. The review focuses on the domains most prominently represented in the literature, namely physical activity and sedentary behavior, diet and weight management, type 2 diabetes prevention, cardiovascular prevention, sleep, behavior change techniques, user engagement and major implementation and methodological limitations [2,4,10,11,12,14].

2. Results

2.1. Physical activity as the principal field of preventive application

Physical activity is the domain most consistently represented in the literature, indicating that mobile and wearable technologies are primarily regarded as tools for increasing daily movement, reducing sedentary time and supporting adherence to physical activity recommendations [2,15,16,18]. In the umbrella review of eHealth and mHealth interventions, significant improvements were observed in step count, moderate-to-vigorous physical activity, total physical activity and reductions in sedentary behavior. This pattern indicates that digital technologies may influence not just one isolated movement parameter, but the broader profile of everyday activity-related behaviors [2,19].

A more focused meta-analysis of stand-alone digital behavior change interventions in adults provides an equally important perspective. It showed that even when an intervention is delivered entirely through digital means and is not embedded within a larger face-to-face program, significant improvements in physical activity can still be achieved, alongside some benefits in body-related outcomes [13,20]. At the same time, the authors explicitly emphasized that long-term maintenance remains a major challenge, meaning that short-term gains should not automatically be interpreted as durable behavior change. This distinction is especially important in

prevention, where the key issue is not temporary improvement, but the sustained maintenance of healthier routines [12,13].

In older adults, the evidence is relatively consistent and generally favorable, particularly for step-based outcomes and overall movement [15,18,21,22]. The systematic review and meta-analysis focused on community-dwelling older adults found that wearable activity tracker-based interventions increased physical activity time and daily step count, especially immediately after the intervention period [15,21]. However, the same review did not find clear superiority with regard to BMI, body fat, or functional measures such as the timed up and go test or chair stand test [15]. These findings suggest that in older adults, wearables may be most effective as tools for increasing movement itself, whereas their influence on broader physical and functional outcomes remains less certain [15,21,22].

This interpretation is reinforced by another systematic review and meta-analysis in older adults. That review concluded that wearable activity trackers increased daily steps, weekly moderate-to-vigorous physical activity, total daily physical activity and reduced sedentary time [18,20]. Importantly, the authors also noted that these devices appeared more effective when combined with additional elements such as telephone counseling, consultations, goal setting, or other structured support mechanisms rather than when used as stand-alone tools [18]. In practical terms, this means that the device itself should be understood as most useful when embedded within a broader structure of behavioral support [16,18,21].

This becomes even clearer in the network meta-analysis of interventions promoting physical activity in older adults. The best-ranked approaches were not single wearable-based strategies, but combined models linking wearable activity trackers with eHealth or mHealth support, structured exercise programs, or financial incentives [16]. Such findings strongly suggest that the most meaningful preventive effect arises not from the mere presence of a device, but from the broader behavioral and motivational system within which the device is placed [4,16,23]. In prevention, this is particularly relevant because sustained physical activity usually depends on multiple reinforcing mechanisms rather than on a single prompt or measurement system [4,16].

In children and adolescents, the picture is more mixed [17,24,25,26]. The review of mHealth and wearable activity trackers in healthy children and adolescents suggested that these technologies may support short-term improvements in activity, partly through self-monitoring and goal setting, but also stressed that the evidence base remains limited and that many effects are modest [24,27]. A more recent meta-analysis of app-based mHealth interventions found improvements in total physical activity, reductions in sedentary behavior, lower BMI and improvements in selected fitness outcomes such as agility and strength, but did not demonstrate significant effects on moderate-to-vigorous physical activity or several other fitness indicators [17]. This suggests that digital interventions may improve some aspects of movement behavior in younger populations, but not all activity-related outcomes respond equally [17,27].

School-based interventions that rely on wearable activity trackers produce an even more cautious picture. The review focusing on school settings did not find a significant overall effect of trackers on objectively measured physical activity among adolescents, despite the clear appeal of schools as environments for health promotion [25,28]. This may indicate that simply introducing a wearable device into a school setting is insufficient unless it is accompanied by a carefully designed implementation strategy, an appropriate motivational structure and organizational conditions that support both the use of the data generated by the device and the translation of that data into behavior change [25,26,28].

Taken together, the literature shows that physical activity is the preventive domain in which mobile and wearable technologies currently have the strongest evidence base [2,13,15,16,18]. At the same time, their effectiveness remains shaped by age, intervention design, duration and the extent to which the technology is combined with broader behavioral support. The most consistent findings concern step count and everyday activity, whereas effects on more complex physical outcomes and long-term sustainability remain less certain [13,15,18].

2.2. Diet, nutritional quality and weight management

Dietary behavior is another major area in which mobile applications and wearable devices are described as potentially valuable preventive tools [2,5,8,14]. In the umbrella review of eHealth and mHealth interventions, improvements were observed in fruit and vegetable intake, reductions in energy intake and saturated fat intake and decreases in body weight [2]. Even at this broad level, the literature suggests that digital tools can do more than passively record dietary behavior; they may also contribute to modifying everyday nutritional choices [1,2,5].

The meta-analysis of app-based interventions in adults with overweight or obesity confirmed reductions in body weight, BMI, waist circumference, fat mass and some metabolic markers such as diastolic blood pressure and HbA1c [14]. This review is especially informative because it does not focus exclusively on body weight, but also shows that digital interventions may influence behaviors and outcomes that underlie broader metabolic risk [1,14,29]. It also demonstrated that the most common behavior change techniques in these interventions were self-monitoring, instruction, feedback, goal setting and action planning [14,23,30]. This pattern indicates that the effectiveness of dietary and weight-related apps depends not merely on calorie logging, but on a wider process of self-regulation and behavioral adjustment [4,14,23].

The central role of self-monitoring was further reinforced by the systematic review focused on digital self-monitoring in weight loss interventions. That review found that greater engagement in digital self-monitoring was associated with better weight loss in most comparisons and that digital modalities such as websites, apps, wearables and electronic scales often outperformed traditional paper-based approaches in terms of engagement [31]. At the same time, the review showed that very high levels of sustained engagement were uncommon, indicating that the preventive potential of digital self-monitoring may remain underused if users reduce the frequency of tracking over time [31,32,33]. From a prevention perspective, this means that it is not enough to provide a tracking tool; the intervention must also support continued participation in the tracking process itself [4,23,31].

The literature also shows that digital nutrition tools are increasingly moving toward more individualized models [1,5,8]. The state-of-the-art review on digital applications for diet monitoring, planning and precision nutrition described tools designed for ordinary users, nutritionists and more advanced professional users, including physicians and researchers. For general users, these tools were described as supporting dietary self-monitoring, energy and nutrient tracking, integration with physical activity data and weight or diabetes management. At the same time, the review highlighted limitations such as the need for manual data entry, variable food database quality, interface complexity, cost and interoperability problems [8]. This suggests that even highly developed digital nutrition tools remain constrained by practical usability issues that can influence their effectiveness in real-life preventive use [5,8].

The umbrella reviews on apps and wearables for nutritional management added further detail by emphasizing that the most effective interventions frequently combined gamification, social interaction and goal setting [5,23]. In these reviews, apps and wearables were described as helping users improve dietary quality, make healthier food choices, monitor fruit and vegetable intake, reduce sodium and improve broader nutrition-related profiles [5,34]. However, the authors also emphasized persistent limitations involving data accuracy, privacy, difficulty maintaining engagement over time and inequities in access to digital tools [5,35]. For a scientific review, this balance is essential, because it shows that the promise of digital nutrition support is real, but so are its practical limitations [1,5,12].

In children and adolescents, the effects of digital nutrition interventions appear more robust for knowledge and selected dietary behaviors than for anthropometric outcomes [26,27,36]. The systematic review of mobile- and web-based interventions found improvements in fruit intake in a substantial proportion of studies, reductions in sugar-sweetened beverage intake in some interventions and frequent improvements in nutrition knowledge, whereas anthropometric changes and physical activity outcomes were less convincing. This is consistent with the idea that changes in knowledge and day-to-day food choices may emerge earlier than measurable changes in body composition [26,27]. Game-based interventions and other engaging digital formats appeared particularly well suited to younger users [5,26,27].

A particularly relevant dietary subdomain is type 2 diabetes prevention [9,10]. The systematic review and meta-analysis of smartphone applications for people at high risk of diabetes found significant effects on weight loss and BMI reduction, but not on HbA1c or waist circumference and no included trials reported actual diabetes incidence as an outcome [10]. This is important because it indicates that the best-supported benefits at present concern risk factors for diabetes rather than direct evidence of reduced disease incidence itself [9,10]. The same review also showed that greater app engagement, more frequent tracking and user-valued features such as progress monitoring and personalization were associated with better outcomes [10,32,33]. This again suggests that the experience of using the app may be just as important as the content of the app in determining preventive benefit [4,10,33].

Another review on digital health technologies for type 2 diabetes prevention reached a similar conclusion. It found encouraging evidence that digital tools can improve diabetes-related risk outcomes, but also stressed that longer follow-up, more standardized protocols and more diverse participant groups are needed before stronger conclusions about wide-scale preventive implementation can be drawn [9]. In practical

terms, this means that digital technologies represent a promising direction in diabetes prevention, but their evidence base remains stronger for intermediate outcomes than for the most definitive long-term endpoints [9,10].

Overall, the literature suggests that in nutrition and weight-related prevention, mobile and wearable technologies can play an important role, especially through self-monitoring, personalization, feedback and support for everyday dietary choices [4,5,8,14,23,31]. Their greatest contribution appears to lie in supporting the process of behavior change and risk-factor control, while the long-term stability of outcomes and their impact on more distal health endpoints remain in need of further study [5,9,10,29].

2.3. Cardiovascular prevention, hypertension and broader metabolic risk

Another important field of application concerns cardiovascular prevention and the management of broader metabolic risk [3,7,37,38]. The systematic reviews of digital solutions for cardiovascular disease prevention described a range of tools, including mobile applications, wearable devices, telemedicine, remote monitoring and other digital channels that may improve user engagement, adherence and the practical delivery of preventive support [3,7,39]. At the same time, these reviews made clear that many available interventions focus on selected domains such as medication adherence, quality of life, dietary behavior, or waist circumference, whereas more comprehensive coverage of the full cardiovascular prevention spectrum remains limited [3]. In other words, the potential is substantial, but the current research and implementation landscape is still fragmented [1,3,40].

The scoping reviews on mobile health technologies in hypertension prevention and management provide a similarly important perspective. Most included studies reported improvements in blood pressure control, medication adherence, attendance at follow-up and healthier lifestyle behaviors [7,37]. This is especially relevant because hypertension prevention and control depend heavily on repeated self-management, monitoring and adherence to recommendations, all of which can be supported by reminders, educational input and remote monitoring functions provided through mobile platforms [3,7,37]. Thus, mobile technologies appear particularly useful where prevention depends on continuity and routine rather than one-time education [7,32,37].

An important complement comes from the meta-analysis comparing digital and nondigital behavioral interventions for cardiovascular risk reduction. At an overall level, digital interventions did not show significant superiority over nondigital ones across all major cardiovascular risk factors. However, subgroup analyses suggested that digital dietary interventions could produce greater reductions in body weight, BMI and fasting glucose, whereas digital physical activity interventions could improve total cholesterol more effectively than nondigital counterparts [38]. This does not justify claiming general superiority of digital prevention, but it does suggest that digital approaches may offer specific advantages in selected behavioral domains, particularly where regular contact, monitoring and feedback matter [4,38,39].

It is also important to note that many digital tools developed for diet or physical activity have direct cardiovascular relevance even if they were not designed exclusively for cardiovascular prevention [1,5,14,34,40]. Across the literature, healthier diet, reduced weight, lower sedentary time, higher activity and better tracking of blood pressure or glucose are often treated as part of a shared prevention strategy targeting noncommunicable disease more broadly [1,2,3,7,9,40]. This means that the preventive function of mobile apps and wearables often cuts across disease categories rather than fitting neatly into one isolated diagnostic framework [1,2,3].

Taken together, the evidence indicates that mobile and wearable technologies have a documented role in cardiovascular prevention, especially as tools for supporting the monitoring and control of risk-related behaviors [3,7,37,38,39]. Their value appears greatest when they function as channels for reinforcing adherence, daily self-management and ongoing preventive routines, although further work is still needed to clarify their influence on long-term hard cardiovascular endpoints [3,7,35,38].

2.4. Sleep as a domain of digitally supported prevention

Although sleep is less frequently discussed than physical activity or diet, the literature indicates that digital interventions may also have meaningful preventive value in this area [2,11,12]. The umbrella review of eHealth and mHealth interventions reported improvements in sleep quality and insomnia severity alongside other health behaviors, suggesting that sleep is increasingly being treated as a core component of the preventive lifestyle profile. This is important because poor sleep is repeatedly linked to obesity, poorer diet and poorer mental health, all of which are relevant to prevention [2,11,27].

The clearest evidence comes from the meta-analysis of digital sleep interventions in college students and young adults. It found significant improvements in sleep quality, sleep efficiency, insomnia severity, dysfunctional sleep-related beliefs, sleep hygiene and sleep knowledge. Some of these effects, especially those related to sleep quality and insomnia severity, were also maintained at follow-up. This is practically important because it suggests that app-based or web-based interventions can do more than temporarily improve sleep perceptions; they may also support more sustained regulation of sleep-related routines [11,27].

The same review also showed that intervention format mattered. Digital cognitive behavioral therapy for insomnia appeared more effective than some other forms of digital sleep support and interventions involving therapist support tended to outperform entirely self-directed formats. From a preventive perspective, this indicates that even within one category of digital intervention, the quality and structure of support can substantially influence outcomes [1,4,11]. It also reinforces the broader point that "digital intervention" is not a single homogeneous entity, but a broad spectrum of formats that differ in intensity, guidance and expected effect [11,13,27].

At the same time, the authors highlighted several important limitations, including heterogeneity across studies, frequent reliance on self-reported sleep measures, a lack of objective sleep assessment in many trials and a still limited number of studies with long-term follow-up. Thus, while sleep clearly appears to be a promising domain for mHealth and eHealth, stronger evidence is still needed regarding the durability and generalizability of observed benefits. Nevertheless, the fact that digital interventions improved multiple aspects of sleep remains highly relevant for prevention, because sleep is a foundational and often neglected element of healthy living [2,11,12].

2.5. Behavior change techniques, personalization and user engagement

One of the most consistent messages across the literature is that the effectiveness of digital health tools depends not only on their technical features, but also on the behavior change techniques embedded in them and on the ability of the intervention to keep the user engaged over time [4,5,13,14,31,32]. The systematic review of mHealth apps using behavior change techniques showed that the most commonly used categories were feedback and monitoring, goals and planning, associations, shaping knowledge and personalization. However, the review also made clear that frequency of use of a particular technique is not the same as evidence of its superior effectiveness, because many results remained mixed. This is an important reminder that intervention design should not focus simply on adding more features, but on understanding how specific techniques operate in context and in combination [4,23,30,33].

In physical activity and weight management, the importance of behavior change techniques was particularly clear [14,31]. The meta-analysis in adults with overweight or obesity showed that self-monitoring, instruction, feedback, goal setting and action planning were among the most commonly used techniques [14]. The review of digital self-monitoring showed, in turn, that more consistent tracking of diet, body weight and activity was associated with better weight loss outcomes [31]. Together, these findings suggest that apps and devices are most effective not when they function as passive recorders, but when they become part of a broader process of self-regulation [4,14,31].

Personalization also emerges as a central mechanism [4,5,10,30]. In the diabetes prevention app review, qualitative findings showed that users valued easy progress tracking, personalized input and social functions and that greater engagement was associated with better weight-related outcomes [10]. The umbrella review of nutritional interventions likewise suggested that the most promising apps and wearables frequently combined personalized feedback, goal setting and gamified elements [5]. This indicates that personalization is not merely a desirable feature, but a substantive mechanism that may support adherence and behavior change [4,5,10].

Social and motivational components are also relevant [5,10,41]. Some reviews suggested that group challenges, social interaction, shared goals and moderate competition can enhance the effectiveness of mobile interventions [5,42]. However, these components are unlikely to be universally beneficial, because their effect depends on whether they enhance motivation or instead create pressure, discouragement, or disengagement [4,5]. From an intervention design perspective, this means that social functions should be selected carefully rather than assumed to be beneficial by default [5,12].

At the same time, many reviews emphasize that user engagement remains one of the greatest barriers to sustained effectiveness [4,5,10,13,31,32]. Even well-designed applications will have limited effect if users stop interacting with them regularly, ignore reminders, or gradually disengage from tracking. In several studies, more frequent engagement with the app was clearly linked to better outcomes, indicating that actual exposure to the intervention is just as important as intervention quality itself [10,31,32]. In practical terms, this means that prevention-oriented intervention design must address not only content and measurement, but also how to maintain users within the intervention long enough for meaningful behavior change to occur [4,5,32].

3. Discussion

The literature presents mobile health applications and wearable devices as tools with genuine relevance to prevention, but it does not support the simplistic assumption that technology alone automatically produces sustained health improvement [3,4,5,12,13,29,42,43]. The most consistent evidence concerns increasing physical activity, reducing sedentary behavior, improving selected dietary behaviors, supporting weight control and improving sleep-related outcomes in selected groups [11,14,15,19]. By contrast, effects on BMI, body composition, some metabolic markers, functional outcomes and long-term hard health endpoints are often smaller, more heterogeneous, or insufficiently established [9,10,15,17,26,29]. This indicates that the greatest strength of digital tools lies in supporting behavior change and the management of risk factors rather than in guaranteeing broad improvement across all health indicators [3,12,13,43].

A particularly strong theme is that effectiveness depends on the quality of the behavioral intervention into which the technology is integrated [4,14,23,30,31]. Self-monitoring, feedback, goal setting, action planning and personalization repeatedly emerged as core components of more successful interventions [4,5,14,30]. In some analyses, the best-performing interventions were not those based on a single device or simple app, but those that combined monitoring with structured exercise, coaching, social support, or incentives. This strongly suggests that technology works best when it acts as a vehicle for behavior change rather than merely as a data collection channel [15,16,18,21].

A second major issue is engagement [4,10,31,32]. In many studies, better outcomes were observed among users who tracked more consistently, responded more often to prompts, or interacted more regularly with key app functions [10,31,32]. At the same time, multiple reviewss pointed to declining engagement over time as one of the main reasons why digital intervention effects weaken [4,5,11,13,32]. Thus, evaluating digital tools requires attention not only to what they contain, but also to whether they can keep users meaningfully involved over time [4,5,32].

A third major issue concerns implementation and methodological limitations. Across the literature, concerns repeatedly emerged regarding data accuracy, privacy, interoperability, device quality, cost and unequal access to digital tools [5,6,8,12,35,43]. In some preventive domains, such as diabetes prevention and broader cardiometabolic interventions, the underrepresentation of socially disadvantaged groups was also highlighted, raising concerns that digital prevention may be easier to access for already advantaged, health-literate and technologically confident users [9,10,12,35,43]. This is especially important because the populations with the greatest preventive need are not always the populations most likely to benefit from current digital solutions [10,12,35,43].

There is also clear variation by age group and preventive domain [5,17,25,26]. In older adults, wearable devices appear relatively effective for increasing step count and everyday movement, whereas in children and adolescents the evidence is more mixed, especially for more demanding activity or anthropometric outcomes [15,17,22,25,36]. In sleep interventions, fully digital approaches may improve several outcomes simultaneously, but the evidence is still limited by heterogeneity and relatively short follow-up periods [11]. This means that there is no single universal model of effective digital prevention and conclusions should always be interpreted in relation to the population, behavior and intervention format under consideration [11,12,13,29].

Taken together, the literature supports a balanced interpretation [2,3,5,13]. Mobile health applications and wearable devices should be viewed neither as a transient technological trend with little clinical value nor as complete solutions to major public health problems [2,3,12,42,44]. Rather, they appear most useful as tools that can strengthen well-designed preventive interventions by helping transform general health advice into concrete, trackable, everyday actions [4,14,15,16]. From a scientific perspective, future progress in this field will depend on better standardization, longer follow-up, more diverse participant samples and more precise identification of which specific intervention elements are actually responsible for observed preventive effects [4,10,11,12,13,29,43].

4. Conclusions

The literature indicates that mobile health applications and wearable devices are meaningful and increasingly well-supported tools for preventive health behaviors [2,5,12,19,20,45]. The strongest evidence concerns their use in increasing physical activity, reducing sedentary behavior, supporting selected dietary changes, assisting weight control and improving sleep-related outcomes [11,14,15,18,19,26]. Their role in cardiovascular prevention and type 2 diabetes prevention also appears promising, although these domains still require more evidence on long-term clinical outcomes [7,9,10,38,39].

At the same time, the evidence clearly shows that technology on its own is not enough [4,5,12,13,29,42]. Benefits are most likely to emerge when digital tools are embedded in well-designed behavioral interventions that include self-monitoring, feedback, goal setting, personalization and elements that help sustain engagement [4,5,14,16,30,31,32]. In practice, this means that an app or wearable should be understood as a tool that strengthens the process of change rather than as an independent solution to unhealthy lifestyles [13,15,16].

The overall picture is therefore complex but coherent [2,3,12]. Mobile health applications and wearable devices can play an important role in prevention, but their real value depends on intervention quality, sustained engagement, data validity, accessibility across populations and the successful integration of technology with evidence-based principles of behavior change [3,4,5,10,12,13,32,35,43]. For that reason, the most defensible conclusion is that these tools should be treated as a promising but still evolving pillar of modern prevention rather than as a complete or final answer to the challenges of lifestyle-related disease prevention [3,12,13,42,44].

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