Review Article **Pol J Public Health, Vol. 135 (2025): 19-24**

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Mobile health technologies as a tool supporting mental health and physical activity in adolescents – a review of current practices

Abstract

In the era of rapid development of mobile health technologies, tools supporting mental health have become an integral part of modern health promotion among adolescents. In Poland, there is a growing interest in and use of solutions that offer access to personalised training programs, mood monitoring, and real-time psychological support.

This article provides a comprehensive review of the latest trends and technological solutions with the potential to improve mental health and to increase physical activity among young people.

A narrative literature review methodology was applied. Publications from 2015 to 2025 in Polish and English, related to the use of mobile health technologies in promoting mental health and physical activity among adolescents, were included.

The review indicates a dynamic development of artificial intelligence and machine learning enabling the creation of increasingly advanced and individualized health solutions foradolescents.. The analysis highlights various challenges faced by users and developers of applications,from the need to tailor interventions to individual needs and motivation levels, through digital fatigue limiting engagement, to concerns regarding privacy and data security.

Integration of mobile applications with healthcare systems opens new possibilities for health monitoring and early intervention. Further research on the effectiveness of these tools is recommended, along with the necessity to strengthen digital competencies of adolescents and their families through educational programs.

Keywords: mobile health technologies, mental health, physical activity, adolescents, health promotion.

DOI: 10.12923/2083-4829/2025-0005

INTRODUCTION

Youth health is one of the most important challenges in modern medicine and health prevention. Both mental health and physical activity levels in this age group are crucial for development, social functioning, and quality of life of young people [1]. In Poland, as in other developed countries, increasing problems related to youth mental health are observed, manifested, among others, by a rise in mood disorders and anxiety disorders. According to the the report by the Ministry of Health from 2023, about 30% of youth experience symptoms of depression, and as many as 40% report anxiety symptoms [2]. Simultaneously, a systematic decline in physical activity among children and adolescents is observed. Data from research conducted by the Mother and Child Institute indicate that only slightly more than 16% of young Poles meet the recommendations for daily physical activity of at least 60 minutes of moderate or vigorous effort [3]. A sedentary lifestyle and insufficient physical activity contribute to an increased risk of chronic diseases, obesity and mental disorders [4]. In response to these challenges, mobile technologies, including fitness applications, play an increasingly important role in supporting mental health promotion and increase physical activity levels among youth.

In recent years, the importance of mobile technologies in health promotion has been strongly emphasized in strategic documents issued by the World Health Organization and the European Union. According to the WHO Global Action Plan on Physical Activity 2018-2030, member states are encouraged to implement innovative and accessible digital solutions to support physical activity among children and adolescents, in order to counteract the global increase in sedentary behaviour and non-communicable diseases [5]. One of the goals of the plan is to foster partnerships with the technology and education sectors to expand the use of mobile applications, activity tracking tools, and digital platforms that promote self-regulation and motivation. Similarly, the European Digital Health Strategy 2020-2025 emphasises the development and implementation of digital solutions, including mobile health applications (mHealth), as tools to support both the mental and physical well-being of the younger generation [6]. In Poland, these goals are reflected in the National Health Program for 2021-2025 period of time, one of whose priorities includes promoting mental health and physical activity among children and adolescents through the use of modern communication technologies [7].

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According to data from the Central Statistical Office (GUS), in Poland as many as 97% of youth use smartphones, of which 70% use them to monitor health or physical activity [8]. These technologies, often enriched with gamification and personalisation elements, create new opportunities to engage young people in health-promoting activities [9].

MATERIAL AND METHODS

This article employed a narrative literature review methodology to synthesise current practices and findings related to the role of mobile technologies (mHealth) in support of youth mental health and physical activity.

Databases and search strategy

A comprehensive search was conducted across four primary academic and scientific databases: PubMed, Scopus, Web of Science, and Google Scholar. The literature search included peer-reviewed articles and reports published between 2015 and 2025 in English and Polish.

Search Terms

The following keywords and combinations were used during the search process: mental health, mHealth, mobile applications, digital health, youth, physical activity, telehealth, AI in healthcare, digital inequality, digital fatigue, data privacy, Poland.

Selection Process

The selection of studies involved a two-stage evaluation process: initial screening of titles and abstracts and full-text assessment of eligible articles. Studies were selected on on the basis of the following inclusion and exclusion criteria (see Table 1). Particular attention was paid to works that: described effective implementation of mHealth technologies; discussed integration with health policy or educational settings; reported on accessibility, equity, or challenges (e.g., digital fatigue) and addressed data protection and ethical implications.

Analysis

The selected studies were subjected to a qualitative thematic analysis. Extracted data were grouped into key categories: effectiveness of mHealth interventions, integration with school health education, digital equity and barriers to access, applications of AI in youth-targeted health technologies, and public health policy integration.

TABLE 1. Inclusion and exclusion criteria.

Criteria Category	Inclusion Criteria	Exclusion Criteria
Language	**English or Polish**	**Other languages**
Publication Type	Peer-reviewed original articles, reviews, organisational reports, strategic documents	Opinion pieces, non-scientific blogs, letters to editors
Publication Year	2015–2025	Publications before 2015
Accessibility	Full-text available	Abstract only or paywalled without access
Relevance	Focus on youth, mHealth, mental health, physical activity	Adult population only, unrelated digital topics
Methodological Quality	Clear objectives, research design, results, and conclusions	Poorly defined objectives, lack of research design or conclusions

Mental health of youth in Poland

Mental health disorders among youth currently represent one of the most serious public health issues. An increasing number of young people experience emotional difficulties that affect their daily functioning, social relationships, academic performance, and, in the long term, their adult life. In Poland, according to data presented in the Ministry of Health report, about 30% of youth exhibit symptoms of depression, and as many as 40% report symptoms of anxiety disorders such as excessive tension, panic attacks, or chronic feelings of anxiety. According to the report on the mental health status of children and youth by the Ministry of Health (Table 2), the scale of psychiatric care increased significantly between 2018 and 2023. The number of patients nearly doubled (from 146.000 to 283.000), as did the number of consultations provided (from 854.000 to over 2.6 million). The number of hospitalisations also increased (from 13.000 to 18.000), as well as the number of hospital days both in inpatient and outpatient settings. These data indicate a growing demand for psychiatric assistance in this age group and reveal serious deficits in access to support, which further exacerbates the problem of insufficient integration of health education with healthcare structures. The increasing prevalence of mental health problems among youth is correlated with social barriers, including the stigma associated with mental illnesses [2].

TABLE 2. Psychiatric care in Poland for individuals under the age of 18 in the years 2018-2023.

	Number of patients	Number of consultations	Number of hospitalizations	Number of inpatient hospitalization days	Number of day care hospitalization days
2018	146 476	854 089	13 053	552 351	189 050
2019	148 808	917 796	13 493	547 542	218 282
2020	146 200	1 231 726	10 920	454 970	167 033
2021	215 204	2 190 394	13 775	543 571	225 296
2022	254 635	2 600 448	16 809	630 515	276 177
2023	283 387	2 609 325	18 084	658 379	444 434

Source: Ministry of Health. Report on the mental health of children and adolescents in Poland. Warsaw: Ministry of Health; 2023.

Particularly alarming are data on suicides, the number of suicide attempts among group of people underthe age of 18 has dramatically increased in recent years: from 730 cases in 2017 to over 2100 in 2023, representing nearly a threefold increase. Suicide remains one of the leading causes of death among young people in Poland and worldwide, highlighting the scale of the mental health crisis [10].

The COVID-19 pandemic has further exacerbated existing problems. Due to social isolation, remote learning, limited peer contact, and increased anxiety about an uncertain future, the risk of mental disorders among youth has grown significantly. Studies indicate that young people experiencing prolonged isolation are more likely to suffer from depression, anxiety, sleep disorders, and exhibit self-destructive behaviours. Moreover, reduced access to professional psychological and psychiatric help during the pandemic worsened diagnostic problems and extended waiting times for specialist support [11].

In the context of the growing youth mental health crisis, implementing effective and innovative preventive and therapeutic strategies tailored to this age group has become crucial.

Digital technologies increasingly play an important role by complementing traditional psychological support, offering youth access to mobile apps, online support platforms, self-help tools, and e-therapy programs. In order to meet the rising mental health needs of children and adolescents, since 2022, Polish schools have taken steps to increase the number of available specialists such as educators, psychologists, and therapists. This initiative is part of a broader strategy by the Ministry of Education and Science and the Ministry of Health, which has aimed to build a comprehensive mental health support system within schools, the environment where children and youth spend most of their time and where early symptoms of emotional and social difficulties most often appear. Increasing the presence of specialists in schools aims not only at crisis intervention but primarily at preventive actions, early diagnosis, and development of students' psychosocial competencies. Access to support directly in educational institutions eliminates many barriers – both geographical and financial,that previously hindered children and families from obtaining psychological help. Practically, this means students that can access individual consultations, group workshops, or peer mediation without leaving school or registering at external psychological-pedagogical clinics [12].

Within the framework of the National Mental Health Program and legislative changes introduced in recent years, further expansion of this support system is planned. Support includes both primary and secondary schools, as well as psychological-pedagogical clinics, which coordinate and support teachers, parents, and students.Simultaneously, a three-tier psychiatric care model for children and youth is being developed, which requires close cooperation between schools and community psychological and psychiatric Care Centers. This model aims to prevent excessive burden on psychiatric hospitals and to provide young people with comprehensive, accessible, and personalised help at the earliest intervention level [13].

Physical activity of youth - current status and challenges

Data from research conducted by the Mother and Child Institute indicate that only 16.8% of children and adolescents in Poland meet the World Health Organization (WHO) recommendations of at least 60 minutes of moderate or vigorous physical activity daily. This means that the vast majority of young Poles lead a sedentary lifestyle, which is a significant risk factor for the development of many civilisation diseases such as obesity, type 2 diabetes, hypertension, and depression. This phenomenon is part of a broader trend observed not only in Poland but also in many developed countries, where rapid technological development, widespread use of smartphones, computer games, and streaming platforms have significantly limited spontaneous physical activity of children and youth. Instead of outdoor play or sports, young people increasingly spend time sitting – both during remote learning and the leisure time [3].

Mobile health technologies – characteristics and popularity among youth

In recent years, there has been a dynamic development of mobile technologies, which have become an integral part of everyday life for young people. In Poland, approximately 97% of individuals in the 13-19 age group have their own smartphones, and over 80% use mobile Internet daily, mainly through social media apps, messaging platforms, and video services [14]. Mobile devices accompany young people almost constantly – at school, at home, during leisure time, and in social relationships – becoming a fundamental tool for communication, entertainment, and increasingly also education and self-development [15].

The role of mHealth in promoting mental health and physical activity among youth

Mobile health technologies (mHealth) play an increasingly significant role in preventive and educational efforts, particularly in schools. At the EU level, a key strategic document is the eHealth Action Plan 2021-2027, which emphasizes the need to integrate mHealth into public health and education policy programs [16]. According to the EU Digital Health Strategy 2020-2025 and the WHO report Digital Health in the WHO European Region 2023, the development of national digital platforms, such as DAPHNE, supports the systematic implementation of mobile technologies in promoting healthy behaviours [17-19].

In Poland, the National Health Program 2021-2025 includes the use of mobile applications to promote the mental and physical health of children and adolescents [7]. The OECD report Country Health Profile 2023 of Poland warns that only 20% of adults meet the recommended 150 minutes of physical activity per week, below the EU average of 33%, highlighting the urgent need for systemic intervention [20].

Research reviews confirm that interactive mHealth interventions in schools increase health awareness among adolescents, promote physical activity, and improve mental well-being [21,22]. Meta-analyses have shown that mobile applications can significantly increase total physical activity and reduce sedentary behaviour, as well as improve muscular strength and agility in children and adolescents [23]. A Spanish experimental study implemented step tracker apps as part of physical education classes-mandatory and promoted usage led to a significant improvement in body composition and fitness, although the effect diminished after the obligation was lifted [24].

Additionally, the Polish Report Card 2022 data center indicates that physical activity among Polish adolescents remains low and requires digital support, especially among youth with disabilities [25]. At the same time, adolescents are eager to use such technologies, suggesting strong potential for programs based on gamification and interactivity [26].

Experimental platforms like DAPHNE (an EU FP7 project) demonstrate that integrating data from mobile sensors with a health-education interface enables personalised support and effectively engages students in the active managment of their health [27].

The development of mobile technologies has simultaneously created new opportunities in the areas of health promotion, prevention, and supporting the mental and physical well-being of youth. Thanks to wide access to smartphones and the Internet, it has become possible to reach young audiences via digital tools that constitute their natural environment. Mobile applications, e-learning platforms, health-related games (so-called serious games), as well as programs based on artificial intelligence or augmented reality (AR) are increasingly used in pro-health initiatives. These technologies enable, among others, monitoring physical activity (e.g., step count, heart rate, sleep duration), supporting healthy habits (through reminders, daily goals, gamification), providing access to educational

content related to mental health (e.g., stress management, breathing techniques, mindfulness), and allowing contact with therapists or health coaches via apps or online chats. Thanks to personalisation and interactivity, mobile technologies are attractive and motivating for young users, increasing the chances of lasting health behaviour changes. Moreover, digital solutions can play a significant role in reducing barriers to the access of traditional psychological help or the physical activity - such as lack of time, logistical problems, shame, or fear of stigmatisation. For example, meditation and relaxation apps provide self-help techniques in a private and safe environment, while teletraining platforms enable physical activity at home without the need to attend sports classes. Due to the high level of digital skills among youth, these solutions, if well designed and evidence-based, can be an effective tool supporting public health among the younger generation [28].

According to data from the Central Statistical Office of Poland in 2024, up to 70% of Polish youth used mobile apps to track physical activity or health status, of which 60% used fitness apps regularly, at least several times a week. This level of engagement shows that digital technologies have ceased to be just an addition to young people's lifestyles and have become an integral part of it, also in the health context. The popularity of health apps stems primarily from their easy accessibility (most are free oraffordable), the possibility to individually tailor workouts to personal needs and preferences, and the attractive visualisation of data – through clear charts, daily goals, reminders, and motivational notifications [29].

Research by Nowak and Błaszczyk conducted among Polish teenagers shows that the main motivations for using such apps are the desire to improve physical fitness (72%), caring for mental health (45%), and social aspects, i.e., the possibility to jointly participate in challenges, online workouts, or compare results with peers (38%). The gamification element, including earning badges, points or advancing in rankings, acts as a motivator, especially for younger age groups. Youth often perceive fitness apps not only as a training tool but also as a form of entertainment and communication, which increases their engagement [30,31].

A meta-analysis conducted by Romeo et al., encompassing 28 randomized studies with over 11.000 participants aged 12-19, showed that youth using mobile applications achieved on average a 25% higher level of daily physical activity (measured by number of steps, moderate or vigorous exercise time) compared to those who do not use such tools. These results indicate that apps can serve as effective intervention tools for the prevention of diseases related to physical inactivity and for the promotion of a healthy lifestyle among adolescents [32].

From the perspective of health education and prevention, integrating mobile applications with school programs, physical education classes or health promotion activities in local communities can bring tangible benefits. The use of these tools not only increases student engagement but also allows teachers, educators, and parents to monitor progress and tailor support to individual needs. In the era of widespread access to smartphones and mobile Internet, health apps have become a natural, attractive, and effective tool supporting the health of the younger generation. Regular physical activity is a well-documented and effective factor improving mental health, reducing symptoms of depression and anxiety, and enhancing overall well-being. The mechanisms behind this impact include increased release of endorphins and other neurotransmitters responsible for good mood, improved sleep quality, and greater feelings of self-efficacy and control over one's life. With the growing popularity of digital technologies, mobile applications have the potential to further amplify these effects by boosting motivation for regular activity and maintaining user engagement [33,34].

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Integrating mHealth into public health policy, for example within programs of the Ministry of Education and Science (MEN) and the Ministry of Health (MZ), requires a strategic approach involving several key actions: the inclusion of health applications and mHealth tools in official educational and preventive programs [7], ensuring cross-sector collaboration between educational institutions, healthcare services, and non-governmental organizations [37], funding and promoting digital initiatives supporting youth health [38], and monitoring and evaluating the effectiveness of implemented solutions [39]. A crucial element for effective use of health applications is the education of youth and parents on the conscious and safe use of these tools. Educational programs should include teaching critical approaches to the selection and the use of health applications, which provide information about risks such as digital fatigue and privacy violations, and promoting skills to assess the credibility of sources and applications. To ensure the safety and effectiveness of mHealth solutions, it is necessary to establish a system for certification and quality verification of health applications. Such a system could include criteria for the substantive and technical evaluation of applications, approval by appropriate public health or scientific institutions, regular monitoring of compliance with data protection and ethical standards, and transparency and accessibility of information for users regarding recommended and certified tools [40-44].

Examples of innovative mobile health technologies supporting youth mental health and physical activity

One of the most innovative examples of modern applications integrating physical activity with mental health promotion is "Zombies, Run!". This app combines running with an interactive narrative where the user becomes the hero of an engaging story about escaping zombies. Such a combination of game elements with real physical activity significantly increases motivation for regular exercise and boosts user engagement,

especially among youth who often seek unconventional forms of activity. Studies indicate that users of "Zombies, Run!" report increased training frequency, improved mood, and reduced perceived stress after several weeks of using the app. Gamification mechanisms and immersive storytelling make workouts feel enjoyable and less tiring [45].

Another interesting solution is the app "Calm", which focuses primarily on meditation and relaxation techniques. Calm also offers physical exercise programs aimed at improving fitness and reducing stress and anxiety symptoms. This hybrid form of support, combining body activity with mental health care, is gaining popularity, including in Poland, where demand for comprehensive tools helping youth cope with stress and daily pressure is growing [46].

Wearable technologies, such as smartwatches and fitness bands (e.g., Apple Watch, Fitbit, Garmin), provide advanced capabilities to monitor health parameters, including heart rate, stress levels, sleep quality, and physical activity levels. Integration of these devices with mobile apps allows real-time health monitoring and the delivery of personalised advice and alerts, encouraging conscious lifestyle decisions [47]. According to data from the Central Statistical Office of Poland in 2024, approximately 25% of Polish youth use wearable devices for health purposes, indicating the growing importance of these technologies in daily health monitoring and improvement [48].

Virtual reality (VR) and augmented reality (AR) technologies are gaining increasing significance in promoting mental health and physical activity. VR apps enable youth to participate in virtual group workouts, mindfulness sessions, or relaxation therapy in a safe, controlled environment, which is particularly valuable for people with anxiety disorders or mobility limitations. Innovative research projects in Poland combine VR technology with movement therapy and psychological interventions, showing promising effects and indicating the potential of such solutions in future healthcare [49-52].

CONCLUSION

In recent years, we have observed a dynamic development of mobile technologies and fitness applications, which constitute innovative tools in promoting mental health and physical activity amongyoung people. An analysis of available studies and reports from Poland and abroad indicates that these applications can effectively increase physical activity levels, improve mental well-being, and motivate young users to maintain a healthy lifestyle.

Elements such as gamification, personalisation of training programs, and integration of mindfulness and relaxation functions support youth engagement and reduce symptoms of stress, anxiety, and depression. Contemporary wearable technologies and solutions based on virtual and augmented reality represent the next step towards more immersive and individually tailored tools. Nevertheless, the use of these innovations is associated with technological, user-related, and social challenges that require further research and implementation. Attention also should be paid to inequalities in access to modern technologies and to the protection of young users' data privacy.

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