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# Enhancing Physical Activity Through Information Technology: Current Trends and Future Directions

## Mejora de la actividad física a través de las tecnologías de la información: Tendencias actuales y orientaciones futuras

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**ABSTRACT**

The potential for using information technology to improve physical activities covers a large scope. The integration of information technology has impacted almost every aspect of our lives in the dynamic modern world, transforming not only how we work and communicate but also how we interact with one another and with physical activities. This study aims is to provide a comprehensive overview of the current trends in the use of information technology (IT) to promote and enhance physical activity. This study utilized randomized controlled trials, quasi-experimental studies, observation, systematic reviews, and meta-analyses with a bibliometric approach in the context of a literature review. The researcher looked through many electronic databases, including PubMed, Google Scholar, PsycINFO, Elsevier, CINAHL, and the Cochrane Library, to find studies that fit the title. They chose sixty (60) papers for this study, and thirty-six (36) of them were analyzed in detail and met the requirements checklist to find and combine studies published in English between 2015 and 2023 that met the review criteria.

**Keywords:** Physical Activities; Information Technology; Current Trends; Future Directions.

**RESUMEN**

Las posibilidades de utilizar las tecnologías de la información para mejorar las actividades físicas abarcan un amplio ámbito. La integración de la tecnología de la información ha repercutido en casi todos los aspectos de nuestras vidas en el dinámico mundo moderno, transformando no sólo la forma en que trabajamos y nos comunicamos, sino también la forma en que interactuamos entre nosotros y con las actividades físicas. El objetivo de este estudio es proporcionar una visión global de las tendencias actuales en el uso de la tecnología de la información (TI) para promover y mejorar la actividad física. Este estudio utilizó ensayos controlados aleatorios, estudios cuasiexperimentales, observación, revisiones sistemáticas y metaanálisis con un enfoque bibliométrico en el contexto de una revisión bibliográfica. El investigador buscó en muchas bases de datos electrónicas, como PubMed, Google Scholar, PsycINFO, Elsevier, CINAHL y la Biblioteca Cochrane, para encontrar estudios que se ajustaran al título. Eligieron sesenta (60) artículos para este estudio, y treinta y seis (36) de ellos se analizaron en detalle y cumplieron con la lista de verificación de requisitos para encontrar y combinar estudios publicados en inglés entre 2015 y 2023 que cumplieran con los criterios de revisión.

**Palabras clave:** Actividades Físicas; Tecnología de la Información; Tendencias Actuales;+ Orientaciones Futuras.

## INTRODUCTION

The potential for using information technology to improve physical activities covers a large scope. The integration of information technology has impacted almost every aspect of our lives in the dynamic modern world, transforming not only how we work and communicate but also how we interact with one another and with physical activities.

## METHODS

Several studies were looked into that corresponded to the above title. By searching major electronic databases such as PubMed, Google Scholar, PsycINFO, and Elsevier, CINAHL, and Cochrane library. Out of the sixty (60) papers that were selected for this study, thirty-six (36) papers underwent in-depth analysis and satisfied the requirement Using the PRISMA-ScR (Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews) checklist, a scoping review was conducted to identify and provide a synthesis of eligible studies published in English between 2015 and 2023.

**Inclusion Criteria**
- Study that involved randomized controlled trials,  quasi experimental, observational and systemic review/meta-analyses
- Research that involving adults/children engaged in physical activities
- Study that evaluate the use of information technology (mobile apps, wear-ables, online platforms, virtual reality) that promote or support physical activity.

**Exclusion Criteria**
- Studies focused solely on technical development of feasibility of IT-based interventions
- Populations with specific medical conditions or disabilities
- Conference abstracts, editorials,and non-peer reviewed publications.

**The role of wearable technology in tracking and monitoring physical activity level**

A healthy and meaningful existence, or at the very least getting through each day's tasks, requires some level of physical activities to various degrees. The World Health Organization (WHO, suggests that adults engage in 150 minutes per week of moderate-intensity physical activity, while children and adolescents should engage in 60 minutes. over 80 % of teenagers and 25 % of adults fail to meet the suggested physical activity levels. [13] As a result, in order to prepare for demands for wellness as well as the evaluation of healthy individuals, physical activity measurement is required. Wearable technology is a major tool for measuring and monitoring physical activity levels, giving users important information about their general health and fitness and general well-being, and has completely changed how people track and interact with their physical activity levels. Accelerometers are frequently used in wearable technology, such as smartwatches and fitness trackers, to count steps taken during the day. This fundamental measure offers a straightforward representation of total physical activity. To calculate the approximate number of calories burnt during various activities, it makes use of information such as steps walked, and occasionally even skin temperature. [14,15]

Numerous wearables are fitted with sensors to track certain workouts, such as heart rate monitors, gyroscopes, and GPS. This makes it possible to track sports like cycling, swimming, jogging, and more with greater accuracy. Certain wearables enable users to download or enter predetermined fitness regimens, offering direction and feedback while performing workouts. Heart rate may be tracked in real time during rest and activity with wearable heart rate monitors. Users may utilize this information to better understand the intensity of their workouts and create training regimens that function better. [16] By measuring sleep duration, evaluating sleep cycles, and offering insights into sleep patterns, many wearables come equipped with functions to monitor the quality of sleep. General health and recuperation depend on knowing this knowledge. In order to keep users interested and active, wearable apps frequently adopt the system of "gamification strategies". People who receive instant feedback on their levels of physical activity are more likely to adopt a more active lifestyle and make better decisions throughout the day. As wearables get more sophisticated, they may monitor things other than just fitness, such as blood oxygen levels, stress levels, and even ECG readings, which provide users a more complete picture of their general health. [16,17]

**Virtual reality and augmented reality and exercise**

Augmented reality (AR) and virtual reality (VR), provide immersive digital experiences, interactive environments, simulation, and interaction, and have completely changed how we approach learning. However, in order to fulfill the huge demand in education, these technologies are still in the emerging stage and need to be heavily customized and heavily invested in [18] Enhancing fitness training with virtual reality (VR) and augmented reality (AR) is a new way to promote health. Several evaluations of systematic literature have

concentrated on VR therapies' efficacy in therapeutic contexts. Comparing exercise-based VR and AR training to traditional programs and no-exercise controls. Various systematic evaluations have examined the efficacy of these interventions as preventative measures in enhancing physical activity, psychological outcomes, and physical performance of a healthy population. Certain programs produce mixed reality workouts by combining VR and AR features. This creates a distinctive and dynamic training environment by enabling participants to experience a combination of virtual and real-world components. It is possible to employ AR and VR to promote social connection while working out. In virtual or augmented settings, users may compete with others, communicate with friends, and participate in group workouts. Physical therapy and rehabilitation settings are increasingly using VR and AR. With the aid of these technologies, patients may do therapeutic activities in a setting that is regulated and adaptable.

The use of VR and AR in workout regimens is anticipated to grow as technology develops, providing people with more entertaining and varied options for maintaining an active and healthy lifestyle.[19,20]

**Gamification of physical activities through technology**

Gamification is a useful technique for encouraging user behavior in a variety of computer systems. This method makes use of game design ideas to motivate people to engage in sports, physical activity, or other active activities in order to provide a therapeutic atmosphere in hospitals for patients to perform exercises. Notwithstanding the necessity of exercise for a healthy lifestyle, surprisingly little is known about how gamification, and specifically contests, affect people's levels of physical activity.[21] However, gamification strategies have gained popularity recently and have had a significant influence on changing behavior. Engaging in an effective gaming competition that helps in promoting physical activity has a great potential to enhance public health across the community and lower the risk of a number of chronic diseases, especially in light of the widespread use of mobile devices and health and activity tracking apps. It is a viable approach to combating the pandemic of physical inactivity worldwide and the prevalence of chronic illnesses that exist today.[22,23]

**The use of social media platforms and online communities to support and motivate physical activities and participation**

The promotion and encouragement of physical activity and participation is greatly aided by social media platforms and online groups. These online communities provide a feeling of community that may boost motivation and accountability by giving people a platform to interact, exchange experiences, and find inspiration. People's intention to stay active is increased by the helpful and entertaining health information they can find on social media, which also serves to uphold the idea that fitness is important. People will be more inclined to modify their exercise habits if they see their friends' fitness photos and workout reports on social media.[24]

Social media gives users the opportunity to create groups focused on certain sports, physical activities, or fitness routines. Similar-minded people exchange experiences, advice, and accomplishments. This also fosters connectivity with nearby people who have similar fitness interests by using platforms like YouTube and Facebook, Tik Toks and many other social platforms to result in events, group exercises, or gatherings in real life. This inspires others in the community and facilitates introspection on a personal level. These tools make it easier to create contests and challenges related to fitness. Events such as step challenges, gym challenges, or virtual races might encourage people to keep moving.[25] Studies have shown the impact of fitness influencers have on people's intentions or actions toward exercise. Fitness influencers may be seen as social media health communicators who utilize their dependability, professionalism, and good looks to encourage people to adopt healthier lifestyles. Users' behavioral intentions are influenced by the personal traits and channel attributes of fitness influencers on media such as YouTube, since these factors impact their pleasure and flow experience.[26,27,28]

**The integration of fitness trackers, smartwatches, and other lot devices into physical activities**

The way people measure, evaluate, and improve their exercise regimens has changed dramatically as a result of the incorporation of fitness trackers, smartwatches, and other IoT (Internet of Things) devices into physical activities. These wearables provide users a seamless connection between their physical activities and real-time data and actionable insights. Yearly several devices are released to match this purpose. Various sensors, algorithms, and companion mobile apps are included with these devices. These devices gather physical activity data that can be used for health research proposes to improve the burden on health challenges and research discovery to improve well-being. thanks to recent developments in mobile sensor technology.[29] Information technology (IT) integration that improves physical activities is a dynamic and developing field with potential future directions and existing trends. The continued developments in wearable, healthcare, virtual reality, and smartphone applications highlight how IT is being used more and more to personalize, make physical activities more accessible, and make them more interesting. Looking ahead, a number of possible paths for development suggest that the convergence of technology and physical fitness may undergo even more revolutionary changes.

**Health and fitness app for goal setting, progress tracking and personalized recommendations**

A fitness and health app is a type of software created to assist people in tracking, controlling, and enhancing several facets of their physical and mental health. These applications employ technology to give people tools, information, and assistance for leading healthy lives. They are usually installed on smartphones, tablets, or wearable technology. Applications for health and fitness can address many facets of both physical and mental well-being, with a broad range of features and capabilities. [30,31] To assist users in setting and achieving their fitness objectives, a plethora of health and fitness applications are available. Typically, these applications include capabilities for organizing workouts, establishing goals, tracking progress, and occasionally even diet and fitness apps. Change behavior deals with observing actions and altering habits and behaviors for the long-term health benefits. However, there are a lot of unanswered issues about how well this technology works to encourage behavior change. Fitness technology generally incorporates behavior modification strategies including goal-setting, feedback, incentives, and social elements. It's important to take into account your own fitness goals, your favorite workout regimen, and any extra features that suit your needs when choosing a health and fitness app for goal setting. Many of these applications include free and paid features, and they are accessible for both the iOS and Android operating systems. [32]

**Technology innovation in promoting physical activities for individuals with disabilities or specific health condition**

People with impairments or certain medical conditions and disability typically engage in low to moderate levels of physical activity in comparison to their usual counterparts. A sense of helplessness and dependency brought on by inactivity can also have a negative impact on physical activity levels, which can hinder people's ability to take initiative and make their own decisions, hinder their growth and social success. Technology has been a major factor in encouraging physical activity. By taking into account technological interventions in various situations, it aims to provide a comprehensive, critical analysis of developing technologies in physical activities and health promotion. It also sought to take a generally favorable position about projects involving interactive technology. In light of this, it is widely agreed that intervention measures are needed to help those with intellectual and various impairments become more physically active, which in turn helps to avoid or lessen the negative effects of being inactive. For instance, some of those programs relied on the supervision and prompts of staff, parents, or caregivers to lead the participants through a variety of activities, some of which also included the use of exercise equipment such as treadmills and stationary bicycles. [33,34,35,36] In summary, the study emphasizes the transformative role of technology in promoting physical activity and health, highlighting the need for personalized approaches, policy support, and continued research to maximize the benefits of IT-enhanced physical activities.

**Reflections**

These studies were focused on two areas according to whether they used technology to help offer physical exercise more often or by other means. Emerging Technology Applications to Promote Physical Activity and Health has drastically subsidized conditions formed as a result of in activities. Utilizing state-of-the-art technologies to promote health and physical activity (PA) has increased. For example, wearable health devices, smartphone applications, and active video games are examples of newly developed technologies that have been adopted to promote health. In order to increase long-term engagement with PA, population-based health programs are searching for innovative ways as technology becomes more and more integrated into everyday life.

**Information technology (IT)-enhanced physical activities have important ramifications for practice, policy, and future research**

In practice, physical activities augmented by information technology (IT) allow for the development of customized training regimens based on the goals, preferences, and health information of each individual. Health indicators may be tracked by wearable technology and sensors, which can give consumers and medical professionals real-time feedback and insights. It makes fitness programs and healthcare services more accessible by enabling remote fitness instruction and telehealth services. Augmented reality (AR) and virtual reality (VR) may produce engaging at-home exercise environments. Social media and online platforms may help build fitness groups that encourage responsibility, support, and inspiration. Engaging and pleasurable physical exercises may be achieved by integrating gaming aspects into fitness applications.

Governments may encourage people and healthcare providers to utilize technology by offering incentives for the incorporation of IT into exercise and healthcare initiatives. A smooth integration and information flow across various IT systems is ensured by establishing standards for health data interoperability. Public awareness initiatives that highlight the advantages of using IT technologies for physical activity and health can be supported by policymakers. To guarantee that all populations have fair access to technology, policies may

address the digital divide and advance digital literacy.

In the future, studies should examine the effects on lifestyle, well-being, and health outcomes over the long run by utilizing IT-enhanced physical activities. To safeguard personal health information gathered via IT applications, research should concentrate on creating strong mechanisms and outline moral standards for the use of data pertaining to health in practice and study. Artificial Intelligence may be used to evaluate user data and create tailored diet programs and exercise schedules. It can also be used to forecast health trends and offer ideas for preventative care by analyzing user behavior and health data. More sophisticated sensors for tracking things like blood glucose levels, muscular activity, and hydration levels during physical exercise may be introduced by future technology. Increased knowledge of behavioral psychology to customize technology-based treatments that encourage and maintain physical activity Create algorithms that take use of behavioral insights to promote regular physical activity.

These trends and future directions highlight the potential for IT to play a revolutionary role in encouraging and sustaining physical activity while addressing individual preferences and health needs in the rapidly growing field of fitness and technology. Research should examine the ways virtual reality, augmented reality, and mixed reality might improve the efficiency and pleasure of exercise. Recognize what influences a user's participation in physical activities boosted by technology.

## CONCLUSION

1. Impact of Technology on Physical Activity and Health: The integration of technology, such as wearable devices, smartphone applications, and active video games, has significantly contributed to promoting physical activity and improving health outcomes.

2. Customization and Personalization: Information technology allows for the customization of training regimens based on individual goals, preferences, and health information. This personalized approach enhances engagement with physical activities.

3. Accessibility and Remote Services: Technology enables remote fitness instruction, tele-health services, and real-time monitoring of health indicators, making fitness programs and healthcare services more accessible to a wider population.

4. Social Support and Engagement: Online platforms, social media, and gamification elements in fitness applications foster social support, responsibility, and motivation, making physical exercises more engaging and enjoyable.

5. Policy Implications: Governments can incentivize the incorporation of technology into exercise and healthcare initiatives by offering incentives. Policies should address digital literacy and the digital divide and ensure fair access to technology for all populations.

6. Technological Advancements: Future technology may introduce more sophisticated sensors for monitoring health parameters during physical exercise and leverage behavioral psychology insights to promote regular physical activity effectively.

7. Revolutionary Role of IT: IT has the potential to revolutionize physical activity promotion, catering to individual preferences and health needs. Future research should explore the impact of virtual reality, augmented reality, and mixed reality on exercise efficiency and user engagement.

8. Behavioral Insights and Algorithms: Developing algorithms based on behavioral insights can encourage and maintain physical activity, emphasizing the importance of understanding user behaviors in technology-based interventions.

9. Future Research Directions: Future studies should focus on the long-term effects of IT-enhanced physical activities on lifestyle, well-being, and health outcomes. Research should also prioritize data privacy, ethical standards, and the use of artificial intelligence to personalize diet and exercise programs.

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## CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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