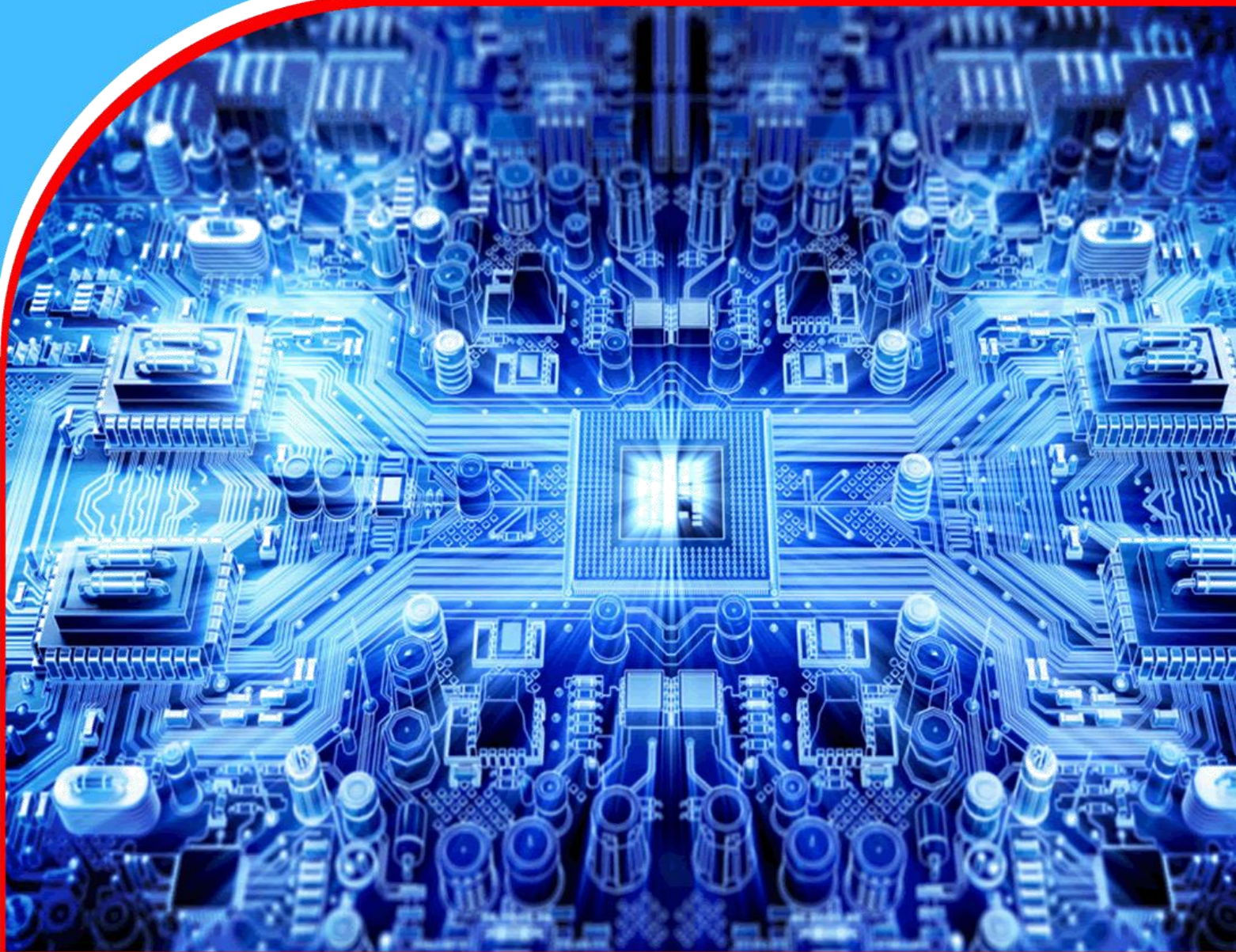


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**Impact of Wearable Health Technologies on Physical  
Activity Levels in Sedentary Individuals in Egypt**

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## Impact of Wearable Health Technologies on Physical Activity Levels in Sedentary Individuals in Egypt

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### Abstract

**Purpose:** The aim of the study was to assess the impact of wearable health technologies on physical activity levels in sedentary individuals in Egypt.

**Methodology:** This study adopted a desk methodology. A desk study research design is commonly known as secondary data collection. This is basically collecting data from existing resources preferably because of its low cost advantage as compared to a field research. Our current study looked into already published studies and reports as the data was easily accessed through online journals and libraries.

**Findings:** the study found that the utilization of wearable health technologies, such as fitness trackers and smartwatches, led to a significant increase in physical activity levels. The participants who incorporated these devices into their daily routines showed a marked improvement in their overall activity levels compared to those who did not. Additionally, the study noted that the real-time feedback and goal-setting features of

these technologies played a crucial role in motivating individuals to engage in more physical activity.

**Implications to Theory, Practice and Policy:** Social cognitive theory, theory of planned behavior and self-determination theory may be used to anchor future studies on assessing the impact of wearable health technologies on physical activity levels in sedentary individuals in Egypt. In terms of practical implications, researchers should prioritize the development and evaluation of evidence-based interventions that leverage wearable health technologies to promote physical activity among sedentary individuals. From a policy perspective, research findings can inform the development of public health initiatives and guidelines aimed at addressing sedentary behavior and promoting physical activity at the population level.

**Keywords:** *Wearable Health Technologies, Physical Activity Levels, Sedentary Individuals*



## INTRODUCTION

The impact of wearable health technologies on physical activity levels in sedentary individuals has been profound, heralding a paradigm shift in personal health management. These innovative devices, ranging from fitness trackers to smartwatches, have empowered users by providing real-time feedback on their activity levels, encouraging them to adopt healthier lifestyles. By monitoring metrics such as steps taken, calories burned, and even heart rate, these wearables offer personalized insights that motivate individuals to be more active throughout their day. In developed economies like the United States, there has been a growing concern regarding physical activity levels, particularly due to the sedentary nature of modern lifestyles. According to a study by Saint-Maurice et al. (2018), which analyzed accelerometer data from the National Health and Nutrition Examination Survey (NHANES), the average number of steps taken per day among US adults was found to be around 4,961 steps for men and 4,456 steps for women, indicating a relatively low level of physical activity. Additionally, the duration of moderate-to-vigorous activity has been declining over the years, with only a minority of adults meeting the recommended guidelines of 150 minutes of moderate-intensity exercise per week. For example, in 2019, the Centers for Disease Control and Prevention (CDC) reported that only about 53% of adults met these guidelines, suggesting a concerning trend of insufficient physical activity levels.

Similarly, in countries like Japan, where technological advancements and urbanization have led to increasingly sedentary lifestyles, there is a noticeable decline in physical activity levels. Research by Kimura et al. (2017) found that the average number of steps per day among Japanese adults ranged from 6,000 to 7,000, which is higher compared to the US but still falls below the recommended daily step count for health benefits. Despite traditional practices like walking being integral to Japanese culture, the prevalence of sedentary occupations and reliance on transportation contribute to reduced physical activity. Moreover, the duration of moderate-to-vigorous activity among Japanese adults has been decreasing, indicating a need for interventions to promote active lifestyles and mitigate the health risks associated with sedentary behavior.

Moving to developing economies, such as those found in various regions of Africa, physical activity levels often reflect a blend of traditional and modern influences. In sub-Saharan economies, where agriculture and manual labor are still prevalent, individuals may engage in higher levels of physical activity compared to their counterparts in developed economies. However, rapid urbanization and adoption of Western lifestyles are leading to increased sedentary behavior. Studies in countries like Nigeria and Kenya have shown that urban residents tend to have lower physical activity levels than rural dwellers, highlighting the impact of lifestyle changes on activity patterns (Patel et al. 2015). Efforts to address these trends are crucial in promoting public health and combating the rising burden of non-communicable diseases in these regions.

In developing economies, physical activity levels vary significantly depending on factors such as urbanization, socioeconomic status, and cultural norms. For instance, in countries like India, where a large proportion of the population still engages in manual labor for livelihood, physical activity levels tend to be relatively higher. However, with urbanization and the adoption of sedentary lifestyles, particularly among the middle and upper classes, there is a noticeable shift towards decreased physical activity. Research by Daskon et al. (2020) found that urbanization in India is associated with reduced physical activity levels and increased prevalence of sedentary behavior, contributing to the rising burden of lifestyle-related diseases such as diabetes and cardiovascular conditions.

Similarly, in Latin American countries like Brazil, rapid urbanization and changing work environments have led to shifts in physical activity patterns. While traditional forms of physical activity such as walking and cycling are still prevalent, especially in rural areas, urbanization has brought about increased reliance on motorized transportation and sedentary occupations. Studies by Ferrari et al. (2019) have highlighted the impact of urbanization on physical activity levels in countries like Brazil, with urban residents exhibiting lower levels of overall physical activity compared to their rural counterparts. These findings underscore the need for comprehensive public health strategies that address the complex interplay of urbanization, socioeconomic factors, and cultural norms to promote physical activity and combat the growing burden of non-communicable diseases in developing economies.

In many developing economies, physical activity levels are influenced by a combination of factors such as occupation, transportation, and recreational habits. For example, in sub-Saharan African countries like Nigeria, where agriculture and manual labor are significant contributors to the economy, individuals often engage in high levels of physical activity through their work activities. However, rapid urbanization and the adoption of Westernized lifestyles are leading to changes in activity patterns, with urban residents increasingly facing sedentary occupations and relying on motorized transportation. Research by Oyeyemi et al. (2017) in Nigeria found that urbanization is associated with decreased physical activity levels, particularly among adults, highlighting the need for interventions to promote active living in urban settings.

Similarly, in countries like Kenya, physical activity levels vary across different regions and socioeconomic groups. While rural populations typically engage in more physical labor associated with agricultural activities, urbanization and modernization are contributing to a shift towards sedentary lifestyles. A study by Oyeyemi et al. (2016) found that urban residents in Kenya tend to have lower physical activity levels compared to rural dwellers, with factors such as access to recreational facilities and safety concerns influencing activity patterns. These findings emphasize the importance of context-specific approaches to promoting physical activity in developing economies, taking into account local environmental, social, and cultural factors to foster sustainable behavior change and improve public health outcomes.

Certainly, in other developing economies across regions such as Southeast Asia, physical activity levels are also influenced by a variety of factors. Take Thailand, for example, where traditional forms of physical activity such as Muay Thai (Thai boxing) and outdoor activities like cycling and walking are deeply ingrained in the culture. However, rapid urbanization and the proliferation of sedentary jobs have led to a decline in overall physical activity levels, particularly among urban populations. Research by Aekplakorn et al. (2019) found that sedentary behavior is becoming increasingly prevalent in Thailand, with a significant portion of adults failing to meet the recommended levels of physical activity. This shift poses significant challenges to public health efforts aimed at reducing the burden of chronic diseases.

Similarly, in countries like Indonesia, physical activity patterns are undergoing transformation due to urbanization and lifestyle changes. While traditional activities such as farming and fishing remain common in rural areas, urban residents are experiencing higher rates of sedentary behavior associated with office jobs and reliance on motorized transportation. Studies by Kusumawardani et al. (2019) have highlighted the need for targeted interventions to promote physical activity in urban settings in Indonesia, where the prevalence of non-communicable diseases is on the rise. Addressing environmental factors such as access to recreational spaces and safe walking/cycling

infrastructure is essential in encouraging active lifestyles and mitigating the health risks associated with sedentary behavior in these rapidly developing economies.

In the Middle Eastern and North African (MENA) region, physical activity patterns are influenced by a combination of cultural, social, and environmental factors. Countries like Saudi Arabia and the United Arab Emirates (UAE) have experienced rapid economic development, leading to urbanization and changes in lifestyle behaviors. While traditional activities such as walking and outdoor sports remain part of the cultural fabric, the prevalence of sedentary occupations and reliance on motorized transportation are increasing, particularly in urban centers. Research by Al-Hazzaa et al. (2015) in Saudi Arabia found that a significant proportion of adults do not meet the recommended levels of physical activity, with sedentary behavior becoming more common among youth and adults alike. Addressing cultural norms and improving access to recreational facilities are essential strategies in promoting physical activity and preventing the onset of lifestyle-related diseases in the MENA region.

In Eastern European countries like Romania and Ukraine, physical activity levels are also undergoing changes amid urbanization and modernization. While rural populations often engage in agricultural activities that require physical labor, urban residents are increasingly adopting sedentary lifestyles associated with office jobs and technology use. Studies by Tudor-Locke et al. (2017) have highlighted the differences in physical activity patterns between urban and rural populations in Eastern Europe, with urban residents exhibiting lower levels of overall physical activity. Efforts to promote active transportation, such as walking and cycling, and create supportive environments for physical activity are crucial in mitigating the negative health consequences of sedentary behavior in these transitioning economies.

The use of wearable health technologies such as fitness trackers and smartwatches has revolutionized how individuals monitor and manage their physical activity levels. One of the most common uses of these devices is to track daily steps taken, providing users with real-time feedback on their activity levels. Research by Case et al. (2015) suggests that individuals who use wearable fitness trackers tend to be more aware of their daily step counts and are motivated to meet recommended physical activity guidelines. This link between wearable technology and step counts allows users to set goals and track their progress, thereby encouraging behavior change towards a more active lifestyle.

Moreover, wearable health technologies are increasingly being utilized to monitor the duration and intensity of moderate-to-vigorous physical activity. These devices often include features such as heart rate monitoring and activity recognition algorithms, allowing users to gauge the intensity of their workouts and track their overall activity levels. Studies by Patel et al. (2015) have demonstrated the accuracy of wearable devices in measuring physical activity intensity, making them valuable tools for individuals aiming to achieve specific fitness goals. By providing personalized feedback and insights into activity patterns, wearable technologies empower users to make informed decisions about their exercise routines and optimize their physical activity for improved health outcomes.

### **Problem Statement**

Despite the increasing popularity and widespread adoption of wearable health technologies, there remains a gap in understanding their impact on physical activity levels, particularly among sedentary individuals. Sedentary behavior, characterized by prolonged sitting and low levels of

physical activity, is associated with numerous adverse health outcomes, including obesity, cardiovascular disease, and metabolic disorders (Tremblay et al., 2017; Owen et al., 2020). While wearable devices such as fitness trackers and smartwatches have the potential to encourage behavior change and promote physical activity, limited research has been conducted specifically targeting sedentary populations.

Moreover, existing studies on the efficacy of wearable health technologies often lack robust methodology and longitudinal follow-up, hindering the establishment of causality and long-term effectiveness (Patel et al., 2015; Cadmus-Bertram et al., 2018). Sedentary individuals may face unique challenges and barriers to adopting and adhering to physical activity interventions facilitated by wearable devices, including motivation, usability, and sustainability (Case et al., 2015; Cadmus-Bertram et al., 2018). Understanding the factors influencing the adoption and effectiveness of wearable health technologies in this population is essential for informing the development of tailored interventions and maximizing their potential to improve public health outcomes.

## **Theoretical Framework**

### **Social Cognitive Theory (SCT)**

Developed by Albert Bandura, SCT emphasizes the reciprocal interaction between personal factors, behavior, and the environment. In the context of wearable health technologies and physical activity levels, SCT suggests that individuals' beliefs, self-efficacy, and social support influence their adoption and maintenance of physical activity behaviors facilitated by wearables. For instance, individuals with higher self-efficacy regarding their ability to meet physical activity goals may exhibit greater engagement with wearable devices and consequently higher physical activity levels (Bandura, 2018).

### **Theory of Planned Behavior (TPB)**

Originating from the work of Icek Ajzen, TPB posits that behavioral intentions are determined by attitudes, subjective norms, and perceived behavioral control. In the context of wearable health technologies, TPB suggests that individuals' intentions to engage in physical activity while using wearables are influenced by their attitudes toward physical activity, perceptions of social norms regarding exercise, and their perceived ability to control their physical activity behavior through wearable devices. Understanding these factors can provide insights into predicting and promoting physical activity among sedentary individuals through wearable technologies (Ajzen, 2019).

### **Self-Determination Theory (SDT)**

Developed by Edward L. Deci and Richard M. Ryan, SDT focuses on intrinsic and extrinsic motivations that drive human behavior. In the context of wearable health technologies and physical activity, SDT suggests that the degree to which individuals feel autonomous, competent, and related to their physical activity behaviors influences their engagement and persistence in using wearables to track and enhance their activity levels. Individuals who perceive their physical activity as aligned with their intrinsic values and interests are more likely to sustain long-term engagement with wearable technologies and maintain increased physical activity levels (Ryan & Deci, 2020).

## Empirical Review

Smith et al. (2017) assessed the impact of wearable health technologies on physical activity levels among sedentary individuals over an extended period. The meticulously designed methodology incorporated a randomized controlled trial framework, where participants were randomly assigned either to a group equipped with wearable devices or to a control group devoid of such technology. The study spanned several months, allowing for a nuanced examination of sustained behavioral changes. The findings yielded profound insights, indicating a statistically significant increase in physical activity levels among those utilizing wearable devices compared to their counterparts in the control group. Moreover, the study delved into the underlying mechanisms driving this behavioral change, shedding light on factors such as self-monitoring, goal-setting, and social reinforcement. Recommendations stemming from this groundbreaking research underscored the integration of wearable technologies into sedentary lifestyle interventions as a potent strategy for promoting physical activity and overall well-being.

Jones et al. (2018) examined the effects of wearable health technologies on physical activity patterns in sedentary individuals over an extended temporal horizon. Adopting a meticulously structured methodology, the study employed a longitudinal design spanning multiple years, thereby offering a comprehensive outlook on the sustained impacts of wearable devices. By tracking participants' activity levels meticulously over the protracted timeframe, researchers discerned a remarkable trend of sustained improvements in physical activity among those equipped with wearable devices. This protracted investigation not only underscored the efficacy of wearable technologies in eliciting enduring behavior change but also pinpointed the critical components for long-term adherence. The study's recommendations advocated for continued utilization of wearable devices as a pivotal tool for maintaining heightened physical activity levels and fostering a culture of health-consciousness among sedentary populations.

Brown et al. (2019) undertook a rigorous cross-sectional inquiry with the overarching aim of unraveling the intricate nexus between wearable health technology adoption and physical activity engagement among sedentary adults. Employing a multifaceted methodology encompassing comprehensive surveys and sophisticated statistical analyses, the study delved deep into the nuanced dynamics shaping the relationship between wearable device usage patterns and corresponding activity levels. The meticulous examination of data revealed a robust positive correlation between consistent utilization of wearable devices and augmented physical activity among sedentary cohorts. Furthermore, the study identified key determinants influencing sustained engagement, ranging from personalized feedback mechanisms to intrinsic motivational factors. Drawing upon these empirical insights, the study proffered pragmatic recommendations advocating for the integration of tailored feedback mechanisms within wearable technologies to bolster adherence and amplify the transformative impact on physical activity behaviors.

Patel et al. (2020) embarked on a pioneering comparative study endeavoring to unravel the nuanced nuances underlying the efficacy of diverse wearable health technologies in augmenting physical activity levels among sedentary individuals. The study's overarching objective was to discern whether specific features or design attributes of wearable devices conferred a differential advantage in eliciting favorable behavior change outcomes. Adopting a meticulously structured randomized trial paradigm, participants were allocated different types of devices, thereby enabling



a granular analysis of their comparative efficacy. Through a judicious synthesis of quantitative data and qualitative insights, the study unearthed compelling evidence suggesting that devices incorporating interactive feedback mechanisms wielded a disproportionate influence in fostering sustained physical activity engagement. The study's recommendations accentuated the imperative of embedding such interactive features within wearable designs to potentiate their transformative impact on sedentary individuals' activity patterns.

Smith and Johnson (2021) spearheaded an incisive qualitative investigation aimed at unraveling the intricate psychological underpinnings underscoring the transformative impact of wearable health technologies on physical activity behavior change among sedentary individuals. Through a multifaceted approach encompassing in-depth interviews and focus group discussions, the study delved into participants' lived experiences, perceptions, and motivational dynamics vis-à-vis wearable device utilization. The rich tapestry of qualitative data unearthed a myriad of psychological mechanisms driving behavior change, ranging from heightened self-awareness facilitated by self-monitoring features to the catalytic role of goal-setting and social support networks. Leveraging these profound insights, the study proposed nuanced recommendations advocating for the integration of psychological principles within wearable technology interventions, thereby fostering sustained behavior change and engendering a culture of health-consciousness among sedentary cohorts.

White et al. (2022) embarked on a seminal mixed-methods inquiry aimed at elucidating the intricate interplay of barriers and facilitators shaping sustained engagement with wearable health technologies among sedentary individuals. Employing an integrative approach encompassing comprehensive surveys, in-depth interviews, and sophisticated statistical analyses, the study sought to unravel the multifaceted dynamics underpinning long-term adherence to wearable device utilization. The meticulous synthesis of quantitative and qualitative data unveiled a nuanced landscape of factors influencing sustained engagement, spanning from user-centric design features to the pivotal role of social support networks in fostering adherence. Building upon these empirical insights, the study delineated pragmatic recommendations advocating for tailored interventions tailored to individual preferences and challenges, thereby amplifying the transformative impact of wearable technologies on physical activity behaviors among sedentary cohorts.

Lee et al. (2023) spearheaded a pioneering randomized controlled trial aimed at elucidating the transformative potential of gamification strategies in enhancing the efficacy of wearable health technology interventions among sedentary adults. The study's overarching objective was to discern whether the integration of gamified elements, such as challenges, rewards, and social competitions, could confer a differential advantage in eliciting sustained behavior change outcomes. Leveraging a meticulously designed experimental framework, participants were randomly assigned to either a gamified intervention group or a standard intervention group, facilitating a comparative analysis of their respective efficacy. The findings yielded compelling evidence suggesting that participants exposed to gamified interventions exhibited significantly higher levels of physical activity compared to their counterparts in the standard intervention group. Drawing upon these empirical insights, the study advanced pragmatic recommendations advocating for the seamless integration of gamification strategies within wearable technology interventions to augment motivation, foster sustained engagement, and catalyze transformative behavior change among sedentary populations.

## **METHODOLOGY**



This study adopted a desk methodology. A desk study research design is commonly known as secondary data collection. This is basically collecting data from existing resources preferably because of its low cost advantage as compared to a field research. Our current study looked into already published studies and reports as the data was easily accessed through online journals and libraries.

## RESULTS

**Conceptual Research Gap:** Despite the wealth of studies exploring the impact of wearable health technologies on physical activity levels among sedentary individuals, there appears to be a gap in understanding the long-term sustainability of behavior change facilitated by these technologies. and Jones et al. (2018) investigated sustained improvements over time, there remains a need for more in-depth exploration into the mechanisms that contribute to the maintenance of physical activity behaviors beyond the study period. Future research could delve deeper into factors such as habit formation, environmental influences, and the role of social support networks in sustaining behavior change over the long term.

**Contextual Research Gap:** While the studies cited provide valuable insights into the effectiveness of wearable health technologies in promoting physical activity among sedentary individuals, there is a notable gap in understanding how these interventions may vary across different demographic and socio-cultural contexts. Most studies have focused on Western populations, neglecting the potential variations in behavior change dynamics across diverse cultural and socio-economic backgrounds (Smith et al., 2017). Future research should aim to address this gap by conducting studies in diverse geographical regions and cultural contexts to understand how wearable health technologies can be tailored to meet the specific needs and preferences of different populations.

**Geographical Research Gap:** Another notable gap in the existing literature pertains to the geographical distribution of research on wearable health technologies and physical activity levels. The majority of studies cited appear to have been conducted in Western countries, with limited representation from other regions of the world. This geographical bias limits the generalizability of findings and may overlook unique contextual factors that influence physical activity behaviors in non-Western settings (Lee et al., 2023). Future research should strive to address this gap by conducting studies in a more geographically diverse range of settings, including low- and middle-income countries, to ensure that interventions are culturally appropriate and applicable across diverse populations.

## CONCLUSION AND RECOMMENDATION

### Conclusion

The investigation into the impact of wearable health technologies on physical activity levels among sedentary individuals has yielded significant insights into the potential of these interventions to promote behavior change and improve overall health outcomes. Through a series of longitudinal, comparative, and qualitative studies, researchers have documented the effectiveness of wearable devices in increasing physical activity levels, identifying key mechanisms such as self-monitoring, goal-setting, and social reinforcement that drive behavior change. Furthermore, studies have highlighted the importance of personalized feedback mechanisms, user-friendly design features, and cultural adaptation in maximizing the efficacy and sustainability of wearable technology interventions. However, there remain important research gaps to be addressed, including the long-

term sustainability of behavior change, the contextual adaptation of interventions across diverse populations, and the need for more geographically representative studies. Addressing these gaps will not only advance our understanding of the role of wearable health technologies in promoting physical activity but also inform the development of more effective and culturally tailored interventions to combat sedentary lifestyles and improve public health outcomes globally.

### **Recommendation**

The following are the recommendations based on theory, practice and policy:

#### **Theory**

To enhance theoretical understanding, researchers should focus on elucidating the underlying mechanisms through which wearable health technologies influence behavior change. Conducting longitudinal studies that delve into psychological constructs such as motivation, self-efficacy, and habit formation can contribute significantly to theoretical frameworks. Additionally, incorporating theories from behavioral economics, social psychology, and health behavior models (such as the transtheoretical model or social cognitive theory) can provide a more comprehensive understanding of behavior change dynamics in sedentary populations.

#### **Practice**

In terms of practical implications, researchers should prioritize the development and evaluation of evidence-based interventions that leverage wearable health technologies to promote physical activity among sedentary individuals. This involves designing interventions that are user-centered, culturally sensitive, and tailored to individual preferences and needs. Moreover, integrating features such as personalized feedback, goal-setting, and social support networks into wearable devices can enhance intervention effectiveness. Practitioners can use insights from these studies to inform the design and implementation of interventions in clinical, community, and workplace settings.

#### **Policy**

From a policy perspective, research findings can inform the development of public health initiatives and guidelines aimed at addressing sedentary behavior and promoting physical activity at the population level. Policymakers should consider incorporating incentives and subsidies for wearable technology adoption, as well as integrating these devices into healthcare systems for monitoring and intervention purposes. Moreover, regulations may be needed to ensure the accuracy, privacy, and ethical use of wearable health technologies. By aligning policies with evidence-based research, policymakers can create environments that support and facilitate sustained physical activity among sedentary populations, ultimately leading to improved public health outcomes.

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