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REVIEW ARTICLE **OPEN ACCESS**

Applying the Social Ecological Model to Explore Physical Activity Levels and Psychosocial Factors among Undergraduate University Students: A Narrative Literature Review

ChantÉ Johannes[1,*] and Nicolette. V. Roman[1]

[1]*Centre for Interdisciplinary Studies of Children, Families, and Society, University of the Western Cape, Cape Town, South Africa*

Abstract:

Introduction: Physical activity is vital for supporting holistic well-being. However, undergraduate university students often report low levels of participation, which has a detrimental influence on psychosocial factors (such as mental health, motivation, and social support). Limited studies have critically applied the Social Ecological Model to understand physical activity participation and psychosocial factors among students.

Methods : This up-to-date critical narrative review explores the application of the Social Ecological Model to understand undergraduate university students' physical activity levels and psychosocial factors. Databases (Google Scholar, PubMed, and SPORTDiscus) were searched to identify relevant studies published in English and available in full text, using key terms such as "social-ecological model," "physical activity," "exercise," "psychosocial factors," "undergraduate," "university," and "students." Articles were selected based on their relevance to the Social Ecological Model framework and physical activity.

Results: The review highlights key psychosocial factors, including mental health, motivation, and social support. Barriers, such as academic pressures, inadequate resources, and unsupportive environments, are also explored within the Social Ecological Model framework. While the model offers valuable insights into diverse influences on physical activity, this study critiques its limitations, particularly its limited consideration of cultural and technological factors that shape students' contemporary experiences.

Conclusion: This review highlights the value of the Social Ecological Model in understanding the factors that influence physical activity levels among undergraduate university students. University policies should adopt a multi-level approach to promote physical activity. Future research should address the model's gaps regarding cultural diversity and technological influences to refine the model and inform tailored physical activity promotion strategies.

Keywords: Social Ecological Model, Physical activity, Psychosocial factors, Undergraduate, University students, Narrative review, Holistic well-being.

* Address correspondence to this author at the Centre for Interdisciplinary Studies of Children, Families, and Society, University of the Western Cape, Cape Town, South Africa; E-mail: chjohannes@uwc.ac.za

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1. INTRODUCTION

The Social Ecological Model (SEM) is a comprehensive conceptual model that evolved from the studies of various researchers and theories to explain the multifaceted and interactive effects of personal and environmental factors on health behaviours [1, 2]. Bronfenbrenner suggests that human development is an interplay between individuals

and their environment. These environments could include family, friends, significant others, the workplace, and cultural values [3]. This theory suggests that multi-level environments determine human development, and ultimately affect lifestyle behaviour choices [3]. Stokols introduced the SEM of Health Promotion [1, 2]. In his studies, he identified the core assumptions that underpin the SEM and described it as a comprehensive model that combined various theories of inquiry [2, 4]. Unlike traditional health behaviour models, such as the Health Belief Model and the Theory of Planned Behaviour, which primarily focus on individual perceptions, attitudes, and biological or geographical determinants of health behaviour, the SEM provides a more holistic approach [2]. The SEM emphasises the dynamic interplay between individual, social, environmental and public-level factors in shaping Physical Activity (PA) behaviours. By accounting for these multiple levels of influence, the SEM offers a holistic approach to understanding and addressing the complex barriers and facilitators of PA among undergraduate university students [2]. Stokols reported that most public health issues involving healthy lifestyle changes tend to be complicated, and can hardly be fully understood from one level. Instead, a more holistic approach should be considered [4]. Thus, this review provides a holistic perspective on PA behaviours and identifies areas for targeted interventions within university settings.

The concept of the SEM emphasises the importance of environments that shape and determine human behaviour, besides individual factors. It is thus imperative to consider all levels of influence that impact human behaviour [2, 5, 6]. This model allows for a multi-dimensional analysis that goes beyond individual characteristics to include social networks, neighbourhood features, and public transportation satisfaction, thus providing a broader perspective on the determinants of PA levels [7]. The SEM is divided into four interrelated domains, namely, 1) individual factors, 2) social factors, 3) the physical environment, and 4) public policy [6, 7]. Considering the interplay of factors across these levels, the SEM provides a comprehensive framework for understanding PA participation among undergraduate university students [7]. It emphasises the individual, social, physical, and public-level factors to create an environment that encourages and supports physically active lifestyles among the student population [8]. For the purpose of this review, the last level, public policy, was adapted to public engagement [9]. Previous research has found that mass media communication strategies, such as social networking sites, play an influential role in PA participation [10, 11]. The SEM has been extensively used and explored across various domains, particularly in the realm of PA research [12].

Various studies have delved into the application of SEM, examining its relevance and effectiveness in comprehending the relationship between factors that influence PA behaviours [8]. This model has been regarded as a versatile theory that has been employed in diverse contexts – ranging from community-based interventions to academic settings – to elucidate the multifaceted nature of PA engagement [13]. By employing the SEM, researchers have been able to dissect the complex interrelationships between individual characteristics, social dynamics, environmental factors, and policy influences, thereby providing a holistic understanding of PA participation [14]. The widespread utilisation of SEM within the field of PA research underscores its adaptability and applicability in unravelling the complexities associated with promoting health behaviours and developing effective intervention strategies [7, 15-17] among students at a tertiary institution [18]. This model was deemed appropriate for this study as it suggests underlying reasons for how people think, their motives and attitudes, and how they perceive their personal lives and the environment, all of which determine their PA behaviour. In addition, the SEM considers various psychosocial factors that determine the specific context of undergraduate students which shapes human behaviour. Nevertheless, undergraduate university students often report low levels of PA participation, which has a detrimental influence on psychosocial factors (such as mental health, motivation, and social support). This up-to-date critical narrative review explores the application of the SEM to understand undergraduate university students' PA levels and psychosocial factors.

2. METHODOLOGY

2.1. Search Strategy

This study employed an up-to-date critical narrative review to explore the literature on SEM, PA, psychosocial factors, and undergraduate university students. A comprehensive search was conducted across multiple databases, including Google Scholar (to broadly examine scholarly literature across various disciplines), PubMed (which houses over 38 million citations from MEDLINE, life science journals, and online books), and SPORTDiscus (a key bibliographic database for research in sport and sports medicine). The search encompassed all relevant qualitative studies from database inception to December 2024. The following MeSh terms were used in these databases: "social ecological model," "physical activity," "exercise," "psychosocial factors," "undergraduate," "university," and "students" The reference lists of suitable studies were also searched for relevant articles. Experts in the fields of PA, social sciences, public health, and sports were contacted for relevant articles.

2.2. Criteria for the Selection of Articles and Data Storage

The retrieved articles were explored for relevance by reviewing their abstracts. Articles were included if they were published in English and available in full text. Articles were considered relevant if they included the terms "social ecological model" and "physical activity." Studies that did not meet these criteria were excluded from the review. All articles were uploaded to the referencing manager, Mendeley.

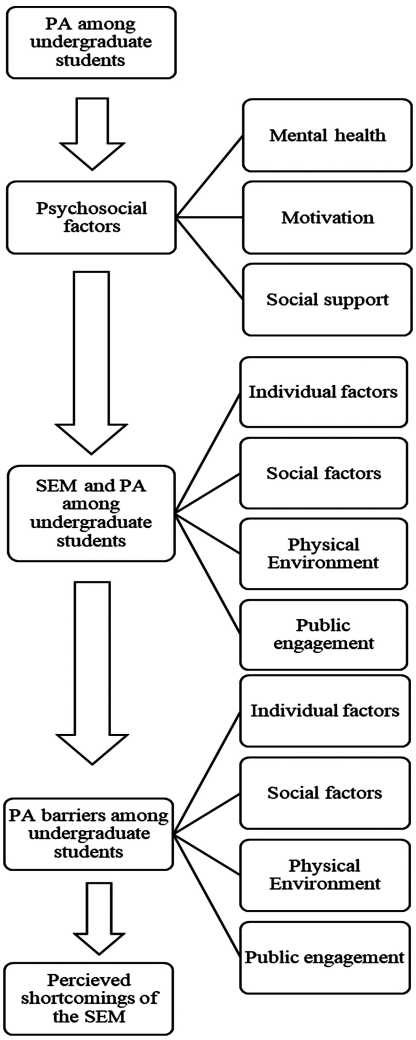

Fig. (1). Narrative layout of included studies.
Note: PA = Physical Activity; SEM = Social Ecological Model

3. RESULTS

Fig. (**1**) shows the narrative layout of the included studies for this review. Studies focused on psychosocial factors (mental health, motivation, and social support), the SEM, and PA among undergraduate students (individual factors, social factors, physical environment, and public engagement), aligned with the SEM framework and perceived shortcomings of the SEM in explaining PA behaviours among students.

3.1. Physical Activity Among Undergraduate University Students

The World Health Organisation (WHO) provides a comprehensive set of recommendations stipulating the amount of PA youth and adults between 18 and 64 years old, should participate in [19]. These recommendations encompass a variety of activities, including, but not limited to, recreational or leisure pursuits, walking, participation in games or sports, and intentional fitness routines [19]. These guidelines aim not only to enhance cardiorespiratory and muscular fitness but also to promote bone health and mitigate the risk factors associated with Non-Communicable Diseases (NCDs), for instance, cardiovascular illnesses, and the onset of mental health symptoms, such as depression, anxiety and stress [20]. By adhering to these guidelines, young adults could strive toward achieving holistic well-being [21] (Fig. **2**).

Worldwide, PA has been proven to be beneficial in several ways, for example, physical health, psychological well-being, body image, and enhanced quality of life [22, 23]. Current research indicates that students are not meeting the recommended PA guidelines [24]. Numerous reasons are reported for the decline in PA among the undergraduate student population, including a lack of mental health, motivation [25], and social support [26]. Being physically active is a multifaceted behaviour determined by psychosocial factors. Therefore, it is important to consider the role these psychosocial factors play in influencing PA participation [27-29].

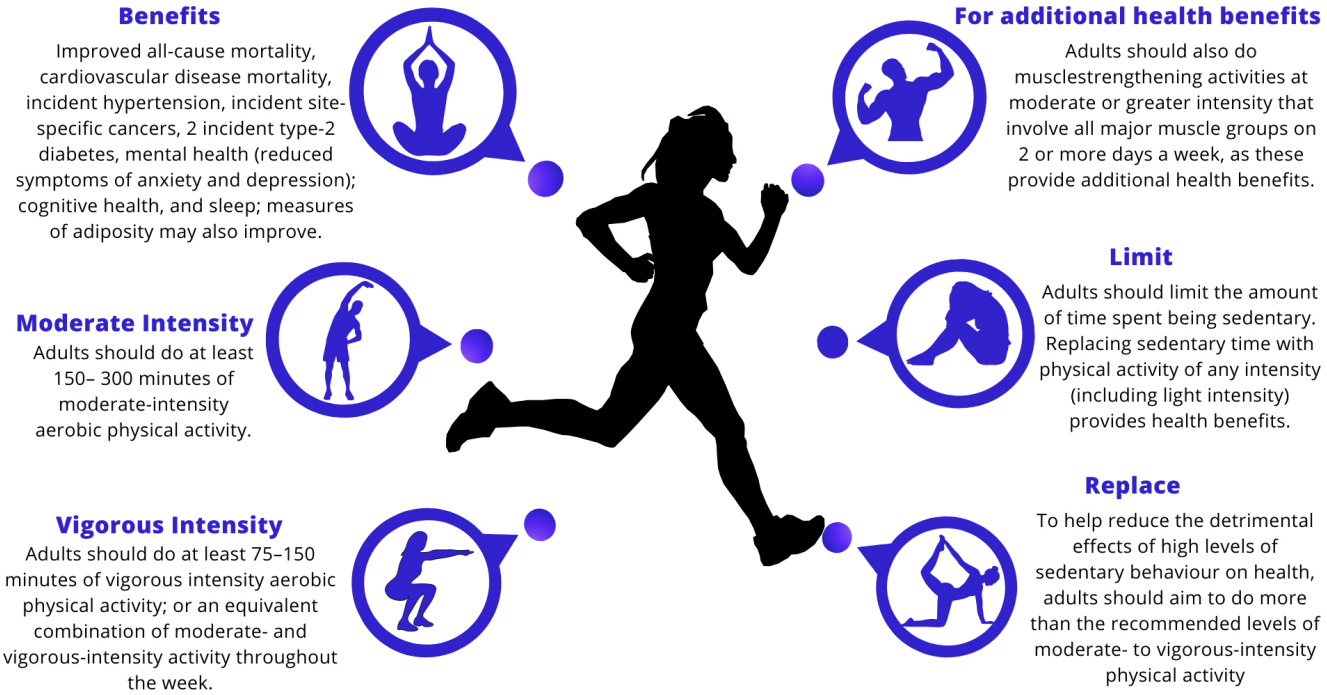

Fig. (2). Visual representation of WHO 2020 PA guidelines.

3.2. Psychosocial Factors

The term psychosocial factors have been defined as characteristics or facets that influence an individual psychologically and or socially [28]. Previous studies have researched the relationship between psychosocial factors and health and well-being; however, the majority merely investigated one or two health risk behaviours and only included an individual or a few psychosocial factors [30, 31]. Psychosocial factors such as mental health, motivation, and social support have been classified as determinants of health that influence PA behaviours and participation [32-34]. However, limited evidence exists regarding the association between psychosocial factors, PA levels, and well-being [35]. Determining what factors influence the well-being of undergraduate university students may provide valuable information to inform the development of PA intervention programmes [36]. Mental health is one of the most important psychosocial factors impacting PA participation, which underscores the interconnectedness between psychological well-being and an active lifestyle [37].

3.2.1. Mental Health

Previous research conducted by the WHO [38] indicated that depression is a mental health illness that affects 300 million people worldwide. Based on this result, the WHO issued a statement indicating that preventing and treating mental health disorders is fundamental to health [39]. Mental health challenges such as depression, anxiety, and stress were identified as public health concerns in developing countries [40], of which South Africa (SA) is classified. Particularly, the worsening status of mental health among students in higher education has been considered a public policy concern [41].

Previous studies have indicated that mental health disorders among young adults, such as undergraduate university students, have become prevalent [42-44]. Globally, it has been estimated that 50% of university students display at least one diagnostic criterion for mental health disorders [45]. One study reported that the first stage of the WHO World Mental Health International College Student project, with 13,984 first-year full-time students, showed that 31% screened positive for at least one 12-month mental health disorder [46]. These results do not improve throughout the university study years, as indicated by research conducted among undergraduate university students in the United Kingdom [47]. Findings from this study revealed that 42.3% of students had a serious mental health concern, for which they needed therapeutic and counselling assistance. Similarly, a recent study focusing on the mental health status of university students in SA found that roughly half (53.3%) of all respondents screened positive for at least one disorder, where anxiety was the most prevalent (37.1%) [48]. One way to alleviate mental health symptoms is through regular PA engagement.

A previous study suggested that higher levels of PA decrease symptoms of depression and anxiety [49]. This is

consistent with another study where it was indicated that the onset of mental health symptoms was associated with decreased PA participation [50]. These results emphasise the need for research that is focused on investigating mental health among university students [42, 51, 52]. However, mental health is not a standalone aspect of human behaviour. Motivation has been researched as having an intertwined connection to mental health, where one influences the other [53].

3.2.2. Motivation

One of the most influential psychosocial factors that determines an individual's decision to be physically active is motivation [32]. The lack of motivation to engage in PA has become an important research topic due to the sedentary lifestyles exhibited by university students [54, 55]. Motivation has been considered a psychosocial factor stemming from internal (intrinsic) and external (extrinsic) stimuli, which may ultimately facilitate sustained PA behaviour [34, 56]. However, a lack of motivation could negatively impact engagement in leisure-time PA [57].

Lack of motivation has become a critical research topic [32]. This was evident in a study focused on motivations, barriers, and preferences to be physically active among university students [58]. Results from this study indicated that the lack of motivation to be physically active was a central theme. Students mentioned that laziness and preference for other activities, such as watching series on their laptop or sitting down, were most preferred. These results are different from a systematic review that focused on the key influences of PA among university students [59]. Results highlighted that 72% of the studies included motivation as a key component for engagement in PA. The article reported that exercising with others was the most frequent theme as it was found to increase students' sense of belonging, accountability, enjoyment, and motivation. In addition, receiving social support and encouragement from others to be physically active played a significant role in shaping students' values towards PA and enhancing their motivation [59]. This suggests an interplay between motivation and social support.

3.2.3. Social Support

Numerous studies have considered social support as a social determinant of human behaviour, particularly engagement in leisure-time PA among university students [60, 61]. Research has defined social support as the perception that one is cared for by a social network such as friends, family, siblings, and significant others [62, 63]. Within the university environment, social support has been regarded as an important aspect of a student's life due to its positive impact on maintaining overall health and well-being [64]. For example, a South African study among university students indicated that social support from family, friends, and significant others was associated with lower levels of depression and anxiety [65]. The findings of this study confirmed that social support plays a protective role in mitigating adverse mental health outcomes, highlighting the need for interventions among university students [65].

In terms of PA, previous research reported that the relationship between social support and PA outcomes was weak to insignificant [26]. Conversely, a meta-analysis of 19 studies revealed that social support was significantly associated with PA. More specifically, this article suggested that support from friends was more strongly associated with PA than family support [66]. Likewise, Deng emphasised that PA positively correlated with university students' social support significantly [67]. Although, findings from previous research have shown a strong association between social support and PA, a large number of university students continue to remain physically inactive [68, 69]. Therefore, an understanding of how social support from family and friends influences students' physical health and well-being is important when developing tailored interventions that promote PA participation [69]. To understand this phenomenon, research suggests that the ecological systems theory of human development (such as the SEM) may be beneficial to comprehend the complexities of PA participation [67].

3.3. Social Ecological Model and Physical Activity Among Undergraduate Students

Ecological models, such as the SEM, are particularly suitable for health research as PA occurs in specific places or contexts, where there is strong support for environmental associations [70, 71]. It is well-accepted that ecological models should be context-specific [70, 72]. In the context of PA, it is recognised that both the built environment [73] and psychosocial characteristics [74] are potential correlates with PA, and therefore, both should be targeted in interventions [72]. Understanding the interactions between the built environment and psychosocial attributes may guide policymakers to develop effective multi-level interventions for PA [74]. Understanding the context-specific environment through psychosocial interactions could also inform the prioritisation of subgroups of populations, among which psychosocial or environmental interventions could be the most effective, such as students within the university setting [75, 76]. A better understanding of the beneficial effects of PA on different types of domains and locations may be essential for more student-tailored interventions [77]. However, comprehending PA behaviour associated with undergraduate students requires a thorough understanding of each level within the SEM, beginning at its core—the individual level [7].

3.3.1. Individual Factors

The SEM has contributed significantly to the theoretical understanding of engagement in PA [7]. Psychological and biological factors at the individual level influence an individual's behaviour to participate in PA [7]. Biological factors may include demographic factors, such as genetics, age, and gender. Whereas, psychological factors may include attitude, beliefs, motivation, self-efficacy, confidence, and knowledge [78].

Young adulthood (18–35 years of age) has become synonymous with the development of poor lifestyle

behaviours that are associated with an increased risk of chronic diseases, such as hypertension, obesity, and diabetes, especially in later years [78, 79]. Gender differences in PA have been researched by many authors, where it was established that differences exist between men and women in terms of their lifestyle behaviours for achieving a healthy lifestyle [55, 78]. Various articles reported that men tended to be more physically active than women [80, 81]. This could be due to the social norms regarding PA and traditional gender roles [55].

Nonetheless, the relationship between psychological factors and PA engagement appears to be more complex and may differ between men and women [82]. While psychological factors, including self-esteem, knowledge, attitude, self-efficacy, and beliefs, are recognised as central to motivation and PA behaviour at the individual level of the SEM [82], some inconsistencies exist [83]. Previous researchers have reported that intrinsic motivation may play a leading role in beneficial beliefs about PA, and thus may lead to sustained behaviour among university students [55]. However, evidence on gender differences in motivation is conflicting. Studies have suggested that male university students had significantly higher levels of intrinsic motivation than female students when being physically active [84]. This suggests that male students were more engaged in PA than female students due to internal factors. Males' internal motivational factors include the perceived benefits of PA engagement, stimulation, and enjoyment [85]. Furthermore, self-efficacy, a key determinant of PA behaviour, has been shown to influence both male and female students, albeit potentially in different ways, suggesting that the relationship between self-efficacy and PA engagement might be influenced by other contextual factors [86].

Besides motivation, self-efficacy has often been found to be related to increased levels of PA among university students [86], and has been well-documented in research [87, 88]. Self-efficacy in this context is defined as a person's beliefs or confidence in their ability to engage in PA consistently, even in difficult circumstances [89, 90]. Burton *et al*. [87] suggest that often individuals do not participate in PA and exercise because their confidence is lacking. Similarly, Newsome *et al*. [88] report that college students were self-conscious and afraid that they might get hurt during PA, thereby precipitating the onset of sedentary behaviour. Thus, methods to improve self-efficacy and reduce sedentarism are needed to promote PA and create positive PA attitudes [88].

A lack of knowledge decreases the intention to engage in PA behaviour [88]. Abula *et al*. [91], who investigated whether knowledge of PA increased PA participation among Chinese college students, report that individuals must first develop intentions to be physically active. Their results explain that students who were aware of the international PA recommendations were more physically active than those who were not [91]. The study also found that only 4.4% of Chinese college students had the correct knowledge of PA [91]. Therefore, students who lack sufficient knowledge about how much PA is required to maintain a healthy lifestyle may not reap the health benefits [92].

3.3.2. Social Factors

Worldwide, social support within the context of the SEM has been previously associated with participation in leisure-time PA among adults, especially university students [64, 93]. Previous studies have indicated that social support in the university environment plays a positive role in maintaining a student's health and well-being [63, 64]. Nevertheless, many university students remain physically inactive, and it is thus important to understand how social support from family and friends may influence physical health [69].

Conflicting evidence exists regarding the relative influence of different support sources. While some studies suggest that family support is the most significant factor in maintaining PA engagement, others argue that peer influence plays a more dominant role during university years [94–96]. For example, family members provide emotional support by encouraging and motivating individuals to be physically active [94]. Parents and siblings offer emotional support through encouragement and understanding, as well as instrumental support by assisting with logistics and finances [95]. Furthermore, appraisal support is provided by offering constructive feedback and recognising efforts to engage in PA [58]. These types of support help students stay motivated, informed, and committed to maintaining an active lifestyle [96].

Friends and peers provide moral support by uplifting, recognising, and praising their friend's efforts to be physically active [94]. This type of support encourages camaraderie and accountability when individuals observe their peers being physically active [93]. For instance, gym buddies and partners serve as motivating factors as they encourage their friends to maintain a regular fitness routine [25]. This was further supported by Mattioli and colleagues [97], who found that physical exercise was strongly related to social stimuli, such as indoor gym groups and team competitions, and the lack thereof could be a plausible reason for the decline in PA engagement [97]. Similarly, Stevens *et al*. [98] suggest that a lack of interpersonal motivation and social support for fitness was due to the lack of the presence of others. The presence of others engaged in a similar activity not only creates a sense of shared identity but also serves as a source of self-efficacy, a sense of belonging, accountability, and psychosocial health [98].

3.3.3. Physical Environment

The physical environment within the SEM context refers to the factors that are physically external to the person [2]. The SEM has attracted a lot of academic interest in the last 15 years and has been crucial in understanding how the built environment influences PA behaviour, and plays a role in formulating public health policies [99]. Stokols [2] previously suggested that

environmental factors are vital components that provide a context in the SEM, since PA must take place in specific physical settings that are likely to influence an individual's decision to be physically active. However, conflicting evidence suggests that barriers associated with these physical environments are prevalent, and researchers have provided compelling evidence as to why individuals were not participating in PA [97, 100]. Authors report that, for some, the decision to be physically active was determined by environmental barriers [101], such as crime-related dangers and inaccessible PA spaces, such as footpaths, parks, and green spaces [102].

Although it is clear that the physical environment plays a role and is related to PA engagement and behaviour, physical environmental factors (for instance residential capacity, pedestrian infrastructure, the proximity of facilities, traffic, and crime safety) have been the least studied factors in terms of PA participation [74, 103]. Previous research has suggested that health professionals and stakeholders should provide a supportive and safe environment within the university setting to enhance PA participation [60]. However, while the need for safe environments is widely acknowledged, the extent to which universities are successful in achieving this remains debated. Specifically, universities and campus security services should prioritise achieving and sustaining lower crime rates to create safe environments for on-campus PA engagement [104]. Therefore, these initiatives need to be spearheaded by the government and public engagement strategies to ensure a holistic improvement in public health outcomes [105].

3.3.4. Public Engagement

Governments, international organisations such as the WHO, public health researchers, and non-governmental organisations have worked on various initiatives to promote PA and mitigate sedentary behaviour as a public health priority [11]. Although, university students understand the benefits of PA, their knowledge does not necessarily translate to a change in PA behaviour [88]. Thus, to combat the public health burden of physical inactivity, new areas of public engagement have emerged [106, 107]. Stakeholders have used innovative methods, such as technology and social media, as mass media communication strategies to enhance PA levels [108]. It is for this reason that the SEM was adapted in this study from public policy to public engagement. On the level of public engagement, mass media (for instance, social networking platforms) have huge potential to shape and communicate public awareness and opinion [10]. Moreover, evidence-based policymaking tends to be more successful in cases where public administrators use diverse informational sources, such as social media activity [109].

With an increasing reliance on social media as a platform for knowledge dissemination, it is also necessary to consider its adoption in health interventions [110]. Internationally, social media has revolutionised how individuals share information and communicate with one another [111]. The reliance on digital technology has altered the perceptions and channels for health information delivery to students [112]. Some researchers have gone further to report that social networking sites play a critical role at the public engagement level among relevant stakeholders, including policymakers and health researchers [10]. In comparison, one existing research shows that social media is a promising tool to potentially bridge the gap between various sociodemographic groups in promoting global physical health and well-being policy [11].

One of the strategies to enhance PA at the public engagement level would be using social media platforms as a catalytic tool for public engagement in propagating health information related to exercise guidelines and recommendations [113]. This allows for mass communication online to be accessed by a global audience in an instantaneous and frictionless way [114]. This manner of public engagement may help policymakers to encourage organisations, experts, and the health-fitness community to adopt PA policies and interventions [115]. Social media, with its broad reach and power [116], could inform policymakers on how they might raise awareness of the physical inactivity concern among students and encourage behaviour change. For example, the use of mobile phone health programmes globally rose between 2019 and 2021, from 27% to 37% [19]. Although, mass media PA strategies are extremely effective with beneficial effects on multiple health conditions, barriers to the implementation of these programmes remain prevalent [106].

3.4. Physical Activity Barriers Among Undergraduate Students

Globally, research has reported a decline in PA intensity, with increasing levels of sedentarism among university students [117, 118]. These findings suggest that changes in PA intensity should be examined, particularly among more vulnerable student populations who are susceptible to mental health disorders [42]. It is, therefore, essential to determine the obstacles at every level of the SEM and create student-tailored programmes, which could improve PA participation among university students.

3.4.1. Individual Factors

Previous research has demonstrated that individual factors were strong predictors of behavioural outcomes among university students [6, 119]. Similarly, Newsome [88] suggested that academic rigour was a barrier to PA, and that students often felt guilty when they participated in PA instead of studying. This ultimately led to reduced participation in PA, which may be attributed to the sense of burden students experience due to their academic responsibilities [76]. Although students identified the potential benefits of PA on stress and anxiety, knowing was not enough to translate into behavioural change [88]. Furthermore, a lack of time, interest, motivation, and

prevailing health conditions were previously reported as the most common barriers to PA for inactive students [120, 121].

One of the most prominent intrinsic factors that stimulated and maintained an individual's engagement in PA was motivation [32]. However, a lack of motivation to be physically active has become a factor among university students [55]. This lack of motivation and willpower significantly impacts the level of leisure-time PA among university students [57]. Likewise, Hilger-Kolb *et al*. [120] suggest that motivational and attitudinal barriers affect PA participation among university students, such as a lack of motivation to be physically active [57], high study workload, and academic stress [122]. Consequently, students who are faced with long classes and assignments are no longer motivated to be physically active [92].

Lack of time has been identified as a significant barrier that prohibited PA engagement among university students [68]. Similarly, Thomas *et al*. [123] state that students had less time to engage in physical activities. Specifically, first-year students stated that PA and sports within the university environment were too time-consuming, and participating in sports and physical activities would require a greater amount of time and commitment [123]. Similarly, Hilger-Kolb and associates [120] state that one of the most frequently reported barriers among university students in Germany was a lack of time due to university commitments. The strain of academic studies and the high workload prevented students from being physically active [120]. Going to the gym and participating in sports were time-consuming factors – time that could have been better spent studying or preparing for lectures [59, 92]. Therefore, time played a critical role in PA participation, especially among university students.

Research has indicated that PA decreases mental health symptoms such as stress, depression, and anxiety, especially among university students [124]. Mohammed *et al*. [125] found an association between mental health status and the level of PA engagement. The results indicated that students with probable mental health challenges or psychiatric cases were 48% less likely to be physically active during their spare time than those who had no mental health disorders (37%) [125]. Similarly, Hussain *et al*. [126] noted that certain mental health challenges inhibited PA participation, such as anxiety (25%), coping difficulties (19.7%), and diagnosed depression (8%). In addition, this study found that excessive fatigue was a barrier to PA that affected both mental and physical health [126]. Therefore, mental health challenges and physical inactivity could continue to grow without the relevant social support from peers and family [88].

3.4.2. Social Factors

Social support from family, friends, and peers has previously been researched as an important factor for PA engagement [127]. Research reports that social support from family and friends is associated with PA participation and is regarded as a motivational strategy for encouraging individuals to be physically active [88]. In a university setting, peers were found to be crucial sources of social support in the form of accountability partners [88]. However, evidence also suggests that a lack of social support could be detrimental to health and well-being [128]. A lack of social support networks, such as friends and family, was reported as a barrier to PA engagement [57, 128]. In conjunction with this, research focusing on the barriers to PA among university students found that students perceived family discouragement as a PA barrier [129]. Similarly, another study found that significant others, who did not encourage and support their partner's decision to be physically active, negatively influenced their partner's PA behaviour [130]. Hence, a lack of community encouragement and social experience, as social support structures, could be a cause of sedentarism and could ultimately lead to isolation [14, 131].

3.4.3. Physical Environment

A lack of resources [100], facilities [75], and equipment [130] have been well-researched as PA barriers. A recent study found that lack of resources had a negative impact on university students' participation in leisure-time PA [57], and negatively impacted leisure-time PA. This notion was agreed upon by Golden and colleagues [6]. They argue that health promotion resources are characterised by a disparity. Vulnerable populations face the reality of being exposed to unequal distribution of resources and, as such, experience this as an environmental barrier [6]. Similarly, Cohen *et al*. indicate that parks and recreation facilities in low-income neighbourhoods are associated with barriers such as crime, safety, and gang violence [132]. Crime and safety pose a risk to being physically active within recreational spaces [103, 133]. Thus, poor urban planning, such as poorly lit areas, neglected spaces, and inadequate pedestrian infrastructure, may lead to inaccessibility to safe facilities [14]. In addition, the high cost of equipment and facilities was reported as a prominent PA barrier [134]. The reduction in PA participation, due to these barriers, is concerning [135]. The physical environment [54], specifically urbanisation [136], has been considered a prominent PA barrier. Khosravi *et al*. [137] indicate that inappropriate infrastructure, such as walking and biking areas, was not adequately designed and contributed to physical inactivity levels among the Iranian population [137]. Furthermore, increased urbanisation, a lack of transportation to PA events, and insufficient infrastructure and facilities contribute to low levels of PA [104]. Thus, public engagement should be prioritised to enhance PA.

3.4.4. Public Engagement

Discussion around public engagement and PA is becoming an increasingly prominent topic within the SEM [7], specifically within the realm of leveraging social media for co-creation regarding policy implementation and health advocacy [110]. However, evidence suggests that barriers regarding the use of social media at the public engagement level continue to exist [115]. For instance, WHO [19] indicated that the African region showed a

decline in reporting communication campaigns between 2017 and 2021. Plausible reasons may be due to the digital divide and limited outreach, content overload, misinformation and bias, as well as resistance from traditional media channels [106, 138].

Firstly, numerous studies have shown that social media is a useful tool for PA promotion [88, 139, 140]. However, with the ongoing digital divide between high- and low-income areas and populations, mass media campaigns exclusively may not be as effective [106]. For example, social media has been reported to contribute to policy design, but its optimal use to improve policy effectiveness is yet to be achieved in developing countries [111]. Individuals lacking access to social media platforms or the internet may miss out on vital health-related information, potentially depriving them of the rewards, such as acquiring knowledge about the PA benefits of PA, and participating in health policy discussions [106]. Consequently, due to the digital divide, mass media efforts to promote PA may face limitations in their outreach [141]. Despite the widespread use of social networking sites, some populations who may not be active on these platforms would face barriers to accessing important information and resources related to PA [106, 111]. Therefore, an opportunity exists for universities to educate their healthcare professionals, and ensure they receive suitable training about healthy lifestyles and suitable tools to better advise students on the health benefits of regular PA [88].

Secondly, with the abundance of information on social media platforms, such as Instagram, YouTube, Facebook, X (previously Twitter), TikTok, WhatsApp, and Snapchat [108], it may be challenging for policymakers to convey their message effectively. Constant competition with new social media networking sites may cause information overload for the reader [142]. Simultaneously, false information and misinformation may easily be spread which may leave students feeling confused and distracted [143]. Dealing with informal, unstructured information may lead to misinterpretation or misleading information [138]. This could be due to social media algorithms [144]. Social media algorithms may promote content that reinforces existing beliefs or biases, leading to echo chambers that hinder constructive dialogue and collaboration on PA policy issues [144]. Therefore, students who frequently visit the same networking sites may be exposed to a limited range of options and perspectives, potentially impeding their ability to engage critically with diverse viewpoints on PA-related matters [145]. Fitness influencers have been known to relay false information that students follow due to their Fear Of Missing Out (FOMO) [112, 115]. This may undermine the efforts of evidence-based PA policies and interventions, and create bias in the content that is viewed [112].

Lastly, policymakers and stakeholders engaged in promoting PA have demonstrated resistance to, or scepticism about adopting innovative methods of mass media campaigns [146]. Policymakers may be wary of the influence of social media or perceive it as less credible than traditional communication channels and validated research [147]. Traditional methods of media communication have been reported as outdated, specifying that methods such as word of mouth, newspapers, magazines, and books were classical means of disseminating information, but may not be relevant for contemporary university students [140, 144]. With the digital incline, these methods have become redundant, and are considered outdated methods of information dissemination [144]. Therefore, to enhance the effectiveness of social media, it is essential to demonstrate ethical and political integrity in formulating public health policies aligned with global PA recommendations [19, 107].

Nevertheless, the use of social media for policy advocacy has been considered valuable to expand research in the field of global health challenges [110]. Addressing barriers to social media through targeted research and policymaking may significantly enhance PA participation among undergraduate university students [112]. Overcoming challenges, such as the digital divide, misinformation, and biased algorithms, could ensure equitable access to accurate health information, and increase awareness and motivation for PA [116, 148]. Effective social media campaigns could promote campus PA programmes, encourage participation and expose students to diverse perspectives on health [114, 143].

3.5. Perceived Shortcomings of the Social Ecological Model

While the SEM offers numerous advantages, practical limitations need to be addressed to fully comprehend its various aspects [1, 2]. Research involving ecological interventions requires the assimilation of knowledge from various disciplines and close coordination among individuals and groups across numerous sectors of the community [2]. In addition, the use of active and passive interventions for health promotion strategies over extended periods could be financially demanding and logistically intricate, requiring coordination and buy-in from diverse stakeholders [149]. These longitudinal studies of programme effectiveness could prove to be too impractical to implement [2, 4]. Another shortcoming of the SEM lies in its complexity, which may make it difficult to apply in the real world outside of research domains [150, 151]. Therefore, it is challenging to determine which level of influence is most prominent in encouraging PA participation [151]. Moreover, the SEM intends to analyse different human behaviour levels, but it may not fully account for their dynamic interplay [152]. For this reason, it may be difficult to appreciate how the levels of SEM are interconnected, and could influence or facilitate PA involvement. Thus, while this model deepens our understanding of the human behaviour system as a whole, some aspects such as specific constructs or instructions on how to transfer ecological approaches into other research and health interventions, are not elucidated [153]. Despite these shortcomings, the model has been recognised worldwide across various research studies for its portrayal

of behavioural studies aimed at addressing public health concerns, such as physical inactivity [7, 153, 154].

4. LIMITATIONS

Although this study's strength lies in the application of the SEM to understand PA behaviours, some limitations must be acknowledged. The reliance on only three databases – Google Scholar, PubMed, and SPORTDiscus – may have restricted the scope of the literature search, potentially excluding relevant studies indexed elsewhere. This may, therefore, limit the generalisability of the findings. Furthermore, the inclusion of only English-language articles and full-text publications may have introduced language and accessibility bias, limiting the diversity of studies considered. Future research wishing to explore similar research initiatives may overcome these limitations by expanding the database selection, incorporating studies in multiple languages, and including articles in various formats to improve the comprehensiveness and inclusivity of the review. This would enable a more robust analysis of PA behaviours.

CONCLUSION

This review highlights the value of the SEM in understanding the complex factors influencing PA levels among undergraduate university students. It emphasises the psychosocial factors, such as motivation, mental health, and social support that shape students' PA behaviours. The findings suggest that university policies and practices should consider a multi-level approach, targeting interventions across individual, social, environmental, and public engagement factors to effectively promote PA. In addition, the critiques of the SEM, such as its insufficient consideration of cultural diversity and modern technological influences, point to the need for adaptations to better suit contemporary university settings. Future research should consider incorporating a more inclusive approach to cultural factors, exploring how different cultural contexts may shape PA behaviours and psychosocial influences. In addition, the role of technological advancements, such as digital fitness tools and social media, should be explored to understand their influence on students' PA engagement. Incorporating these insights could guide the development of targeted, holistic PA promotion strategies that address specific barriers, ultimately supporting the well-being and engagement of students, and contributing to the achievement of Sustainable Development Goal 3 on Good Health and Well-Being.

AUTHORS' CONTRIBUTIONS

C.J: Study conception and design were carried out; C.J.: Data collection was performed; C.J.: Analysis and interpretation of the results were conducted; C.J. and N.R: The draft manuscript was prepared by author.

LIST OF ABBREVIATIONS

FOMO	=	Fear Of Missing Out
NCDs	=	Non-Communicable Diseases
PA	=	Physical Activity
SA	=	South Africa
SEM	=	Social Ecological Model
WHO	=	World Health Organisation

CONSENT FOR PUBLICATION

Not applicable.

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CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

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