



A Narrative Review of the Interrelationships among Personality, Motivation, and Physical Activity among University Students

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Abstract

This narrative review examines the interrelationships among personality traits, motivation for physical activity, and physical activity (PA) levels among university students. Despite the well-documented physical and psychological benefits of PA, participation rates among university students remain suboptimal. Drawing on the Big Five personality framework and Self-Determination Theory (SDT), the study reviews how stable personality dispositions shape motivational processes and, in turn, influence PA engagement. Extraversion and conscientiousness consistently predict higher PA participation, while neuroticism is negatively associated with exercise behavior. SDT highlights that the satisfaction of autonomy, competence, and relatedness fosters autonomous motivation, which supports long-term exercise adherence. Synthesized findings suggest that personality traits influence PA both directly and indirectly through motivational pathways: students high in intrinsic and identified regulation show stronger engagement in moderate-to-vigorous PA, whereas controlled motivation and amotivation predict lower activity levels. Moderating factors such as gender, culture, and prior exercise experience further shape these relationships. Cross-cultural differences and methodological variations partially explain inconsistencies across studies. The review concludes that personality, motivation, and PA form a dynamic interactive system crucial for understanding health behaviors in university populations. Tailoring interventions according to personality profiles and enhancing autonomous motivation may effectively promote sustained PA participation. Current research, however, is limited by an overreliance on cross-sectional designs, insufficient longitudinal and cross-cultural comparisons, and a lack of multi-method behavioral data. Future studies should emphasize causal mechanisms and incorpo-

rate real-world interventions to deepen understanding of psychological determinants of university students' physical activity.

Subject Areas

Sociology

Keywords

Personality Traits, Motivation, Physical Activity, Self-Determination Theory

1. Introduction

According to statistics, approximately one quarter (27.5%) of adults and over three quarters (81%) of adolescents do not meet the World Health Organization's recommended levels of physical activity [1]-[3]. In response to the alarming global trend of insufficient physical activity, the World Health Assembly has introduced relevant action plans, targeting a 15% voluntary reduction in worldwide levels of physical inactivity by 2030. Physical activity is not only beneficial in preventing chronic diseases but also plays an irreplaceable role in enhancing learning efficiency, alleviating stress, and maintaining mental health [4] [5]. The university period is a critical stage for physical and psychological development. The health of university students is not only significant for their future but also has a notable impact on societal progress and national competitiveness. However, the rate of participation in physical activity among university students remains suboptimal. Many students fail to establish good exercise habits, leading to a persistent decline in physical fitness, a prevalence of psychological health issues, and unprecedented challenges for physical education [6] [7].

Physical activity is defined as any bodily movement produced by skeletal muscle contraction that results in energy expenditure above the resting level [8]. Such activity encompasses routine daily movements (walking, household chores, cycling) as well as planned, organized exercise and sporting participation (aerobic exercises, team sports, fitness activities). Physical activity is a key means of promoting health and fitness, taking both voluntary, everyday forms and systematic, organized training or competition [9].

Individual differences in physical activity participation are influenced not only by environmental factors but also by internal psychological factors, such as personality. Personality refers to enduring patterns of thoughts, feelings, and behaviors that shape how individuals perceive the world and make lifestyle choices, including engagement in physical activity. The Big Five Personality Traits framework highlights strong links between personality and health behaviors, with traits like extraversion and conscientiousness serving as significant predictors of physical activity [10] [11]. Meanwhile, motivation for physical activity, as the intrinsic drive prompting individuals to choose and persist in engaging in physical activities, not only gives rise to these behaviors but also affects the type, frequency, and

sustainability of exercise [12].

Although research on the relationship among personality traits, physical activity motivation, and physical activity has gradually increased, the mechanism underlying these relationships is complex. Against this backdrop, this review searched major databases (Google Scholar, CNKI, Web of Science, Scopus) for empirical studies on university students' personality (Big Five), physical activity motivation, and physical activity. Studies involving university students, at least two core variables, and recent (last 10 years) publications were prioritized to offer a comprehensive and objective overview. Based on theoretical review, this study explores the relational mechanisms among personality traits, physical activity motivation, and physical activity in university students.

2. Overview of Core Theories

2.1. Personality

Personality psychology, though a relatively late-emerging independent discipline, is deeply rooted in both Eastern and Western intellectual traditions. Ancient Chinese philosophers like Mencius, Xunzi, Confucius, and Laozi engaged in rich discussions about personality, emphasizing moral cultivation over scientific analysis [13]-[15]. Meanwhile, Western figures such as Socrates, Plato, and Aristotle contributed systematic thought and an empirical foundation [16] [17]. Modern personality psychology emerged in the early twentieth century, influenced by advances in psychometrics, psychiatry, and behaviorism, with Gordon Allport's "Personality: A Psychological Interpretation" (1937) recognized as a foundational text [18]. Since then, six major theoretical perspectives—psychoanalytic, trait, biological, humanistic, behaviorist and social learning, and cognitive—have developed, each highlighting distinct facets of personality. For example, the psychoanalytic approach emphasizes the unconscious [19], the behaviorist approach focuses on environmental conditioning, while the cognitive approach explores information processing. Calls for integrating these perspectives endure, yet theoretical disputes remain [20]. Structural models include typologies, which sort people into discrete groups like Enneagram [21], or DISC [22], but often oversimplify human diversity. In contrast, trait theories view personality as a range of stable, continuous dimensions like those in the Big Five model: openness, conscientiousness, extraversion, agreeableness, and neuroticism [23]-[25]. Influential theorists such as Allport, Cattell, Eysenck, and Jung pioneered these frameworks [26]-[29]. The Five-Factor Model, supported by substantial evidence, dominates the field despite ongoing debate about the stability and predictive power of traits [30]-[33].

The measurement of personality utilizes a diverse array of methodological approaches, including self-report instruments such as the MMPI and NEO-PI [34], Q-sort assessments, peer ratings, biological metrics such as brain imaging and skin conductance [35], behavioral observations, structured interviews, and document analyses based on personal diaries or correspondence. Each of these meth-

ods possesses unique strengths and inherent limitations. To mitigate methodological biases and enhance reliability, researchers often adopt multimethod strategies when assessing personality [36] [37].

2.2. The Big Five Personality Traits Theory

The Big Five structure has been confirmed under various classification systems. Since the late 1980s, the Big Five personality theory has become the dominant paradigm in personality psychology, enjoying broad acceptance. It provides a theoretical framework for describing the covariation among personality traits through five robust factors [38].

Although some individual studies report slight variations in the results concerning the number of factors, general consensus holds that approximately five traits can comprehensively capture all dimensions of personality description. This approach is widely regarded as a standard means for explaining individual behavior through five dimensions: Extraversion, Neuroticism (also referred to as Emotional Stability), Openness, Agreeableness, and Conscientiousness—acronym “OCEAN,” likened to the “sea” of personality traits.

The most influential contributors to the Big Five model are Robert R. McCrae and Paul T. Costa, Jr., who developed the revised NEO Personality Inventory (NEO-PI-R), a landmark in Big Five theory [23]. The NEO series, based on the Big Five, was introduced by Costa and McCrae in 1987. Both the NEO-PI-R and its short version, NEO-FFI, have become widely used personality assessment tools globally [39]. The Big Five model has received extensive support from cross-cultural and longitudinal research and is broadly applied in practice [40].

The five dimensions—Extraversion, Agreeableness, Conscientiousness, Neuroticism, and Openness—each include multiple subordinate facets. Specifically:

a) Extraversion, a central trait in personality theories like the Five Factor Model, describes individuals who are energetic, sociable, talkative, and assertive. It is characterized by six facets: warmth (a friendly and intimate interpersonal style), gregariousness (a preference for social interaction and stimulation), assertiveness (leadership and confident expression of needs), activity (energetic engagement in speech and behavior), excitement-seeking (a preference for novelty and adventurousness), and positive emotion (frequent joy and enthusiasm). These facets collectively drive social engagement, leadership, and the active pursuit of stimuli, contrasting with introverts who tend to be reserved and quiet [40] [41].

b) Agreeableness reflects individuals’ attitudes toward others, characterized by traits like kindness, empathy, and cooperation. Its six facets, as described by McCrae and Costa [40], include trust (believing in others’ goodness and rarely suspecting motives), straightforwardness (candor and sincerity), altruism (thoughtfulness and helpfulness), compliance (yielding rather than asserting one’s own interests), modesty (humility about abilities and status), and tender-mindedness (compassion, empathy, and emotional responsiveness to charity). High scorers exhibit cooperation and social harmony, while low scorers may display antago-

nism or indifference. Trust, a foundational element, is crucial for developing identity and intimacy [40] [42] [43].

c) Conscientiousness, a trait characterized by self-discipline, organization, and achievement orientation, is defined by six facets: dutifulness, diligence, order, punctuality, ambition, and perseverance [40]. Individuals high in Conscientiousness are perceived as capable, organized, and systematic, demonstrating strong self-discipline and adherence to moral codes [44]. They pursue excellence through achievement striving and self-discipline, and engage in careful deliberation before acting, leading to purposeful and planned lives [40] [45]. This trait distinguishes organized, reliable, and principled individuals from those who are careless and distractible [45].

d) Neuroticism relates to emotional regulation and stability, with high scorers experiencing anxiety, impulsivity, and moodiness, while low scorers exhibit emotional stability and resilience. Its six facets include frequent worry, mood swings, self-pity, self-consciousness, emotionality, and vulnerability [40]. Individuals high in neuroticism are prone to worry, tension, irritability, sadness, guilt, embarrassment, difficulty resisting temptations, and struggle under stress. These negative emotions can impede coping and social functioning, warranting compassion rather than ridicule [40]. Overall, Neuroticism distinguishes individuals prone to stress and mood fluctuations from those who are calm and emotionally resilient.

e) Openness to Experience signifies adaptability and receptivity to novelty, with high scorers being curious, creative, and imaginative, while lower scorers are more traditional. Its six facets are imagination, creativity, uniqueness, preference for variety, curiosity, and open-mindedness [45]. This includes fantasy (rich imagination), aesthetics (sensitivity to art and beauty), actions (willingness to try new experiences), ideas, and values (inquisitiveness and the pursuit of knowledge). Highly open individuals often hold liberal values, appreciate diverse perspectives, and experience profound emotional reflection [45]. Openness differentiates those who seek new experiences and engage in divergent thinking from those who prefer routine.

2.3. Motivation for Physical Activity

Theoretical research on physical activity motivation draws extensively on psychology and education, particularly the Self-Determination Theory (SDT) proposed by Deci and Ryan, which emphasizes the role of intrinsic motivation, autonomy, and psychological needs in fostering behavior and well-being. SDT posits that behavior is driven by the fulfillment of basic psychological needs for autonomy, competence, and relatedness. When these needs are satisfied, individuals are more likely to internalize external regulations and display higher levels of self-determined behavior. SDT classifies motivation into intrinsic motivation, extrinsic motivation (including external regulation, introjected regulation, identified regulation, and integrated regulation), and amotivation, each differing in terms of autonomy [12] [46]-[48].

According to Self-Determination Theory (SDT), the degree to which social en-

vironments support basic psychological needs shapes motivation along a spectrum from intrinsic motivation (driven by enjoyment) to amotivation (lack of intention), with various forms of extrinsic motivation in between that differ in autonomy. These range from integrated and identified regulation (more self-determined) to introjected and external regulation (more controlled) [49]. The key SDT process, internalization, describes how external motivations become more internal and autonomous when basic needs are satisfied, leading to better well-being and outcomes, whereas need-thwarting environments foster external regulation and negative consequences [46] [50] [51].

Self-Determination Theory (SDT) is a comprehensive framework explaining the mechanisms underlying human motivation and behavior, centering around three core sub-theories: Cognitive Evaluation Theory (CET), Organismic Integration Theory (OIT), and Basic Needs Theory (BNT). CET differentiates between intrinsic motivation—engaging in activities out of interest or enjoyment—and extrinsic motivation—driven by external rewards or pressures. It highlights that the satisfaction of autonomy (the sense of volition) and competence (the feeling of effectiveness) enhance intrinsic motivation, while external incentives perceived as controlling can undermine it [52]. OIT expands on motivational types along a continuum from amotivation (lack of intent) to fully self-determined forms, such as intrinsic motivation, illustrating how individuals internalize external regulations through increasingly autonomous stages: external, introjected, identified, and integrated regulations. This process reflects the gradual transformation of external motives into personally endorsed values and identities as psychological needs are met [53]. BNT posits that autonomy, competence, and relatedness (the sense of connection and belonging with others) are three fundamental psychological needs, and their fulfillment is essential for fostering autonomous motivation, well-being, and persistent positive behavioral outcomes. Together, these three sub-theories of SDT clarify how the satisfaction of basic psychological needs catalyzes the internalization of motivation, leading to higher levels of self-regulation and sustained adaptive behavior, with robust applications in domains such as education, sports, work, and health promotion [54].

Self-Determination Theory posits that human behavior is influenced by both intrinsic motivation (i.e., satisfaction and enjoyment derived from the activity itself) and extrinsic motivation (the pursuit of external outcomes or rewards). It emphasizes three fundamental psychological needs: autonomy, competence, and relatedness. Autonomy refers to the sense of choice and control an individual experiences, enabling actions that align with their own values and interests. Competence is the feeling of efficacy and achievement in interactions with the environment. Relatedness signifies forming connections with others and experiencing a sense of belonging and care. When these three needs are fulfilled, people tend to display stronger intrinsic motivation, more positive behaviors, and higher well-being. Self-Determination Theory classifies motivation along a continuum: from amotivation (a lack of motivation altogether), to external regulation (behavior driven by external rewards or punishments), introjected regulation (driven by internal pressures such

as guilt), identified regulation (actively pursuing goals deemed personally important), integrated regulation (integrating external goals with one's self-values), and finally, intrinsic motivation, where actions are driven purely by interest, curiosity, and personal satisfaction [55]. Motivation can shift from extrinsic to intrinsic as individuals internalize values and environmental influences. The stronger the intrinsic motivation, the greater the sense of self and overall well-being. This article will discuss the theoretical connection between motivation and personality by combining these theories with the Big Five Personality Theory.

3. Literature Review

3.1. Empirical Research on the Big Five Personality Traits and Physical Activity Motivation

Currently, there is a lack of research directly examining the relationship between the Big Five personality traits and physical activity motivation. Yang *et al.* found that college students' Big Five personality traits exert a chain-mediated influence on exercise behavior through exercise self-efficacy and physical activity motivation, with conscientiousness, extraversion, and neuroticism passing through both mediating variables, while openness primarily operates through exercise motivation [56]. Brown-Devlin and Devlin's study indicated that college students' sporting motives and team identification both originate from their inherent personality traits, revealing the critical role of personality traits in sporting behavior and offering new perspectives for understanding physical activity motivation and team identification [57]. Zhang's research confirmed that Big Five personality traits significantly impact college students' physical activity motivation and mental health through the mediating role of emotional intelligence, where extraversion, agreeableness, conscientiousness, and openness are positively or negatively correlated with exercise motivation and mental health, while neuroticism shows the opposite [58].

Most studies consistently indicate that "conscientiousness" can positively predict academic or achievement motivation, while "neuroticism" is typically negatively correlated with motivation. "Agreeableness" shows a positive effect in some studies. Differences in findings might be attributable to cultural and sample variations, as these studies were conducted in different countries and contexts. Existing research confirms that the Big Five traits, especially conscientiousness and extraversion, significantly affect physical activity motivation. However, cultural backgrounds and methodological differences may influence outcomes, underscoring the importance of cross-cultural understanding of personality and motivation. These findings have practical implications, suggesting that identifying personality traits can help design motivational educational interventions and guide career planning and counseling.

3.2. Empirical Research on the Big Five Personality Traits and Physical Activity

Wilson and Dishman conducted a meta-analysis of the association between the Big

Five personality traits and physical activity (PA), exploring extraversion, neuroticism, conscientiousness, openness, and agreeableness. Major findings indicated that extraversion, conscientiousness, and openness were positively associated with physical activity, while neuroticism was negatively correlated. Although agreeableness generally showed no significant relationship with PA, age moderated this effect—among adults aged 35 and older, a negative association was observed. The average effect size suggested a small but significant correlation. The study also found that sample and study characteristics influenced these relationships, including: a) gender—relationships of conscientiousness, neuroticism/openness with PA differed significantly between men and women; b) region—differences were found between North America and Europe. The positive association between extraversion and PA is reasoned to stem from extraverted individuals' preferences for social stimulation and intense sensory experiences, which align with the nature of physical activities. Those high in neuroticism are prone to anxiety, self-focus, and negative emotions, which may hinder participation in PA, resulting in a negative correlation. Conscientious individuals, due to their self-discipline and sense of responsibility, are more likely to engage in regular, health-benefitting physical activities. Similarly, individuals high on openness are more willing to try new things, including sports, and thus are positively related to PA. The study also noted limitations such as variations in PA and personality measurement tools, conceptual definitions, generally small sample sizes, and incomplete variable reporting, which impeded comprehensive analysis of moderating factors [59].

Müller investigated the relationships among personality traits, self-rated health (SRH), and physical activity (PA) in a sample of 4244 German university students. An online cross-sectional survey assessed the five Big Five domains, PA and sedentary time (via the short-form International Physical Activity Questionnaire), and SRH and muscle-strengthening activity (MSA) with a single-item measure. Using multiple linear and logistic regressions, and controlling for sociodemographic, behavioral, and (mental) health variables, individual and global personality, SRH, and PA variables were analyzed for associations with meeting PA guidelines. Results indicated extraversion and conscientiousness were consistently positively associated with PA variables, while negative emotionality (i.e., neuroticism) was negatively correlated. For example, each point increase in extraversion was associated with an additional 17 minutes of weekly MSA; sedentary time was not associated with personality trait scores [60].

Gacek *et al.* analyzed 219 Polish and 280 Spanish physical education (PE) students, using the International Physical Activity Questionnaire (IPAQ) and the NEO-FFI personality scale. Results showed Polish students had higher extraversion, conscientiousness, lower neuroticism, and higher total PA (total PA: 8697.21 METs) than Spanish students. In both groups, higher extraversion was associated with greater total PA, as well as vigorous and moderate-intensity PA, while higher neuroticism correlated with lower PA. Higher conscientiousness was positively related to PA in all domains. In moderate PA, nationality moderated the effects of

neuroticism, openness, and conscientiousness—among Polish students, increased neuroticism was linked to reduced moderate PA, while higher openness and conscientiousness were connected to increased moderate PA. Overall, PA was positively related to extraversion and conscientiousness, and negatively to neuroticism. These results highlight the moderating effect of country and culture on the personality—PA relationship, underscoring the necessity of considering individual and cultural differences in designing culturally adaptive PA interventions [61].

Cui-Ping Li *et al.* examined the relationships among the Big Five traits, PA, and creativity in 296 university students, employing SEM analysis to explore how personality shapes PA, which subsequently influences creativity traits. Results found openness to be significantly positively associated with PA, while PA was significantly negatively correlated with creativity traits such as curiosity, challenge, risk-taking, and imagination. The study concluded that openness is an important predictor of PA and stressed the importance of incorporating personality and PA in the development of university students' creativity [62].

Daniels *et al.* investigated the relationship between personality traits and high school sports participation on university students' PA, sampling 237 undergraduates at a US university (September 2020-May 2021), and assessed PA levels, personality, high school PE participation, and demographic variables. Pearson partial correlation analysis showed conscientiousness was significantly positively correlated with all PA indicators except active transport, while previous high school PE participation was strongly associated with vigorous and leisure PA. The study concluded that conscientiousness is a key factor, and high school PE experience may promote continued higher levels of PA into adulthood, especially in vigorous and leisure activities. Further research into whether leisure activities may improve conscientiousness was recommended [63].

Weiss *et al.* examined the relationships between low neuroticism, high extraversion, and high conscientiousness with PA, exploring specific personality combinations (styles) and their association with PA using data from the University of North Carolina Alumni Heart Study. Participants completed the revised NEO Personality Inventory (NEO-PI-R) and reported average PA levels for the past month (eight-item scale). The first study assessed prospective correlations between the five broad trait domains and PA; the second and third studies performed multivariate logistic regressions analyzing PA and personality combinations (styles), controlling for age, sex, education, marital status, and depression. Results demonstrated that a combination of low neuroticism, low agreeableness, and high conscientiousness predicted higher PA; likewise, high extraversion and high openness were associated with higher PA, while low extraversion combined with high agreeableness or low conscientiousness predicted lower PA. Notably, the activity facet of extraversion played a significant role in the relationship between extraversion and PA. The study concluded that non-additive effects among personality traits significantly impact PA, and that assessing personality styles may help identify at-risk groups for PA avoidance, informing personalized inter-

vention development with important implications for public health and clinical practice aimed at increasing PA and reducing sedentary behavior [64].

The literature review indicates that extraversion and conscientiousness are key personality traits consistently positively associated with physical activity, while neuroticism shows a negative correlation; autonomous motivation plays a significant mediating role in connecting these traits with physical activity, although findings regarding the relationship between traits like agreeableness and physical activity remain inconsistent.

3.3. Empirical Studies of Physical Activity Motivation and Physical Activity

Liu Yuyuan addressing low PA participation rates among Chinese middle school students, investigated the relationship between physical activity motivation and high-intensity PA during PE classes. Using literature review, questionnaires, and objective measurements—students completed the Behavioral Regulation in Exercise Questionnaire and wore Actigraph w GT3X-BT triaxial accelerometers—her study examined 720 randomly sampled students from Shanxi Province, China. Significant sex differences were found: males scored higher in intrinsic motivation, identified regulation, and introjected regulation; females scored higher in external regulation and amotivation. High-intensity PA also differed by gender and grade—boys' and ninth-graders' levels were higher. Importantly, intrinsic motivation, identified regulation, and introjected regulation were positively correlated with high-intensity PA, whereas external regulation and amotivation were negatively correlated. The study concluded that motivational factors significantly affect high-intensity PA, suggesting that enhancing intrinsic, identified, and introjected regulation could promote student engagement and long-term health [65].

Liu Wenshuo used grounded theory to explore the evolution of motivational factors underpinning university students' persistent exercise behaviors. After introducing core concepts and relevant theoretical foundations, the study reviewed research on sustained exercise behavior and motivation, conducted in-depth interviews with consistently exercising undergraduates, and iteratively coded interview data. Findings revealed two motivational transitions: in the initial phase, motivation stemmed from imitation, physical and mental benefits, academic achievement, and interest; during maintenance, motivation shifted to social connections, sense of competence, academic and health benefits, and continued interest; in the persistence stage, motivation became exercise addiction, personal attachment, sense of competence, health benefits, and sustained interest. The evolution of motivation essentially reflects the internalization of external motivation: initially, behavior is jointly driven by controlled external and intrinsic motivation, but as exercise continues, satisfaction of basic psychological needs strengthens intrinsic motivation and weakens the regulatory effects of external motives, culminating in a persistent exercise pattern supported by intrinsic motivation alone [66].

Sáez *et al.* analyzed physical activity motivation among university students and

its relationship to gender, activity level, and exercise satisfaction, finding that intrinsic regulation is most strongly related to the number of weekly hours spent in sports. Significant differences were found in intrinsic and extrinsic regulation and exercise hours between male and female students [67].

4. Conclusions

4.1. Summary of Theoretical and Empirical Relationships

In summary, personality traits, physical activity motivation, and engagement in physical activity are closely related and mutually influential, providing an important theoretical perspective for understanding and fostering physical and psychological health among university students. As relatively stable psychological characteristics, personality traits underpin individual motivation formation and behavioral choice. Within the Big Five framework, extraversion and conscientiousness consistently predict higher levels of PA participation, while neuroticism is robustly associated with lower PA engagement. Personality traits not only exert direct effects on physical behaviors but also indirectly influence PA levels and persistence by shaping the quality and type of motivation. Major motivational theories such as Self-Determination Theory (SDT) indicate that only through the satisfaction of basic psychological needs (autonomy, competence, and relatedness) can individuals develop high-quality, autonomous motivation, leading to sustained participation in physical activity. Personality is thus a critical factor in both need satisfaction and the internalization of motivation: personality traits influence the degree of autonomous motivation, which in turn regulates and reinforces behavior, for example, promoting more active and enduring engagement in various forms of exercise.

Numerous empirical studies—especially those focused on university and adolescent populations—have validated these theoretical pathways. Students who are more extraverted and conscientious tend to have stronger intrinsic motivation and are more likely to develop regular exercise habits; individuals high in neuroticism are more susceptible to setbacks and less likely to participate. Types of physical activity motivation (e.g., intrinsic motivation, identified regulation) hold important predictive value not only for the rate and depth of participation, but also serve as mediating mechanisms, amplifying the effects of personality on PA. Factors such as gender, culture, and prior exercise experience frequently function as moderators, impacting the strength and pathways of the overall model.

4.2. Main Points and Significance

The positive interplay among personality traits, physical activity motivation, and physical activity forms a foundational element for health promotion in higher education. Personality traits shape exercise needs and preferences among university students, while well-established physical activity motivation is key to internalizing exercise habits and maintaining healthful behavior; in turn, regular participation in PA promotes personality development and the continuous optimization of mo-

tivation. This theoretical relationship not only enriches the frameworks of health education and sport psychology, but also holds significant practical value in promoting students' all-round development, elevating physical and mental wellness, and fostering lifelong exercise literacy. If universities tailor education and interventions according to varying personality and motivation types, they can more effectively enhance students' physical fitness, psychological resilience, and social adaptability.

4.3. Existing Limitations and Research Gaps

Despite advances, research on the interrelations among personality, motivation, and PA faces several limitations. First, cross-cultural and multinational comparative studies are lacking: most data derive from Europe, North America, and some Asian countries, making it difficult to capture the full spectrum of cultural differences in these relationships. Second, prevailing research is overly reliant on cross-sectional surveys, limiting the ability to delineate causality and leaving the dynamic relationships and mechanisms among personality, motivation, and behavioral change underexplored. Third, the boundaries and specific pathways of mediation and moderation effects between personality, motivation, and PA require further clarification. Fourth, the roles of individual characteristics such as gender, year of study, major, and exercise experience have not been fully elucidated. Furthermore, most studies depend on questionnaires and lack integrated multi-source and behavioral tracking data; interventional studies and real-world tests of motivational activation are underdeveloped.

Conflicts of Interest

The authors declare no conflicts of interest.

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