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Optimizing Quality of Life of Vulnerable Students: The Impact of Physical Fitness, Self-Esteem, and Academic Performance: A Case Study of Saudi Arabia Universities

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Abstract: This study aims to fill in a gap by examining how physical activities (PAs), feeling good about oneself physically, and academic performance (ACD_PRF) all work together to influence the overall quality of life (QoL) for vulnerable students. We examined data from 400 vulnerable students studying in various universities and major specializations. We employed the Partial Least Squares–Structural Equation Modeling (PLS-SEM) data-analysis technique to test the validity and reliability of the outer model and to test the hypotheses used in the inner model. The research findings indicate that physical activities and physical self-esteem (PHS) can directly and indirectly improve vulnerable students' QoL. However, among vulnerable students, ACD_PRF can only strengthen their QoL indirectly through improving their PHS. These findings help us to understand how physical activities, feeling good about one's body, and ACD_PRF all contribute to these students having a better overall QoL. This knowledge can help us to develop better ways to support vulnerable students and to improve their well-being in all aspects of their lives, bodies, and ACD_PRF, which contributes to these students having a better overall QoL. This knowledge can help us to develop better ways to support students with disabilities (SwDs) and to improve their well-being in all aspects of their lives.

Keywords: physical fitness; quality of life; students with disabilities; physical self-esteem; academic performance



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1. Introduction

Today, many countries have started to invest in sports infrastructure and to formulate policies that encourage their citizens to carry out more physical activity (PA) and, thereby, to recognize the importance of physical fitness (PHYS_FIT) and to increase awareness among all their populations [1]. This helps people to enroll in everyday physical exercises that enhance their physical and mental health [2]. Physical exercises improve people's wellness, fitness, and well-being [3,4]. In promoting sustainable health and well-being, the key objective is reorientating health services and public policies and the community's engagement in creating sustainable healthy environments that support the Sustainable Development Goals (SDGs) [5]. Globally, universities and educational institutions provide their students, generally and more specifically students with disabilities (SwDs), with a sustainable learning environment that is designed to encourage them to learn, exercise, and find entertainment [6].

PHYS_FIT is very important for SwDs. PHYS_FIT is essential in improving a person's quality of life (QoL). Individuals can significantly improve their health and well-being by exercising regularly and PA [7]. Chronic illness, poor mental health, and heart disease

are all risk factors due to inadequate physical health awareness (PHA) and, consequently, there is a need for sustainable support [8]. The SDGs' third goal focuses on the importance of the sustainability of people's health and well-being. Due to stigma and prejudice, it may be difficult for SwDs to obtain health-related services, learning technologies, and fitness facilities [9]. Due to these obstacles, SwDs are frequently unable to participate fully and equally in society [10]. Since being physically fit is essential to carrying out daily tasks, low strength and stamina limit one's independence as an adult [11]. Students' motor development and physical exercise are modifiable factors that positively correlated with PHA [12,13].

Since 2012, physical inactivity has been acknowledged as a worldwide pandemic that has resulted in substantial health and economic consequences [14]. Globally, educational institutions including universities have developed their learning environments to include extracurricular activities, such as sports, since these are supposed to improve the level of PA and PHYS_FIT. In many countries, little attention has been paid to developing and maintaining educational institutions' health facilities [15]. In the regard, the findings of previous studies show that students, who participate in most extracurricular activities, outperform non-participants in terms of their educational performance [16]. According to the findings of previous studies, there is a link between PA and improved QoL in terms of environment, vitality, social interactions, mental health, and physical health [17].

In addition, it has been demonstrated that PHYS_FIT components, which include balance, speed of execution, flexibility, strength, endurance, and agility, improve with exercise programs and, in turn, improve university students' PHYS_FIT and overall QoL [18]. Being physically healthy improves psychological well-being by lowering stress, elevating mood, and raising self-worth. The findings of previous studies demonstrate that those who consistently maintain more significant levels of physical fitness report greater degrees of pleasure and general contentment with their lives [19].

In this study, we focus mainly on the problems of PHYS_FIT and its direct impact on SwDs' QoL. Our research problem focuses mainly on the issue of PHYS_FIT among Saudi Arabia university SwDs. PHYS_FIT is important for all people and can lead to protecting them from illnesses and diseases [20,21]. The World Health Organisation (WHO) recommends that adolescents participate for a minimum of one hour every day in moderate-to-vigorous physical activity (MVPA) [22]. SwDs needs to balance their daily activities and time for fitness activities. This requires time, support, and special facilities. The findings of previous studies have shown that individuals with disabilities participate in less PA than those without disabilities [23]. Many countries do not widely share the culture of sustainable QoL through sustainable PHYS_FIT and PA.

The findings of international studies reveal that 75% of people with particular disabilities do not engage in enough PA to benefit from it [24]. Previous studies' findings demonstrate that SwDs engage in sedentary behaviors more frequently than their able bodied classmates [25]. The measurement of regular activity is the most popular method to determine PHA [26]. A positive correlation between PHA and academic accomplishment can be used as justification to create, sustain, maintain, expand, and even enhance physical education programs in an environment of academic accountability [27]. Low general PHA is linked to poor academic performance. Students who are physically fit have a much reduced risk of performing poor in academics [28]. Students' levels of PHA can be enhanced by encouraging them to exercise and becoming more involved in physical activity [29].

There is a great need to enhance the level of SwDs' PA and, therefore, their PHYS_FIT. Numerous studies' findings have identified obstacles that prevent SwDs from engaging in as much PA as they would like [30,31]. Numerous types of disability impact on wellness, fitness, and health. In certain situations, handicaps (such as losing a limb or reduced intellectual functioning) may make it difficult to function. However, it need not hurt one's health, wellness, or fitness [32]. The health risks increase with college students' exercise participation levels [33].

This study is necessary because it explores the direct impact of PHYS_FIT on SwDs' physical self-esteem (PHS), academic performance (ACD_PRF), and QoL. With to recent data, the percentage of disabled Saudi Arabia people ranges from 3.9% to 7.1%, with physical disabilities making up most instances. These numbers are expected to climb due to the continuous increase in health risks such as obesity, lack of exercise, motor crashes, and persistent diseases [34]. Very few previous studies have examined these relationships. In addition, our model is unique in showing how ACD_PRF and PHS mediate PHYS_FIT's impact on QoL. There is little such information and literature currently available, more particularly with respect to Arab nations. Very few studies have studied PHYS_FIT and its relationship with SwDs' QoL. Previous Saudi Arabia studies have primarily focused on physical exercise in children diagnosed with Down syndrome and their parents [35].

Consequently, in this study, we aim to examine PHYS_FIT's impact on Saudi Arabia university SwDs' ACD_PRF, PHS, and QoL. In addition, we have developed our ACD_PRF approach to investigate the role that ACD_PRF and PHS play as mediators in the relationship between PHYS_FIT and QoL. In this study, we try, also, to test PHS' direct effects on ACD_PRF and QoL. Therefore, when compared to previous studies, this shows the importance of this study and the significant contribution made by its findings to the current literature. There is a lack of literature since very few previous studies have explored PHYS_FIT's impact on university SwDs' QoL. In addition, by introducing new concepts, such as sustainable PHYS_FIT and QoL among SwDs, we try to fill the ACD_PRF gap in aligning sustainability with the current university environment.

We anticipate that this study's findings will affect academia, society, and health. Furthermore, our goal is to offer useful suggestions and recommendations to educational institutions' decision-makers and policy formulators. This study's conclusions will assist sustained wellness, QoL, and wellness in line with the SDGs.

2. Literature Review

2.1. Physical Fitness (PHYS_FIT) and Physical Self-Esteem (PHS)

The quantity of physical training necessary to reach a physical work capacity is known as PHA; this is a crucial aspect of total force fitness [32]. Being physically fit can improve confidence, productivity, and self-esteem [3]. Self-esteem does not include sentiments of perfection and superiority but, rather, it is a measure of acceptance of oneself, self-worth, and contentment with oneself [36]. Enhancing a person's physical health is crucial in elevating their self-worth [37]. Being physically fit makes the person feel better about themselves, and makes the person feel stronger and more energized [38]. Elevated PHA levels have been linked to heightened physical self-perception and self-worth. Both constitute teenage mental well-being [39].

The findings of previous studies show that both PHYS_FIT and PA influence teenagers' self-esteem [40]. In young people and teenagers who are overweight or obese, PA interventions improve several psychological outcomes such as depression, self-esteem, and body image [41]. Sports and unstructured PA provide a valuable setting for socialization, skill development, and athletic self-worth in children. Therefore, a strong sense of athletic self-worth may lead to more participation in sports and PA [42]. The findings of previous studies show that PHYS_FIT at $t_0 + 1$ engagement in PA predicts better levels of belongingness and self-esteem [43].

The findings of previous studies confirm the significance of enhancing health-related and, more specifically, muscle mass and CRF in school-age individuals to improve their physical health and self-esteem [44]. During school age, increasing PHA related to health, and more especially musculoskeletal and mental fitness, can improve physical state and self-esteem [44].

PHYS_FIT can positively influence SwDs' self-esteem. In the domain of the pediatric population, participation in PA offers numerous benefits that result in various health outcomes. These benefits encompass enhancements in PHA that include cardiorespiratory and muscular fitness, and improvements in cardiometabolic health indicators such as blood

pressure, dyslipidemia, glucose levels, and insulin resistance [45]. In addition, by lowering depressive symptoms, raising self-esteem, and lowering obesity, exercise improves the condition of bones, cognitive functions, such as managing time and learning efficiency, and mental health [46]. It also improves fitness and health-related QoL areas related to the body, mind, and society [47]. We can argue that by facilitating adequate fitness resources at universities, students not only enhance their self-esteem but can also improve their satisfaction with university life. Therefore, we formulated the following hypothesis:

H1. *Physical Fitness (PHYS_FIT) has a direct and significant effect on Physical Self-esteem (PHS).*

2.2. Physical Fitness (PHYS_FIT) and QoL

PHYS_FIT is a well-known and potent health indicator related to an active lifestyle and exercise [48]. There has been no thorough study of PHYS_FIT's effect on SwDs' QoL. Matiejat et al. [49] describe QoL as "A subjective perception of well-being and satisfaction that the child can best evaluate according to his or her own experience within several life domains". Numerous researchers have examined and written about the problem of PHYS_FIT in various populations. PHYS_FIT is vital to people's lives and is in line with the SDGs. Numerous demographic samples have been used to study and record the relationship between the PHYS_FIT status and QoL [50,51]. However, most of these studies did not choose SwDs as a population. Similarly, it has been discovered that with respect to the elderly population there is a relationship between PHYS_FIT and QoL [52]. Other studies' findings show that QoL related to fitness includes both mental and physical components [53]. When people exercise more physically, this positively affects their physical state, mental state, and QoL.

SwDs needs a learning environment that encourages and motivates them to do more physical activity. The idea of creating a sustainable learning experience, supported by PHYS_FIT facilities, is essential for all students and, more particularly, SwDs. The findings of previous studies demonstrate that enhanced physical activity and fitness yields advantages and is essential to maintaining optimal biological state, psychological health, and QoL [54,55].

We argue that universities have an ethical obligation to improve their student's QoL. This can easily be done if, regularly and routinely, students are provided with extracurricular activities and physical exercises. The extracurricular committees play an important role in attaining this goal, which is one of the SDGs. SwDs' level of PA has a positive effect on their PHYS_FIT, and, thereby, their QoL [47,56,57]. Therefore, we formulated the following hypothesis:

H2. *Physical fitness (PHYS_FIT) has a direct and significant effect on Quality of Life (QoL).*

2.3. Physical Fitness (PHYS_FIT) and Successful Academic Performance (ACD_PRF)

The findings of a limited number of studies have demonstrated a connection between PHYS_FIT and ACD_PRF. The findings of most of these studies show that among a sizeable sample of middle school kids components of PHYS_FIT are linked to success [58]. These findings show a solid and favorable correlation between PHYS_FIT and successful ACD_PRF. Other socio-demographic and fitness parameters do not affect the dose-response connection between successful academic achievement and cardiovascular fitness [59].

The findings of previous studies show that, compared to those who are unfit, fit young people achieve higher scores in mathematics and language exams. According to the findings of two studies [60,61], better ACD_PRF for adolescents is associated with increased fitness from childhood. Exercise is a crucial component that can significantly influence student performance. This is because the findings of previous studies have shown improvements in several mental abilities that include operation, decision-making, awareness, focus, and memories. All of these can be aided by everyday practice [62,63].

In addition, the findings of previous studies show varying degrees of correlations, either good or small, between successful ACD_PRF and being physically active [64]. There are positive associations between overall academic accomplishment, arithmetic success, and comprehension proficiency that indicate there may be an overall relationship between PHA and preadolescent learning skills [65]. Consequently, the university's role is to create a sustainable academic life that assists students in general and continuously. Many studies have shown a positive connection between PHYS_FIT and ACD_PRF. Therefore, we formulated the following hypothesis:

H3. *Physical Fitness (PHYS_FIT) has a direct and significant effect on Academic Performance (ACD_PRF).*

2.4. *Physical Self-Esteem (PHS) and the Quality of Life (QoL)*

Self-esteem can be defined as the sentiment, regard, and care individuals have for themselves, which means how much they like, perceive, and believe in their health [66]. One way to define self-esteem is a person's assessment of their total value as a person [67]. In modern life, the idea of self-esteem is pervasive. In professional settings, such as schools and offices, athletic contests and music performances, individuals typically believe that having a strong sense of self-worth is essential for success [68].

Previous studies' findings show a strong correlation between improved PHS and a higher QoL [69]. This can be interpreted as the direct effect of self-esteem. When students have high to moderate levels of self-esteem, they have developed good attitudes toward their QoL. Academic coaching and orientation help students to improve their trust and self-esteem, and achieve successful ACD_PRF. Our review of the literature confirms that poor self-esteem predicts feelings of depression, anxiety disorders, and poor QoL [70]. This shows a positive correlation between self-esteem and QoL. The findings of previous studies of women with impairments show a substantial correlation between PHS and reported QoL [71]. We argue that the university's support is crucial in this regard. When universities provide SwDs with special care, it helps them to have a positive attitude and greater PHS. Accordingly, their QoL is enhanced. Therefore, we formulated the following hypothesis:

H4. *Physical Self-esteem (PHS) has a direct and significant effect on Quality of Life (QoL).*

2.5. *Academic Performance (ACD_PRF) and Quality of Life (QoL)*

There is growing concern about students' ACD_PRF at all levels. Each student's ACD_PRF and academic achievement are determined by their disclosed overall GPA and weekly study time [72]. Conventional academic success-prediction techniques emphasize the significance of traits like motivation and IQ [73].

Students' mental and physical quality, which constitute the students' QoL, may be responsible for affecting their overall ACD_PRF. The findings of previous studies reveal a positive relationship between QoL satisfaction, learning motivation, and writing test scores [74]. In their study, Henning et al. [75] explored the relationships between medical students' self-reported good grades, willingness for education, and views on their QoL. Their findings demonstrate that there is a positive relationship between QoL satisfaction, learning motivation, and written exam scores. Poor QoL, which is defined by high levels of worry, anxiety, stress, and exhaustion, always has an impact on ACD_PRF. Therefore, poor QoL has a negative effect on students' ACD_PRF [76,77].

Previous studies' findings show a link between students' ACD_PRF and their QoL. A significant correlation exists between successful ACD_PRF and QoL [78]. According to a previous study, students who pursue careers in medicine and other health-related fields do better academically when generally they have a higher QoL [79]. By focusing on setting up situations that are encouraging for young people, a sustainable university encourages wellness and good health in its learning environment. Therefore, we formulated the following hypothesis:

H5. *There is a significant relationship between Academic Performance (ACD_PRF) and Quality of Life (QoL).*

2.6. Physical Self-Esteem (PHS) and Academic Performance (ACD_PRF)

The findings of numerous studies reveal a positive correlation between ACD_PRF and physical self-confidence. Studies of Portuguese middle school pupils demonstrate that consistent physical activity improves ACD_PRF and levels of confidence and self-worth [80].

Higher-education students who practice games while maintaining a healthy sense of self-worth perform better academically [81]. The findings of an additional investigation of college students enrolled in a deliberate communication course show a limited link between ACD_PRF and PHS. This study's findings emphasize the need for treatments aimed at fostering positive PHS and motivation and involvement in the education process [82]. Participation in extracurricular sports strongly impacts ACD_PRF and how one's sense of self-worth has developed [83]. We argue that the university plays an essential role in developing positive self-esteem among its students and their academic performance. Therefore, we formulated the following hypothesis:

H6. *Physical Self-esteem (PHS) has a direct and significant effect on Academic Performance (ACD_PRF).*

2.7. The Mediation Role of Physical Self-Esteem (PHS) and Academic Performance (ACD_PRF)

Very few studies have tried to understand the mediation roles played by PHS and ACD_PRF in the relationship between PHYS_FIT and QoL. PHS mediates the association between PHYS_FIT and QoL [84]. We were unable to find more previous studies that determined PHS' and ACD_PRF's mediation roles. Accordingly, this makes our model unique. The greater influence comes from PHS, which is the most effective mediator between ACD_PRF and PA [85]. We can say that PHS enhances the relationship between PHYS_FIT and QoL. In addition, ACD_PRF plays an expected role in improving the relationship between PHYS_FIT and QoL. Our model is designed to explore this meditation role. Therefore, we formulated the following hypotheses:

H7. *Physical Self-esteem (PHS) mediates the relationship between Physical Fitness (PHYS_FIT) and Quality of Life (QoL).*

H8. *Physical Self-esteem (PHS) mediates the relationship between Academic Performance (ACD_PRF) and Quality of Life (QoL).*

H9. *Academic Performance (ACD_PRF) mediates the relationship between Physical Fitness (PHYS_FIT) and Quality of Life (QoL).*

In Figure 1, the proposed model is presented. The model included physical fitness, self-esteem, academic performance, and quality of life variables.

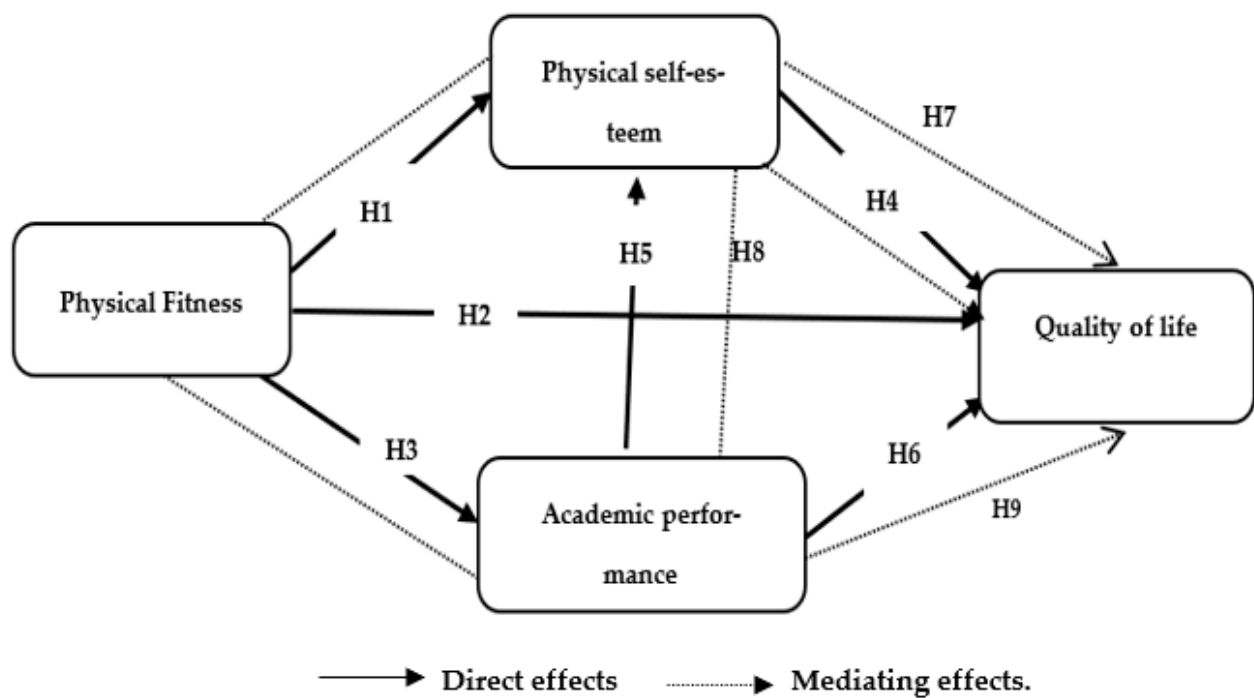


Figure 1. Conceptual Research Model.

3. Materials and Methods

We adopted a cross-sectional quantitative research design for this study to achieve its objectives. We extensively reviewed the previous literature to establish the measures and build the current research framework. Subsequently, based on this review, we developed this study's hypotheses. Next, we gathered field data through a self-administrated online questionnaire. Finally, we used PLS-SEM to analyze the collected data.

3.1. Measures and Design of Questionnaire

To ensure the reliability and validity of this study, we utilized a previous valid and established scale and adopted well-known psychometric properties to assess and choose the research scale (see Appendix A Table A1). As introduced by Abadie [86], we adopted the PF measure of student physical fitness. This scale encompasses four aspects of physical fitness, namely, "muscular strength; flexibility; body composition; and cardiorespiratory fitness". Samples of the questions in the PF scale contain statements about lifting objects, muscular flexibility, weight management, and cardiovascular endurance. The scale utilizes a Likert grading system with four levels, ranging from 1 to 4, where (1) indicates "did not apply to me at all", (2) signifies "applied to me to some extent, or occasionally", (3) suggests "applied to me to a significant extent, or a substantial part of the time", and (4) denotes "applied to me very much, or most of the time". In addition, we selected 5 items, adopted from the physical self-concept section of the "Physical Self-Description Questionnaire" (PSDQ), to evaluate physical self-esteem (PSE) [86,87]. This assessment tool comprehensively assesses an individual's positive feelings about their physical self [86,88]. We asked this study's participants to respond to five statements (e.g., "I am satisfied with my physical appearance and abilities").

Also, we included in this study the "Satisfaction with Life Scale" (SWLS), developed by Diener et al. [89]. This scale comprises five items to assess QoL. It evaluates a person's overall cognitive assessment of their satisfaction with life. We asked this study's participants to show their level of agreement with certain statements about their happiness. Some examples of these statements include "I am satisfied with my life circumstances" and "If I could live my life again, I wouldn't change much". We rated each statement on a 5-point Likert scale, extending from 1 "strongly disagree" to 5 "strongly agree". The

conceptualization and assessment of AP were inspired by McGuire's [90] research. Students self-reported their AP as a PHYS_FIT outcome during the first semester of the 2022–2023 academic year. Example items include statements like "Engaging in physical fitness activities has enhanced my understanding of the course material" and "Incorporating physical fitness has contributed to my better grasp of the subject matter". Before distributing the questionnaire, 10 professors reviewed it for clarity and content validity; as a result, no changes were made to the questionnaire questions.

We developed an online questionnaire based on recommendations from previous studies. After creating measurement items, a team member recorded the questions in Google Forms. Next, the team conducted a thorough review before distributing the questionnaire's "Uniform Resource Locator" (URL) to the participants. We explicitly explained this study's aims and objectives at the beginning of the questionnaire and invited the sampled participants to contribute. Through official university emails, we sent the participants the link to the questionnaire which was provided in Arabic. The research team supervised the replies daily. The participants' optional personal details, such as their phone numbers, email addresses, names, and social media profiles, were included at the end. We asked a group of twenty-five students and twenty academics to assess the questionnaire's simplicity, clarity, and appropriateness. While this procedure did not identify any significant alterations, we made some adjustments to enhance the language used in the questionnaire. We calculated Cronbach's alpha (α) values to evaluate the reliability of the measures. The alpha (α) values ranged from 0.874 to 0.960 and exceeded the recommended threshold [91]. Given that we utilized a self-reported questionnaire, we acknowledged the potential for "Common Method Variance" (CMV) [92]. To address this concern, we implemented three strategies. Firstly, we organized the questions in the questionnaire so that the dependent questions (QoL) preceded the independent questions (PHYS_FIT, PHS and ACD_PRF). Secondly, we maintained the confidentiality of respondents' sensitive personal information. Thirdly, we applied "Harman's single-factor method", in conducting an "Exploratory Factor Analysis" (EFA) on all questions by using SPSS software V22 while restricting the extraction to one factor without rotation. We adopted this approach to ensure adherence to the stipulation of identifying only one factor. The findings from our analysis indicate that CMV does not pose a challenge throughout the study since a single variable explained 44% of the variance in the data [93].

3.2. Participants and Data-Collection Process

We adopted deductive and quantitative methodology in this study. This entailed sampling SwDs from diverse university programs such as finance, computer science, engineering, human resource management, accounting, arts, and medicine. We conducted this sampling across six renowned Saudi Arabia universities. These were King Faisal University (29%), King Saud University (18.5%), King Abdulaziz (15.5%), Hail University (10.5%), Taibah University (8%), and Imam Mohammad ibn Saud Islamic University (18.5%). We selected these universities based on their significant status in Saudi Arabia, thereby making them representative in the broader context.

We meticulously planned the data-gathering methodology to ensure an accurate reflection of SwDs' perspectives while respecting their rights and confidentiality. In recognizing the unique challenges and needs linked to different conditions, we meticulously developed the research framework to cover a wide range of disabilities. We targeted only students with disabilities as registered through the official university disability support services and academic units and who are currently enrolled in the targeted universities. We used multiple channels, including disability support services and academic units to select this study's participants. Since ethical considerations were paramount throughout the data-collection phase, we followed institutional review boards' guidelines to safeguard the participants from any potential harm or undue pressure. We employed a randomized sampling technique to select the student sample for this study which we conducted between August and September 2023. The data collection involved 450 respondents from the specified programs.

After excluding returned questionnaires that did not meet the criteria, we retained 400 valid responses which represented an impressive response rate of 88%. The sample comprised 290 men (72%) and 110 women (28%), predominantly aged between 17 and 24 years old (77%) as shown in Table 1 below.

Table 1. Respondents' Profiles.

| Category | Group | Frequency | % |
|--------------|-----------------------------|-----------|--------|
| Gender | Male | 290 | 72.5% |
| | Female | 110 | 27.5% |
| Age group | 17–20 | 163 | 40.75% |
| | 21–24 | 149 | 37.25% |
| | 25–28 | 88 | 22.0% |
| Disability | Physical disability | 72 | 18.0% |
| | Visual disability | 113 | 28.25% |
| | Hearing disability | 109 | 27.25% |
| | Speech disability | 106 | 26.5% |
| Universities | King Faisal | 116 | 29.0% |
| | King Saud | 73 | 18.25% |
| | King Abdulaziz | 61 | 15.25% |
| | Hail | 42 | 10.5% |
| | Taibah | 33 | 8.25% |
| | Imam Abdulrahman bin Faisal | 75 | 18.75% |
| Discipline | Finance | 45 | 11.25% |
| | Computer Science | 43 | 10.75% |
| | Engineering | 35 | 8.75% |
| | Human Resource Management | 90 | 22.5% |
| | Accounting | 42 | 10.5% |
| | Arts | 120 | 30% |
| | Medicine | 25 | 6.25% |
| Weight | 55–72 | 120 | 30.0% |
| | 73–90 | 131 | 32.75% |
| | 91–110 | 149 | 37.25% |
| Height | 145–179 | 294 | 73.5% |
| | ≤180 | 106 | 26.5% |

3.3. Data-Analysis Methods

We used a special technique called PLS-SEM to understand the connections between the study factors. This method is good at figuring out how different things (like fitness and self-esteem) are related, even when you do not have a large sample size [94]. PLS-SEM is employed in our study and is adequate for analyzing the complex model in our research paper, which contains four latent dimensions with 17 reflective indicators and mediation effects [95]. The study aims to predict the impact of physical fitness on QoL through the mediating role of physical self-esteem and academic performance; therefore, PLS-SEM data-analysis techniques seem adequate as they are often employed in prediction-oriented research where the main aim is to understand and predict relationships between latent constructs [94]. Finally, PLS-SEM is adequate for social science research in which it is common to violate normal assumptions as it can manage non-normal distribution in a

dataset [95]. PLS-SEM works in two parts: building a model of the main relationships (the inner model) and ensuring that the used measures reflect what they are supposed to (the outer model) [96]. To check if the employed measures were good, we considered things like the strength of the connections which included “standardized factor loading” (greater than 0.7), and how well the measures captured the overall idea they were trying to measure. This included “Composite Reliability” (CR) (greater than 0.7), “Average Variance Extracted” (AVE) (greater than 0.5), R2 (greater than 0.1), and “Stone-Geisser Q2” (greater than 0.0) (Hair et al.) [95].

4. Results and Analysis

4.1. Evaluation of the Study Outer Model

The first step in PLS-SEM analysis is to check the employed measuring tools. In this regard, researchers use different tests to ensure that the things which they are measuring (like PF or PSE) are being done accurately. They consider things like how well each question reflects the bigger idea that it is supposed to capture (indicator and construct loadings), how consistent the questions are (reliability), and if the questions are measuring what they say they are (validity). To this end, some of the critical tests used by researchers include Cronbach’s Alpha, Composite Reliability, and Average Variance Extracted.

When assessing indicator loadings, it is recommended that these values should ideally be above 0.70. This threshold indicates that the indicator can explain around 50% of the variance; this indicates improved reliability [96]. The results, presented in Table 2, demonstrate reliable loading indicators. To maintain internal consistency and reliability of the study’s constructs, it is recommended that CR and CA values should ideally range between 0.70 and 0.95 since this ensures improved reliability and validity [97]. As shown in Table 2, the results confirm that the desired threshold has been achieved. Furthermore, it is essential to conduct the AVE test to assess this study’s convergent validity. The recommended threshold for AVE is 0.50 or higher [96]. As shown in Table 2, the AVE values demonstrate their adherence to this threshold. Moreover, as shown in Table 3, the cross-loading values further confirm adequate discriminant validity. Compared to all other research dimensions, each item exhibits a strong correlation with its corresponding dimension.

The assessment of variable distinctiveness is crucial in this context. Therefore, to test discriminant validity, the factor-loading should exceed the cross-loading values (see Table 3). Furthermore, we implemented the test recommended by Fornell and Larcker [98]. The results, displayed in Table 4, highlight the existence of adequate discriminant validity. Moreover, by using the “Heterotrait-Monotrait Ratio” (HTMT) test, which provides a more precise evaluation [94], we analyzed the factors to determine how much empirical uniqueness was sustained from other factors in the structural model. As shown in Table 4, our findings demonstrate satisfactory results, with no values exceeding 0.90. Moreover, the “squared average variance extracted” for each variable (in bold) is greater than the inter-correlation values, which indicates that there are no significant discriminatory issues among the research constructs [99].

Table 2. Psychometric characteristics of the study scale.

| Factors | Cronbach’s Alpha | C.R (rho_a) | AVE |
|-----------------------------|------------------|-------------|-------|
| Threshold | >0.7 | >0.7 | >0.5 |
| Physical Fitness | 0.940 | 0.941 | 0.848 |
| Academic Performance | 0.874 | 0.899 | 0.798 |
| Physical self-esteem | 0.912 | 0.914 | 0.740 |
| Quality of Life | 0.960 | 0.961 | 0.863 |

Table 3. Cross-loadings.

| | Academic Performance | Physical Fitness | Physical Self-Esteem | Quality of Life | VIF |
|------------|----------------------|------------------|----------------------|-----------------|-------|
| Acd_Prfl_1 | 0.926 | 0.476 | 0.715 | 0.392 | 2.880 |
| Acd_Prfl_2 | 0.918 | 0.389 | 0.744 | 0.376 | 2.759 |
| Acd_Prfl_3 | 0.834 | 0.375 | 0.479 | 0.308 | 1.946 |
| Phys_Fit_1 | 0.462 | 0.892 | 0.458 | 0.626 | 2.851 |
| Phys_Fit_2 | 0.469 | 0.956 | 0.500 | 0.600 | 1.013 |
| Phys_Fit_3 | 0.450 | 0.955 | 0.469 | 0.584 | 1.918 |
| Phys_Fit_4 | 0.327 | 0.879 | 0.454 | 0.645 | 2.686 |
| QoL_1 | 0.417 | 0.656 | 0.542 | 0.946 | 3.114 |
| QoL_2 | 0.382 | 0.619 | 0.497 | 0.942 | 2.469 |
| QoL_3 | 0.380 | 0.606 | 0.518 | 0.949 | 2.610 |
| QoL_4 | 0.352 | 0.581 | 0.468 | 0.941 | 2.618 |
| QoL_5 | 0.347 | 0.626 | 0.473 | 0.863 | 2.742 |
| Self_est_1 | 0.640 | 0.530 | 0.871 | 0.521 | 2.839 |
| Self_est_2 | 0.649 | 0.457 | 0.855 | 0.457 | 2.733 |
| Self_est_3 | 0.639 | 0.407 | 0.872 | 0.458 | 2.809 |
| Self_est_4 | 0.644 | 0.420 | 0.868 | 0.463 | 2.991 |
| Self_est_5 | 0.600 | 0.370 | 0.833 | 0.412 | 2.455 |

Table 4. Fornell–Larcker criterion matrix and HTMT results.

| Dim. | AVE Square Root | Pearson's Correlation Matrix | | | |
|------------------------|-----------------|------------------------------|-------|-------|---|
| | | 1 | 2 | 3 | 4 |
| 1-Academic performance | 0.893 | 1 | | | |
| 2-Physical Fitness | 0.921 | 0.465 | 1 | | |
| 3-Physical self-esteem | 0.860 | 0.738 | 0.511 | 1 | |
| 4-Quality of life | 0.929 | 0.405 | 0.666 | 0.539 | 1 |
| HTMT | | | | | |
| 1-Academic performance | | | | | |
| 2-Physical Fitness | | 0.509 | | | |
| 3-Physical self-esteem | | 0.809 | 0.548 | | |
| 4-Quality of life | | 0.437 | 0.701 | 0.574 | |

4.2. Inner Model Evaluation

After finalizing the measurement model, we proceeded to test the structural model. The goodness of model fit showed a satisfactory result with NFI value of 0.965 and SRMR value of 0.045, which meet the fit criteria as suggested by Hair et al. [95]. Collinearity might play a vital role in how the model's variables affect the model's contributions. This study tries to address this issue by estimating the variance inflation factor VIF values that should be below the value of 5, according to Hair et al. [95], which imply that multicollinearity is not a relevant problem (See Table 3). Apart from this, the strength of the regression model is estimated by calculating the coefficient of determination which R2 and the Stone–Geisser Q2 denote. For Academic performance, the R2 value is 0.216, physical self-esteem is 0.580, and QoL R2 is 0.501, which are high R2 values as suggested by Hair et al. [94]. Likewise, Q2

is greater than the suggested number of which 0 shows good predictive power (academic performance $Q2 = 0.208$; physical self-esteem $Q2 = 0.254$; and QoL $Q2 = 0.440$) [94].

Table 5 details the correlations' results, the hypotheses' assessments, and relevant tests. This table offers an overview of the outcomes related to the hypotheses tested in this study. Table 5 shows that PHYS_FIT has a positive and significant impact on PSE ($\beta = 0.214$, $t = 5.040$, $p < 0.001$), on QoL ($\beta = 0.539$, $t = 7.655$, $p < 0.001$), and ACD_PRF ($\beta = 0.465$, $t = 8.785$, $p < 0.001$). Therefore, hypotheses H1, H2, and H3 are accepted. Furthermore, there is a positive and significant link between PSE and QoL ($\beta = 0.329$, $t = 4.466$, $p < 0.001$). Therefore, hypothesis H4 is accepted. Similarly, ACD_PRF has a positive impact on PSE ($\beta = 0.638$, $t = 14.071$, $p < 0.001$). Therefore, hypothesis H5 is accepted. However, among SwDs, ACD_PRF has no positive and significant impact on QoL ($\beta = -0.088$, $t = 1.320$, $p = 0.187$). Therefore, hypothesis H6 is rejected.

Table 5. Results of Inner Model.

| Hypothesis/Direct and Indirect Path Relation | Path Coefficient | sd | T-Statistic | Value of p | Results |
|--|------------------|-------|-------------|--------------|---------------|
| H1 Physical fitness → Physical self-esteem | 0.214 | 0.042 | 5.040 | 0.000 | Supported |
| H2 Physical fitness → Quality of life | 0.539 | 0.070 | 7.655 | 0.000 | Supported |
| H3 Physical fitness → Academic performance | 0.465 | 0.053 | 8.785 | 0.000 | Supported |
| H4 Physical self-esteem → Quality of life | 0.329 | 0.074 | 4.466 | 0.000 | Supported |
| H5 Academic performance → Physical self-esteem | 0.638 | 0.045 | 14.071 | 0.000 | Supported |
| H6 Academic performance → Quality of life | -0.088 | 0.067 | 1.320 | 0.187 | Not supported |
| H7 Physical fitness → Physical self-esteem → Quality of life | 0.070 | 0.020 | 3.485 | 0.000 | Supported |
| H8 Academic performance → Physical self-esteem → Quality of life | 0.210 | 0.046 | 4.571 | 0.000 | Supported |
| H9 Physical fitness → Academic performance → Quality of life | -0.041 | 0.031 | 1.319 | 0.187 | Not supported |

As shown in Table 5, the assessment of the mediating effects reveals that (with a positive and significant p -value) PSE successfully mediates the link between PHYS_FIT and QoL ($\beta = 0.70$, $t = 3.785$, $p < 0.001$). Similarly, PSE mediates the path between ACD_PRF and QoL ($\beta = 0.210$, $t = 4.571$, $p < 0.001$). Therefore, as illustrated in Table 5 and Figure 2, hypotheses H7 and H8 are accepted. However, ACD_PRF failed to mediate PSE's effect on QoL ($\beta = -0.041$, $t = 1.319$, $p = 0.187$). Therefore, hypothesis H9 is rejected.

From analyzing the coefficient of determination (R^2), which indicates the proportion of variances predictable by the factors being studied, it becomes apparent that PHYS_FIT, PSE and ACD_PRF can predict 50% of the variances in QoL. In addition, by using $Q2$, we evaluated the predictive relevance of this study's model. By showing that all $Q2$ values exceeded zero, this indicates the substantial predictive relevance of this study's model.

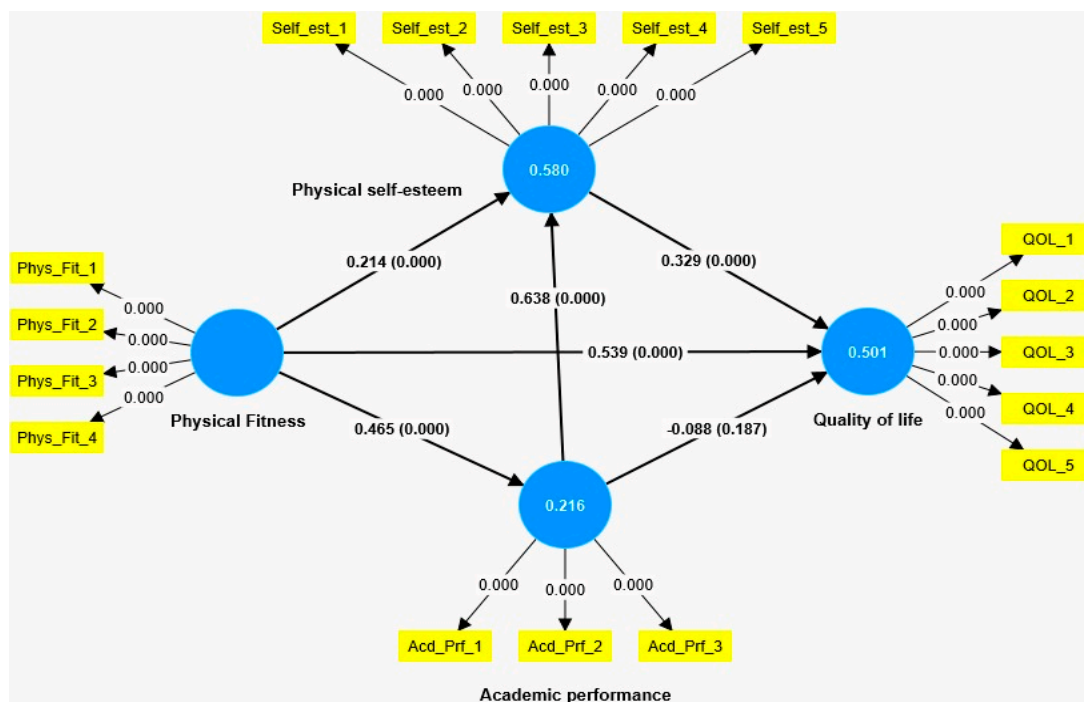


Figure 2. The Study Model.

5. Discussion

In this study, we aimed to determine the relationship between PHYS_FIT and QoL, and to identify the critical elements that influence the quality of the Saudi Arabia university SwDs. Accordingly, we examined the following relationships: the direct correlations between PHYS_FIT and PSE; between PHYS_FIT and QoL; between PHYS_FIT and ACD_PRF; between PSE and QoL; between ACD_PRF and QoL; and between ACD_PRF and PSE. In addition, we attempted to investigate the following: (1) the effect of PSE on the link between PHYS_FIT and QoL; (2) PSE's role as a mediator between ACD_PRF and QoL; (3) ACD_PRF's mediation effect on the relationships between PHYS_FIT, PSE and QoL; and (4) ACD_PRF's mediation effect on the relationship between (PHYS_FIT and QoL).

This study's findings show that PHYS_FIT has a beneficial direct impact on PSE. Our findings are consistent with earlier empirical research findings [37,39,44]. These studies indicate that, through enhanced physical and academic performance, biochemical and psychological effects, and increased self-efficacy and goal achievement PHYS_FIT directly impacts PSE. However, SwDs face unique challenges as their physical limitations can make it difficult to navigate buildings, attend classes, and participate in activities. This may cause feelings of loneliness and frustration that can affect their self-esteem.

Furthermore, this study's findings show that PHYS_FIT directly impacts QoL. These findings are consistent with those of previous research studies. In the context of a student's disability, PHYS_FIT can be a powerful tool used to enhance their independence, well-being, resilience, and overall QoL [47,50,53,56]. By creating accessible opportunities and celebrating individual achievements, universities can empower SwDs to thrive on their personal and academic journeys. This study's findings indicate that, consistent with previous studies' findings, PHYS_FIT positively impacts ACD_PRF [58–60]. Therefore, PHYS_FIT can be a valuable tool for SwDs to improve their cognitive function, to manage stress, and to boost their overall well-being. This can lead to a more positive learning environment and potentially contribute to better ACD_PRF. In addition, this study's findings, consistent with previous studies [61], demonstrate that ACD_PRF increases significantly in participants who engage in consistent physical activity routines. Consistent with the findings of the previous studies [71], this study's conclusions confirm the beneficial direct relationship between PSE and QoL for SwDs. By promoting a positive body image and fos-

tering self-acceptance, universities can contribute to improved social integration, increased motivation, better mental health, and ultimately a higher QoL for their students.

The relationship between ACD_PRF and QoL for SwDs is intricate and multidimensional. While academic success can positively impact well-being, this study's findings highlight a negative relationship between ACD_PRF and QoL. This finding can be interpreted as indicating that the pressure to succeed academically can be particularly intense for SwDs who might face additional challenges. Chronic stress and anxiety can have a negative impact on mental health and overall well-being. This study's finding is contrary to previous findings [100]. This study's findings show that there is a direct relationship between ACD_PRF and PSE. These findings confirm those of previous studies and emphasize the importance that physical education programs or participation in sports can help with SwDs' academic success and help to boost their PSE. On the one hand, the mastery of new skills and experiencing the joy of movement can contribute to a more positive body image [82]. On the other hand, this study's findings show that ACD_PRF does not improve the relationship between PHYS_FIT and QoL.

Furthermore, this study's findings demonstrate that, consistent with those of previous studies [101], PSE has a considerable impact on QoL. While PHYS_FIT directly improves health and some aspects of QoL for SwDs, PSE plays a crucial mediating role. By fostering a positive body image and self-confidence, universities can empower students' ACD_PRF through the full benefits of PA and lead them to experience an overall higher QoL.

This study's findings show that PSE mediates and improves the relationship between ACD_PRF and QoL. This finding adds to the study's conclusions regarding the context of SwDs. Therefore, students with a high sense of their own physical worth may be more inclined to value leading a healthy lifestyle, including getting enough sleep and managing their stress. These healthy habits can indirectly improve ACD_PRF and overall well-being, contributing to a higher QoL. These findings highlight the significance of PSE in promoting excellent educational outcomes. A few previous studies have investigated the relationship between PSE and actual state. This is despite there being a substantial relationship between quality of life, student conduct, and perceived academic competence. Therefore, high levels of PSE have a positive effect on ACD_PRF which, in turn, improves future QoL. Improved PHYS_FIT can lead to a more positive body image and increased confidence in physical abilities. This enhanced PSE can motivate students to participate in various activities, manage challenges, and, ultimately, experience a higher QoL. However, it is likely that the strength of this mediation depends on the specific disability and the student's circumstances.

This study's findings contribute to the current literature by reporting novel results. In this study, we aimed to understand how PSE and ACD_PRF mediated the link between PHYS_FIT and QoL. This study's findings demonstrate that PSE is crucial to improving the link between ACD_PRF and QoL. A single, moderate level of physical exercise significantly impacts a student's ability to integrate academic concepts and create a better learning environment, enabling participants to demonstrate increased levels of physical confidence. This suggests that shifting the university culture towards a "growth mindset", which values effort, progress, and individual strengths alongside ACD_PRF, reduces pressure and fosters a more supportive learning environment for all students.

6. Conclusions

There has been great focus on issues related to students with disabilities at the university level around the globe. The primary goal of fostering sustainable health and well-being is to reorient public policies and health services and community engagement in establishing sustainable, healthy settings that promote the Sustainable Development Goals (SDGs). Across the world, academic institutions and colleges offer their students, particularly those with disabilities (SwDs), a sustainable learning environment that is intended to motivate them to learn, exercise, and have good wellbeing [5].

This study examined the direct effects of physical fitness (PHYS_FIT), physical self-esteem (PHS), academic performance (ACD_PRF), and quality of life (QoL). We collected the data online using a self-reported questionnaire and received valid responses from 400 students. We used the SmartPLS 4 program and PLS-SEM to examine the collected data. This study's findings show that PHYS_FIT has a direct impact on PHS. The findings of this study supported prior research that found a positive association between PHYS_FIT and PHS [44]. This implies that when students have practiced additional exercise, this can help them to lose weight, tone their muscles, and help them to develop more endurance. They may feel more assured about how they look as a result of these adjustments.

University management and students' affairs department should develop sustainable policies that encourage students, especially those with disabilities, to do more exercise regularly. Frequent exercise improves students' general physical capacity, adaptability, and power. This sense of accomplishment in physical fitness practices might greatly increase trust in the possibilities of the student body. Students engaging in consistent physical activity can yield multiple advantages that surpass mere physical transformations. It can have a genuinely transformational effect on their sense of general well-being and PHS [102]. Our findings suggest that Saudi education institutions ought to create specialized disability PHYS_FIT support service departments to administer disability services including PHYS_FIT effectively.

Our finding shows that PHYS_FIT improves the QoL of students with disabilities. This finding is also aligned with the previous studies [47]. In conclusion, integrating physical fitness into daily activities and study curriculums can greatly enhance students' well-being. Universities should create a sustainable learning environment that allows students with disabilities to engage in physical activities as well as present chances for social networking, friendship-building, and meeting new individuals. All these practices might help to improve their QoL.

Our findings also show that PHYS_FIT improves the level of ACD_PRF. This confirms previous studies' findings [58]. This suggests that regular physical activity can increase blood flow to the brain, hence improving memory, attention span, and QoL [103]. Better comprehension and data interpretation may result from this. Thus, universities should pay much attention to the curriculum design and ensure that there are many non-class activities including sports and PHYS_FIT facilities.

In addition, our findings show that PHS and ACD_PRF both directly impact students' QoL. These findings also support previous studies [78,81].

The results of this study further demonstrate that PHS and ACD_PRF both mediate and increase the relationship between PHYS_FIT and QoL. Further research can utilize moderating variables like gender and student year of study to assess the model of this study in two other groups or in a different settings (population, industry, or country) and perform a multiple-group analysis. Universities should train staff, teachers, and student assistance providers to better appreciate the problems posed by disabilities and promote inclusive interactions.

7. Implications and Future Research

There are many valuable consequences, both academic and social, that arise from this study's findings. Saudi universities can assist students by supporting physical activities and identifying the specific desires of SwDs by encouraging reachable fitness programs. Saudi universities can inform their student unions, on the benefits of physical fitness for mental health, social commitment, and overall welfare.

Among the noteworthy scholarly ramifications is advocacy for inclusive education. Therefore, we recommend that Saudi Arabia universities foster an environment that is more inclusive by encouraging physical health and celebrating a range of talents. Positive social connections and a feeling of belonging are critical factors to help SwDs' well-being and academic success.

Practicing consistent exercise can be an influential instrument for Saudi universities to aid SwDs with less classes. Physical activity can improve health up to a greater extent and result in fewer cases of sickness due to improved immunity. Furthermore, taking these courses and promoting their desired objectives helps SwDs develop significant self-supporting skills to help them during their education journey. In addition, Saudi universities should include SwDs from the start when designing new fitness programs and before implementing them. This generates an additional comprehensive environment and guarantees the programs encounter SwDs' desires and needs.

Additionally, based on the research results, numerous policy guidelines can be recommended to improve the QoL and academic performance of vulnerable students in KSA. These policy guidelines include incorporating physical fitness practices into the academic core curriculum to promote a holistic methodology for university student development. Furthermore, offering additional academic assistance like coaching and homework support is vital for university students who require extra help to fulfill their academic objectives. Strengthening home-school collaborations is also vital to ensure consistent and continuous support for university students with disabilities across different circumstances. Partnership with community health organizations, fitness and sports centers is crucial to provide widespread support to vulnerable university students. Furthermore, supporting community residents in university volunteering can offer extra backing and mentorship for university students with disabilities, positively contributing to their overall QoL and academic success.

Finally, it is important to check how well these programs work. By listening to student feedback and looking at data, universities can adjust and improve them over time to encourage collaboration between community and university stakeholders and, thereby, ensure a thorough and well-coordinated approach to serving SwDs. Universities should consult SwDs before creating and implementing new physical fitness initiatives. These should be monitored continuously to ensure the effectiveness of such initiatives and, based on user feedback and statistical data, adjustments should be made as necessary.

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Data Availability Statement: Data are available upon request. Kindly contact the first author privately through e-mail.

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Appendix A

Table A1. The employed study scale.

| Scale Variables and Items | |
|--|-------------|
| Physical Fitness | |
| Muscular strength | |
| "I am as physically strong as I need". | |
| "An object that I can lift once with slight difficulty soon becomes strenuous when I attempt to lift it repeatedly". | Phys_Fit_1 |
| "I possess less muscular strength than most individuals my age". | |
| Flexibility | |
| "I possess greater muscular flexibility than most individuals my age". | |
| "I am very limber (flexible) individual". | Phys_Fit_2 |
| Body Composition | |
| "I do not need to alter (lose or gain) my weight in order to improve my physical health". | |
| "I am more overweight than most individuals my age (remove)". | Phys_Fit_3 |
| Cardiorespiratory fitness | |
| "I am in good physical condition". | |
| "I am better able to walk briskly for twenty minutes than most individuals my age". | Phys_Fit_4 |
| "I am more physically fit than most individuals my age". | |
| "When I exercise, I tire easily". | |
| "I need to improve my present overall physical condition". | |
| Physical self-esteem | |
| "Physically, I am happy with myself". | Self_est_1 |
| "Physically, I feel good about myself". | Self_est_2 |
| "I feel good about who I am and what I can do physically". | Self_est_3 |
| "I feel good about who I am physically". | Self_est_4 |
| "I feel good about the way I look and what I can do physically". | Self_est_5 |
| Quality of life | |
| "In most ways my life is ideal". | QoL_1 |
| "I am satisfied with my life". | QoL_2 |
| "The conditions of my life are excellent". | QoL_3 |
| "So far, I have gotten the important things I want in life". | QoL_4 |
| "If I could live my life over, I would change almost nothing". | QoL_5 |
| ACADEMIC PERFORMANCE | |
| "Engaging in physical fitness activities has enhanced my understanding of the course material". | Acad_Prfl_1 |
| "The use of physical fitness has led to a better learning experience in my study". | Acad_Prfl_2 |
| "Incorporating physical fitness has contributed to my better grasp of the subject matter". | Acad_Prfl_3 |

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