



Research article

Provision of Quality Physical Education to enhance the motive of Physical Activity and its underlying Behavior among university students

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ABSTRACT

Background: Physical activity (PA) plays a crucial role in promoting good health and an active lifestyle among university students. Quality Physical Education (QPE) program is instrumental in achieving sustainability in PA. Motivation is a key factor in encouraging PA in students. However, motivation alone may not lead to inclusivity unless quality components are thoughtfully integrated into physical education (PE) programs.

Aims: This study aimed to address three research questions: i) Can the motivation for PA participation be enhanced through the provision of high-quality PE programs in university settings? ii) Does the quality provision of PE contribute to promoting sustainable PA among adolescents? and iii) Is this carry-over process influenced by gender?

Methods: This cross-sectional study enrolled N = 610 university students, comprising 467 males and 143 females. Only students who had PE as a part of their coursework were included. These students participated in more than 27 different sports and had an average age of 20.76 years (SD = 3.47) and an average of 4.70 years (SD = 4.93) of athletic experience. To achieve the study's objectives, descriptive statistics (mean, SD), Pearson's correlation, and regression analysis were employed. Additionally, a 2 (Gender) by 2 (Type of Sport: Individual vs. Team) MANCOVA, with age as a covariate, was used to assess gender-based differences in the variables.

Results: The study found that the factors demonstrated strong reliability and positive correlations between QPE and exercise needs satisfaction. However, these factors did not establish significant correlations with PA. Perceived competence for exercise needs satisfaction showed gender differences, with males scoring higher. Additionally, QPE did not exhibit significant gender-based differences. In terms of PA, males had higher mean scores compared to females.

Conclusion: The provision of QPE was identified as a crucial determinant of exercise satisfaction competence among students. While QPE provision was adequate at the university level, it did not promote PA among females as anticipated.

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1. Introduction

The concept of Quality Physical Education (QPE), advocated by the United Nations Educational, Scientific, and Cultural Organization (UNESCO) in 1978, is aimed to establish a high standard of physical education (PE) provision in schools worldwide [1]. Remarkably, a customized QPE program not only encourages an active lifestyle but also fosters an understanding of the importance of promoting lifelong physical fitness. It includes elements of enhanced peer-led learning, which further enhances physical, social, and emotional well-being, and motor skills [2]. These domains collectively make a significant contribution to addressing three critical global challenges that have been further exacerbated by the recent COVID-19 pandemic: a 41 % decrease in physical activity (PA); deteriorating mental health, particularly among students; and inequality, which has negatively impacted PA participation among girls and disabled children [3]. The advancement of QPE deserves ongoing attention, as this field cultivates a well-rounded skill set that can enhance an individual's educational and employability prospects [1].

Physical activity (PA) is often regarded as the best 'pill' for promoting an active lifestyle [4]. Reflecting this perspective, the proverb 'Health is Wealth' resonates well, underscoring its essential role in shaping a sustainable and healthy future for students [5]. Consequently, sustainable physical activity (PA) [6] holds paramount importance in achieving optimal health and active living [7]. Regular engagement in PA yields multiple health benefits [8] and helps mitigate numerous health risks [9]. To realize these favorable outcomes, consistency in PA is recognized as the key factor (World Health Organization, 2010) [10]. According to both the World Health Organization (WHO) and the European Commission (EC), it is recommended that adults engage in a minimum of 150 min of moderate-intensity PA or 75 min of vigorous-intensity PA per week, or a combination of the two (World Health Organization, 2010) [10]. Failing to meet these recommendations results in physical inactivity, which is associated with an increased risk of various non-communicable diseases (NCDs) such as high blood pressure, diabetes, cancer, and others, as well as higher overall mortality rates [11]. Globally, over 5.3 million people, or 9 % of the population, succumb to physical inactivity-related causes annually [11].

The escalating global prevalence of physical inactivity stands as a pressing concern and aligns with the United Nations Sustainable Development Goals (SDGs) [4,5]. Baena-Morales et al. (2021) conducted research highlighting the connections between Physical Education (PE) lessons and the SDGs, emphasizing the role of students in fostering a more sustainable world [5]. Their study systematically assessed all proposed SDGs, shedding light on those relevant to physical activity (PA) and sports. However, the precise contribution of PE to Agenda 2030 remains unspecified [5]. Significantly, the alignment between the advancement of physical activity (PA) and the attainment of several SDGs is conceptually sound and substantiated by scientific evidence [4]. Quality Physical Education (QPE) plays a pivotal role in shaping our commitment to promoting lifelong PA, ultimately addressing the issue of PA dropout rates [12]. It is worth noting that PA dropout is a common experience among most students [13], necessitating an in-depth and cautious discussion of this matter.

Just six decades ago, Saudis led a simple and active life, relying solely on their daily physical labor to maintain their lean and petite physique [14,15]. However, the recent economic transformation and technological revolution have brought about significant changes in Saudi lifestyles. This transformation includes increased sedentary behavior, reduced physical activity, a growing fondness for sugary beverages, and a shift towards calorie-dense diets [14,15]. In short, all of these factors have substantially contributed to the increasing prevalence of non-communicable diseases (NCDs) in Saudi Arabia.

According to a 2021 report from Alarabia News, more than 25,000 people in Saudi Arabia lost their lives to cancer and diabetes in that year alone. Furthermore, it is projected that this number will double to 50,000 by 2025 [16]. Unfortunately, these debilitating conditions primarily affect adults between the ages of 20 and 39, and their root causes are physical inactivity, sedentary behavior, and unhealthy dietary habits. The exponential increase in non-communicable diseases in Saudi Arabia necessitates substantial dialogue to devise strategies for mitigating this escalating trend. In response to this health crisis, the concept of promoting a healthy and active lifestyle has been firmly integrated into the Saudi Vision 2030 initiative, which aims to "encourage widespread and regular participation in sports and athletic activities." [17,18].

According to UNESCO's 2013 report, at the primary level, children in Saudi Arabia receive approximately 120 min of physical activity (PA) per week. However, with the transition to the secondary level, this declined to just 45 min of PA per week [1]. This is less than what children in other neighboring countries receive, such as Qatar with 75 min per week, Kuwait with a range of 40–135 min per week, Bahrain with 65 min per week, Jordan with 45–60 min per week, and others. Furthermore, Saudi Arabia's PA level falls at the lower end of the middle average range of 40–160 min of PA per week, as reported by UNESCO in 2013.

1.1. Quality Physical Education, physical activity, and motivation

Motivation is considered a critical factor in encouraging and sustaining regular physical activity (PA). Motives are seen as intrinsic mechanisms that guide and motivate behavior, which can also be influenced by thoughts or emotions aligned with or contrary to those needs, including personal plans and expectations [19]. As a result, there is a commonality among the three different categories of internal motives—needs, cognitions, and emotions—offering a rationale for one's desire to engage in specific activities.

Both extrinsic and intrinsic motives play a role in the context of PA, as theorized in motivation studies [20]. It has also been observed that exercise goals can be either intrinsic or extrinsic, depending on their significance in achieving a desired outcome, such as weight reduction for achieving a fit and lean body shape [21]. Therefore, the promotion of Quality Physical Education (QPE) programs in educational settings, which encompasses staffing, facilities, policies, and more) serves as an incentive for students to engage and maintain regular PA [5]. However, it is important to note that student motivation alone may not foster inclusivity unless high-quality components are thoughtfully integrated into PE programs. In this context, the sustainability vision aims to assess whether QPE has access to sufficient resources to support the primary motivation for PA and corresponding student behavior, although concrete

evidence for this claim is limited.

The self-determination theory (SDT) provides a clear explanation of how motives can fulfill fundamental psychological needs, including relatedness (a sense of emotional connection with others), competence, and autonomy (the belief that one's actions are self-determined), all of which are essential foundations for fostering positive motivation and personal development [22]. To sustain PA, it is vital to promote intrinsic motivation (such as students' favorite sports), provide teacher support, enhance students' perceptions of their own competence, and emphasize the value of PA [4]. Community-based initiatives also play a crucial role. Ensuring adolescents have access to sufficient Quality Physical Education (QPE) is a prerequisite for attempting to enhance their motivation for PA. Questions regarding the availability of suitable PE facilities and a secure environment for PE, as raised by Ho and others (2012), are paramount [23]. The overarching question arising from these discussions is, 'Why, despite the numerous health benefits of PA, do we often struggle to promote sustainable PA for building a healthy, enduring future?'

1.2. This study

The concerning decline in children's participation in healthy activities like Physical Education (PE) [24] sharply contrasts with the increasing prevalence of screen time [25]. As teenagers transition from high school to college, research indicates a decline in physical activity (PA) [26]. The university years represent a critical period for cultivating and maintaining a healthy and active lifestyle. Regrettably, despite the numerous benefits associated with PA, a significant proportion of university students do not meet recommended guidelines. Promoting PA in educational institutions is advocated by fostering intrinsic motivation (favoring sports), providing teacher support, enhancing students' perceptions of their competence, and instilling the value of PA by educating students about its health benefits [27]. However, concerns arise regarding the connection between higher education and decreased PA since many universities worldwide rarely encourage student participation in PA [28].

Nonetheless, there is reason for optimism, as the college years also provide opportunities for individuals to develop healthy habits and lifestyles [26]. Moreover, a country's sustainable future, encompassing health, economy, and other aspects, hinges on nurturing a healthy younger generation. Establishing active lifestyle habits during adolescence is pivotal for a sustainable, healthy transition into adulthood. Consequently, it is imperative to understand both the personal and contextual factors influencing university students' engagement in PA [29,30]. Factors such as support from others, such as teammates or family members, and the planning and scheduling of activities hold significance in this context [27].

In this context, the sustainability vision seeks to determine whether there is sufficient support for Quality Physical Education (QPE) to promote the motivation for sustainable PA and the corresponding behavior among students. However, empirical evidence validating this claim is limited. Therefore, further research on QPE holds promise in elucidating students' motivations for sustainable PA. Grounded in self-determination theory, this study addresses three broad research questions as follows.

- Does the quality provision of PE programs in university settings enhance students' motivation for participation in PA?
- Does the quality provision of PE help promote sustainable PA among adolescents?
- Is this carry-over process influenced by gender?

2. Methodology

2.1. Permission

Permission to conduct this cross-sectional study (Reference number: 2021/PMU/3rd FS) was obtained from the Futures Research Office, Prince Mohammed Bin Fahad University, Kingdom of Saudi Arabia. Furthermore, this research grant is initiated through the collaboration of the Prince Mohammad Bin Fahd Center for Futuristic Studies (PMFCFS) and the World Futures Studies Federation (WFSF). Data for this study were garnered over a period spanning from November 2022 to February 2023.

2.2. Participants

To fulfill the study objectives $N = 610$ students (male ($n = 467$) and female ($n = 143$)) who were enrolled in PE courses participated. Participants were recruited from all university departments and were involved in >27 different sports. The participants had a mean age of 20.76 (SD = 3.47) years and a mean of 4.70 (SD = 4.93) years of athletic experience. Participation in the study was entirely voluntary and one could withdraw from the study without seeking prior permission from the PI. The data collection was completed within 4 months of the proposal's acceptance.

2.3. Procedure

After receiving grant approval, the principal investigator contacted the relevant authorities for data collection. Subsequently, participants were approached through the university's internal portal system, specifically targeting students who were required to study Physical Education (PE) as part of their degree program. Upon receiving confirmation of participation, students were provided with guidance on how to complete the survey. Participants were also informed about the survey's location on the university campus. The survey was conducted on various pre-scheduled dates, which were communicated to the participants in advance. The survey took place in lecture halls and classrooms at the PMU. This research adheres to the principles outlined in the Declaration of Helsinki. Before

commencing data collection, all participants received a comprehensive briefing on the study's objectives, along with the potential societal and personal benefits it could offer. Participants were informed that their involvement in the study was entirely voluntary, and they could withdraw from the survey at any time without prior permission. Additionally, the study maintained strict confidentiality to protect the privacy of personal information, including the anonymization of data wherever possible. Throughout the research process, a commitment to impartiality and non-discrimination was upheld, ensuring that no biases or discriminatory practices related to factors such as race, gender, age, or socioeconomic status influenced any aspect of the study. The questionnaire packet comprised two sections. The first section collected biographical details (e.g., age, sports involvement, number of years participating). Participants completed the questionnaires listed below in the second section.

2.4. Measures

Quality Physical Education: To assess the provision of QPE in university settings, the Professional Perception of QPE (PPQPE) scale developed by Ho, Ahmed, and Kukurova (2021) was utilized [31]. It comprises 48 items across eight dimensions, including skill development and bodily awareness ($\alpha = 0.935$), facilities and norms in PE ($\alpha = 0.932$), quality teaching of PE ($\alpha = 0.923$), plans for feasibility and accessibility of PE ($\alpha = 0.824$), social norms and cultural practices ($\alpha = 0.825$), governmental input for PE ($\alpha = 0.859$), cognitive skills development ($\alpha = 0.920$), and habituated behavior in physical activities ($\alpha = 0.933$). The questionnaire demonstrated excellent psychometric properties and internal consistency, with Cronbach's alpha values ranging from $\alpha = 0.824$ to $\alpha = 0.935$. Respondents used a 6-point agreement-rating scale that included three negative and three positive agreement responses with identical scores (e.g., strongly disagree = 1, mostly disagree = 2, slightly disagree = 3, moderately agree = 4, mostly agree = 5, and strongly agree = 6). Sample items included statements such as "University should have a safe and suitable environment for PE lessons" and "PE should be accessible to all children, regardless of their ability/disability, sex, age, cultural, race/ethnicity, religious, social, or economic background."

Need satisfaction: To gauge students' typical feelings about exercise, the Psychological Needs Satisfaction in Exercise (PNSE) Scale, developed by Wilson, Rogers, Rodgers, & Wild (2006), was employed [32]. This scale consists of 18 items and employs a 6-point Likert scale. It comprises three subfactors: i) PNSE-Perceived Competence (Original scale Cronbach $\alpha = 0.91$, Present study Cronbach $\alpha = 0.909$), with sample items including "Confident I can do challenging exercise" and "Confident in my ability to exercise"; ii) PNSE-Perceived Autonomy (Original scale Cronbach $\alpha = 0.91$, Present study Cronbach $\alpha = 0.874$), with items like "Free to choose exercises I participate in" and "Free to make my own exercise decisions"; and iii) PNSE-Perceived Relatedness (Original scale Cronbach $\alpha = 0.90$, Present study Cronbach $\alpha = 0.815$), featuring statements such as "Connected to people I interact with" and "Attached to exercise companions." Higher scores indicate greater satisfaction for each respective need. An example item is "I feel confident in my ability to do exercises that personally challenge me."

Physical Activity Assessment: To assess students' levels of moderate and vigorous physical activity during leisure time (MVPA), the Leisure Time Exercise Questionnaire (LTEQ) by Godin and Shepherd (1985) was administered [33]. Responses were collected on a 7-point scale, with the question being "Considering a 7-day period (a week), during your leisure time how often do you engage in any regular activity long enough to work up a sweat (heartbeats rapidly)?" Higher scores indicate more vigorous physical activity. The LTEQ has been widely used to identify the intensity and nature of activities. Students were asked if they had engaged in any of the listed physical activities for more than 15 min during their leisure time. Responses helped identify their involvement in activities for assessing cardiorespiratory fitness levels. Participants responded to items related to strenuous exercise (heart beats speedily), moderate exercise (not fatiguing), and mild exercise (nominal effort). Scores for strenuous, moderate, and mild exercise were multiplied by 9, 5, and 3 METs, respectively, and then summed to obtain an overall MVPA score [33].

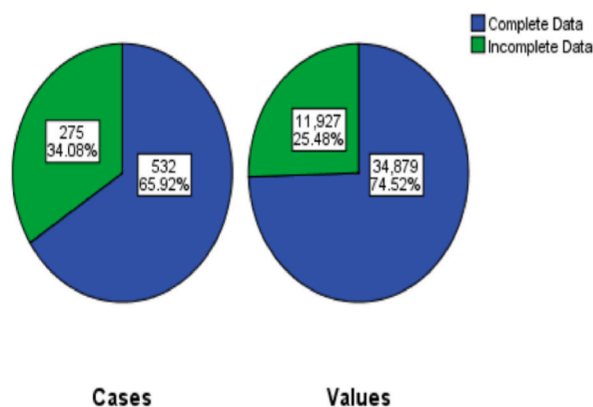


Fig. 1. Overall summary of missing data.

2.5. Data analysis

To measure the variability in the data and assess whether there was adequate provision for facilitating QPE programs, descriptive statistics (mean, standard deviation, percentages) were employed. To examine relationships among all variables, Pearson's correlation analysis was conducted. The reliability of the subfactors was assessed using Cronbach's alpha. Regression analysis was used to determine the extent to which QPE contributed to the prediction of PNSE. Lastly, to investigate whether this carry-over process is influenced by gender, multivariate analysis of covariance (MANCOVA) was performed. Data were analyzed using a 2 (Gender) by 2 (Type of Sport: Individual vs. Team) MANCOVA, with age serving as a covariate. In addition to the MANCOVA results, eta-squared (η^2) values were calculated and interpreted according to Cohen's (1988) guidelines, where 0.01 represents a small difference, 0.06 a medium difference, and 0.14 a large difference [34]. Analyses were performed using IBM SPSS and R (see Fig. 1).

2.6. Primary analysis

Missing data analysis: Invitations were sent to 850 subjects, with $N = 610$ (72.76 %) participants returning completed survey questionnaires (Fig. 1). To assess the missing-value patterns, Little's multivariate test of Missing Completely at Random (MCAR) (Little, 1988) was applied [35].

Little's test can identify differences in variables among subgroups that exhibit a similar pattern of missing data. The test yielded a χ^2 distance ($df = 2853$) = 3348.004, $p = 0.000$, indicating that the data were not missing completely at random at a significance level of 0.00 (Fig. 2). The frequency analysis of items using the MCAR test helped identify missing values that did not depend on other variables. Consequently, multiple imputations were employed to fill in the missing data in the dataset. This technique is effective in providing a robust assessment for data that is not missing completely at random, compared to other outdated approaches, such as listwise and pairwise deletion. An item analysis of the QPE questionnaire was conducted to examine participants' responses. To achieve this objective, frequencies and percentages for each individual statement were computed using the original unimputed dataset (see Fig. 2).

3. Results

Pearson's correlations revealed positive correlations between all the subfactors of QPE and the exercise need satisfaction subscales. However, none of the physical activity levels showed any correlation with either the QPE factors or the exercise need satisfaction. Notably, all the QPE factors and exercise need satisfaction subscales exhibited strong reliability scores (Table 1).

Multiple regression analysis (Table 2) was employed to assess whether the quality of PE (dependent variable) significantly predicted participants' exercise needs satisfaction and physical activity levels (predictors). Firstly, multicollinearity was checked for. The analysis did not detect any multicollinearity, as all the variables had a tolerance level < 0.1 and a VIF (variance inflation factor) > 10 . The regression results indicated that the three predictors combined explained 63.4 % of the variance ($R^2 = 0.40$, $F(3,606) = 135.95$, $p < 0.05$). It was found that QPE significantly predicted PNSE-Perceived Competence ($\beta = 0.199$, $p < 0.05$), PNSE-Perceived Autonomy ($\beta = -0.336$, $p < 0.05$), and PNSE-Perceived Relatedness ($\beta = -0.249$, $p < 0.05$). Furthermore, the three predictors for physical activity explained 15.5 % of the variance ($R^2 = 0.019$, $F(3,606) = 4.97$, $p < 0.05$). The overall model was statistically significant, $F(3, 606) = 135.95$, $p < 0.001$, accounting for 40.2 % of the variance in the criterion variable ($\eta^2 = 0.402$). It was found that QPE significantly predicted Moderate Exercise ($\beta = 0.088$, $p < 0.05$) and Mild Exercise ($\beta = 0.107$, $p < 0.05$). The model accounted for

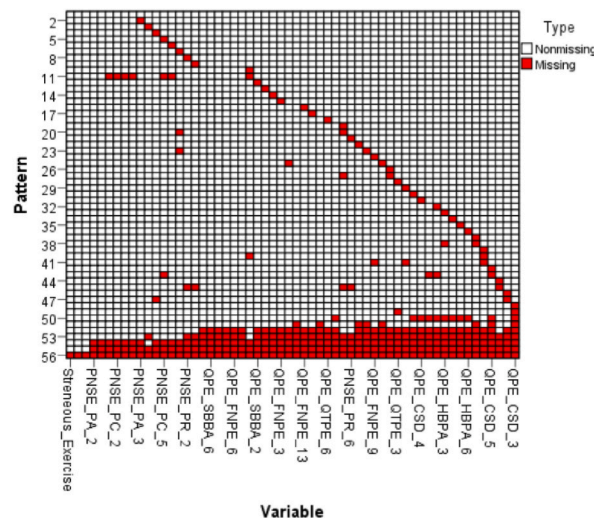


Fig. 2. Missing values patterns.

Table 1

Correlation matrix of the variables and Cronbach's alpha.

	Mean	SD	QPE SDBA	QPE FNPE	QPE QTPE	QPE CSD	QPE HBPA	PNSE Perceived Competence	PNSE Perceived Autonomy	PNSE Perceived Relatedness	Strenuous Exercise	Moderate Exercise	Mild Exercise	α
QPE SDBA	33.80	7.34	1	.856 ^a	.791 ^a	.638 ^a	.733 ^a	.478 ^a	.492 ^a	.478 ^a	-.006	.078	.101 ^b	.904
QPE FNPE	63.70	13.20		1	.844 ^a	.663 ^a	.784 ^a	.440 ^a	.515 ^a	.457 ^a	-.020	.109 ^a	.138 ^a	.943
QPE QTPE	28.55	6.36			1	.735 ^a	.794 ^a	.461 ^a	.496 ^a	.461 ^a	-.016	.076	.108 ^a	.886
QPE CSD	18.85	4.67				1	.778 ^a	.418 ^a	.473 ^a	.369 ^a	-.031	.120 ^a	.078	.894
QPE HBPA	28.40	6.30					1	.421 ^a	.464 ^a	.444 ^a	-.039	.122 ^a	.114 ^a	.891
PNSE Perceived Competence	26.67	7.06						1	.496 ^a	.494 ^a	.041	.116 ^a	.092 ^b	.909
PNSE Perceived Autonomy	27.90	6.59							1	.432 ^a	.007	.091 ^b	.039	.874
PNSE Perceived Relatedness	25.83	6.39								1	.017	.071	.098 ^b	.815
Strenuous Exercise	40.31	22.27									1	.054	.041	-
Moderate Exercise	20.21	9.98										1	.225 ^a	-
Mild Exercise	11.74	4.95											1	-

^a Correlation is significant at the 0.01 level (2-tailed).^b Correlation is significant at the 0.05 level (2-tailed).

Table 2
Regression analysis of factors.

Variables	R	R ²	Adjusted R ²	Sig.	F	Standardized Coefficients		Collinearity Statistics	
						Beta		Tolerance	VIF
QPE	.634 ^a	.402	.399	.000 ^a	135.95	–	–	–	–
PNSE-Perceived Competence				.000		.199		.658	1.520
PNSE-Perceived Autonomy				.000		.336		.708	1.413
PNSE-Perceived Relatedness				.000		.249		.709	1.410
Physical Activity	.155 ^b	.024	.019	.002 ^b	4.97	–	–	–	–
Strenuous Exercise				.422		–.032		.996	1.004
Moderate Exercise				.033		.088		.947	1.056
Mild Exercise				.009		.107		.948	1.054

Dependent Variable: Total QPE.

^a **Predictors:** (Constant), PNSE Relatedness, PNSE Autonomy, PNSE Competence.

^b **Predictors:** (Constant), Mild Exercise, Strenuous Exercise, Moderate Exercise.

approximately 2.39 % of the variance in the criterion variable ($\eta^2 = 0.02$).

To examine the interaction of the variables in male and female students, a MANCOVA was conducted with age and sports type as covariates. A main effect difference in Exercise satisfaction for Gender was observed, and the effect was large for PNSE Competence

Table 3
Descriptive statistics on the perception of Psychological Need Satisfaction for exercise between male and female students.

Psychological Need Satisfaction items	Male Mean ± SD	Female Mean ± SD	Total Mean ± SD	Total Male Mean ± SD	Total Female Mean ± SD	t	Sig. (2-tailed)	MD	η^2
Perceived Competence				27.22 ± 6.73	24.89 ± 7.79	3.47	.001	2.32	0.33
Confident I can do challenging exercise	4.68 ± 1.31	4.26 ± 1.52	4.58 ± 1.37	–	–	–	–	–	–
Capable of doing challenging exercises	4.38 ± 1.44	4.02 ± 1.55	4.29 ± 1.47	–	–	–	–	–	–
Capable of completing exercise challenges	4.60 ± 1.35	4.24 ± 1.42	4.51 ± 1.38	–	–	–	–	–	–
Able complete personal exercise challenge	4.49 ± 1.39	4.16 ± 1.49	4.41 ± 1.42	–	–	–	–	–	–
Confident in my ability to exercise	4.33 ± 1.44	3.92 ± 1.54	4.23 ± 1.48	–	–	–	–	–	–
Feel good about the ability to exercise	4.72 ± 1.33	4.28 ± 1.45	4.62 ± 1.37	–	–	–	–	–	–
Perceived Autonomy				28.10 ± 6.36	27.23 ± 7.26	1.38	.167	.871	0.13
Free to choose exercises I participate in	4.76 ± 1.37	4.58 ± 1.49	4.72 ± 1.40	–	–	–	–	–	–
Have a say in choosing exercises I do	4.51 ± 1.49	4.43 ± 1.56	4.49 ± 1.51	–	–	–	–	–	–
I am in charge of my exercise program decisions	4.56 ± 1.38	4.46 ± 1.45	4.54 ± 1.39	–	–	–	–	–	–
I decide what exercises I do	4.66 ± 1.34	4.55 ± 1.34	4.64 ± 1.33	–	–	–	–	–	–
Free to make my own exercise decisions	4.89 ± 1.29	4.65 ± 1.39	4.83 ± 1.32	–	–	–	–	–	–
Free to exercise in my own way	4.70 ± 1.40	4.53 ± 1.47	4.66 ± 1.42	–	–	–	–	–	–
Perceived Relatedness				26.19 ± 6.08	24.62 ± 7.18	2.58	.010	1.57	0.25
Connected to people I interact with	4.20 ± 1.54	3.85 ± 1.66	4.12 ± 1.57	–	–	–	–	–	–
Share a common bond with people	4.31 ± 1.45	4.01 ± 1.62	4.24 ± 1.50	–	–	–	–	–	–
Close to my exercise companions	4.54 ± 1.30	4.11 ± 1.51	4.44 ± 1.37	–	–	–	–	–	–
Sense of camaraderie with companions	4.34 ± 1.44	4.28 ± 1.57	4.32 ± 1.47	–	–	–	–	–	–
Get along with the people I interact with	4.36 ± 1.48	4.09 ± 1.56	4.29 ± 1.50	–	–	–	–	–	–
Attached to exercise companions	4.43 ± 1.39	4.27 ± 1.47	4.39 ± 1.41	–	–	–	–	–	–

Table 4
Descriptive statistics on the perception of quality physical education between male and female students.

Quality physical education items	Male Mean ± SD	Female Mean ± SD	Total Male Mean ± SD	Total Female Mean ± SD	t	Sig. (2-tailed)	MD	η ²
Skill Development and Bodily Awareness (SDBA)			33.88 ± 7.04	33.54 ± 8.26	.481	.631	.337	0.04
QPE enhances your physical skills.	4.88 ± 1.29	4.79 ± 1.46	–	–	–	–	–	–
QPE enhances students' knowledge of sport-related terms.	4.90 ± 1.23	4.77 ± 1.40	–	–	–	–	–	–
QPE enhances students' knowledge of different activities.	4.88 ± 1.23	4.86 ± 1.38	–	–	–	–	–	–
QPE gives students chances to learn and interact with classmates	4.81 ± 1.27	4.76 ± 1.36	–	–	–	–	–	–
QPE teaches students how important activity is to the process of growth.	4.85 ± 1.20	4.74 ± 1.43	–	–	–	–	–	–
QPE helps students understand how their bodies work.	4.85 ± 1.31	4.82 ± 1.40	–	–	–	–	–	–
QPE helps students to develop a habit of attending sports activities after school and use their spare time in sports wisely.	4.67 ± 1.37	4.78 ± 1.36	–	–	–	–	–	–
Facilities and Norms in Physical Education (FNPE)			63.83 ± 12.81	63.31 ± 14.45	.410	.682	.518	0.03
Schools should have a safe and suitable environment for PE lessons.	5.03 ± 1.31	5.05 ± 1.31	–	–	–	–	–	–
Schools should have safe and suitable equipment PE lessons.	5.02 ± 1.33	5.07 ± 1.28	–	–	–	–	–	–
Schools should have safe and suitable facilities for physical education lessons.	5.04 ± 1.30	4.99 ± 1.35	–	–	–	–	–	–
Students should be given opportunities for active learning in PE lessons.	4.94 ± 1.29	4.96 ± 1.26	–	–	–	–	–	–
Positive sport-related attitudes and values should form a major focus in learning.	4.89 ± 1.27	4.76 ± 1.41	–	–	–	–	–	–
Health knowledge should be regarded as one of the major areas of learning.	4.85 ± 1.32	4.70 ± 1.43	–	–	–	–	–	–
Different types of physical activities and associated knowledge should form the content through which young people learn.	4.85 ± 1.23	4.80 ± 1.28	–	–	–	–	–	–
The teaching and learning of PE should be fun and enjoyable.	4.97 ± 1.29	5.06 ± 1.27	–	–	–	–	–	–
Physical education should be a compulsory subject in school for all children.	4.76 ± 1.35	4.69 ± 1.41	–	–	–	–	–	–
Extension of PA opportunities after-school or extra-curricular/co-curricular activities is essential in helping students extend their learning experiences in sports and physical activities.	4.66 ± 1.30	4.67 ± 1.39	–	–	–	–	–	–
Teachers should be qualified to teach PE.	4.92 ± 1.31	4.93 ± 1.37	–	–	–	–	–	–
PE should be accessible to all children, whatever their ability/disability, sex, age, culture, race/ethnicity, religious, social, or economic background.	4.95 ± 1.29	4.80 ± 1.51	–	–	–	–	–	–
PE is the most effective means of equipping children with the skills, attitudes, values, knowledge, and understanding for lifelong PA and sport participation.	4.88 ± 1.28	4.76 ± 1.32	–	–	–	–	–	–
Quality Teaching of Physical Education (QTPE)			28.68 ± 6.18	28.15 ± 6.92	.863	.388	.525	0.08
Learn and develop basic skills in different physical and sports activities.	4.91 ± 1.27	4.94 ± 1.32	–	–	–	–	–	–
Demonstrate a basic understanding of the importance of physical activities and health.	4.88 ± 1.28	4.77 ± 1.46	–	–	–	–	–	–
Communicate ideas, and feelings effectively with others.	4.76 ± 1.34	4.72 ± 1.31	–	–	–	–	–	–
Basic motor skills within the context of appropriate physical activities of a low organization.	4.57 ± 1.37	4.49 ± 1.38	–	–	–	–	–	–
Demonstrate basic skills in decision-making, communication, etc.	4.76 ± 1.26	4.63 ± 1.32	–	–	–	–	–	–
At the middle-class level, developing appropriate health and fitness understanding that includes setting and achieving personal goals for healthy living.	4.77 ± 1.32	4.59 ± 1.48	–	–	–	–	–	–
Cognitive Skill Development (CSD)			18.86 ± 4.60	18.84 ± 4.89	.032	.975	.014	0.00

(continued on next page)

Table 4 (continued)

Quality physical education items	Male Mean ± SD	Female Mean ± SD	Total Male Mean ± SD	Total Female Mean ± SD	t	Sig. (2-tailed)	MD	η^2
Help students develop their critical thinking skills.	4.72 ± 1.38	4.71 ± 1.36	-	-	-	-	-	-
Enhance students' ability in problem-solving.	4.67 ± 1.39	4.63 ± 1.44	-	-	-	-	-	-
Raise students' innovative thinking.	4.71 ± 1.35	4.71 ± 1.39	-	-	-	-	-	-
Raise students' independent thoughts.	4.72 ± 1.36	4.63 ± 1.45	-	-	-	-	-	-
Help students develop socially acceptable moral thinking and conduct.	4.69 ± 1.40	4.77 ± 1.36	-	-	-	-	-	-
Habituated Behavior in Physical Activities (HBPA)			28.50 ± 6.13	28.08 ± 6.84	.689	.491	.415	0.06
Demonstrate suitable decisions on actions for maintaining healthy living.	4.77 ± 1.29	4.73 ± 1.31	-	-	-	-	-	-
Demonstrate a habit of regular exercise.	4.82 ± 1.29	4.79 ± 1.36	-	-	-	-	-	-
Understand the relationship between physical and sports activities and personal and social development.	4.82 ± 1.27	4.70 ± 1.30	-	-	-	-	-	-
Take up suitable responsibilities to serve sports clubs or other related activities in school or the community.	4.59 ± 1.30	4.56 ± 1.30	-	-	-	-	-	-
Develop advanced proficiency in different physical and sports activities.	4.77 ± 1.28	4.63 ± 1.36	-	-	-	-	-	-
Develop necessary skills of participation in and out-of-school programs available within the community and which have the potential for lifelong long involvement and participation	4.71 ± 1.32	4.65 ± 1.40	-	-	-	-	-	-

Df = 608.

(Wilks' $\lambda = 0.98$, $F(1, 608) = 9.16$, $p < 0.003$, $\eta^2 = 0.015$). Additionally, a main effect of Sports Type was identified for PNSE Relatedness (Wilks' $\lambda = 0.97$, $F(1, 608) = 4.617$, $p < 0.010$, $\eta^2 = 0.015$). No interaction effect (Gender * Sports Type) was observed. A main effect difference in Physical Activity for Gender was noted, and the effect was moderate for Mild Exercise (Wilks' $\lambda = 0.96$, $F(1, 608) = 11.73$, $p < 0.000$, $\eta^2 = 0.013$), Strenuous Exercise (Wilks' $\lambda = 0.97$, $F(1, 608) = 8.03$, $p < 0.012$, $\eta^2 = 0.013$), and Moderate Exercise (Wilks' $\lambda = 0.97$, $F(1, 608) = 6.79$, $p < 0.009$, $\eta^2 = 0.011$). The subfactors of QPE did not show any significant differences between the sexes.

The results of the participants' scores for Psychological Need for Exercise Satisfaction are presented in Table 3. When considering the mean score, male participants exhibited a higher Psychological Need for Exercise Satisfaction than female participants. Independent samples t-tests were conducted to compare the three subfactors of Psychological Need for Exercise Satisfaction scores for male and female adolescent students. There was a significant difference in the Perceived Competence for Exercise Satisfaction scores for male students ($M = 27.22 \pm 6.73$) and female students ($M = 27.23 \pm 7.26$; $t(608) = 3.47$, $p < 0.05$, two-tailed). The magnitude of the difference between the means ($MD = 2.32$, 95 % CI) was large ($\eta^2 = 0.33$). This implies that male students have significantly higher Perceived Competence Need Satisfaction for Exercise than female students. However, the subscales of Perceived Autonomy for Exercise Satisfaction scores for male students ($M = 28.10 \pm 6.36$) and female students ($M = 24.89 \pm 7.79$; $t(608) = 1.38$, $p > 0.05$, two-tailed); and Perceived Relatedness for Exercise Satisfaction scores for male students ($M = 26.19 \pm 6.08$) and female students ($M = 24.62 \pm 7.18$; $t(608) = 2.58$, $p > 0.05$, two-tailed) did not show any significant differences.

The results of the participants' perception of the quality provision of PE in the school setting scores are presented in Table 4. Independent samples t-tests were conducted to compare the five subfactors of QPE scores for male and female adolescent students. None of the subfactors, Skill Development and Bodily Awareness (SDBA) scores for male students ($M = 33.88 \pm 7.04$) and female students ($M = 33.54 \pm 8.26$; $t(608) = 0.481$, $p > 0.05$, two-tailed); Facilities and Norms in Physical Education (FNPE) scores for male students ($M = 63.83 \pm 12.81$) and female students ($M = 63.31 \pm 14.45$; $t(608) = 0.410$, $p > 0.05$, two-tailed); Quality Teaching of Physical Education (QTPE) scores for male students ($M = 27.22 \pm 6.73$) and female students ($M = 24.89 \pm 7.79$; $t(608) = 3.47$, $p > 0.05$, two-tailed); Cognitive Skill Development (CSD) scores for male students ($M = 27.22 \pm 6.73$) and female students ($M = 24.89 \pm$

Table 5
Descriptive statistics on Physical activity levels between male and female students.

Physical activity levels	Range	Min.	Max.	Mean ± Std. Deviation Male	Mean ± Std. Deviation Female	Mean ± Std. Deviation Total	t	Sig. (2-tailed)	MD	η^2
Strenuous Exercise	162.00	.00	162.00	41.75 ± 23.88	35.62 ± 15.02	40.31 ± 22.27	2.89	.004	6.12	0.28
Moderate Exercise	110.00	.00	110.00	20.77 ± 10.05	18.39 ± 9.57	20.21 ± 9.98	2.50	.013	2.37	0.24
Mild Exercise	36.00	.00	36.00	12.11 ± 4.67	10.55 ± 5.60	11. ± 74 ± 4.95	3.33	.001	1.56	0.32

7.79; $t(608) = 3.47$, $p > 0.05$, two-tailed); and Habituated Behavior in Physical Activities (HBPA) scores for male students ($M = 27.22 \pm 6.73$) and female students ($M = 24.89 \pm 7.79$; $t(608) = 3.47$, $p < 0.05$, two-tailed) showed any significant differences between the scores of male and female students. The magnitude of the difference between the means of the subfactors such as SDBA ($MD = 0.337$, 95 % CI) was small ($\eta^2 = 0.04$), FNPE ($MD = 0.518$, 95 % CI) was small ($\eta^2 = 0.03$), QTPE ($MD = 0.525$, 95 % CI) was small ($\eta^2 = 0.08$), CSD ($MD = 0.014$, 95 % CI) was small ($\eta^2 = 0.00$), and HBPA ($MD = 0.415$, 95 % CI) was small ($\eta^2 = 0.06$). This implies that male and female students did not show any significant difference in their perception of QPE provision in their university setting.

The results for the physical activity levels of students are presented in Table 5. When considering the mean score, male students are involved in more physical activities than their female counterparts. Independent samples t-tests were conducted to compare the physical activity levels between active and inactive students. The strenuous PA levels of male students ($M = 41.75 \pm 23.88$) were significantly higher than female students ($M = 35.62 \pm 15.02$; $t(608) = 2.89$, $p < 0.05$, two-tailed). The magnitude of the difference between the means ($MD = 6.12$, 95 % CI) was large ($\eta^2 = 0.28$). Similarly, the moderate PA levels of male students ($M = 20.77 \pm 10.05$) were significantly higher than female students ($M = 18.39 \pm 9.57$; $t(608) = 2.50$, $p < 0.05$, two-tailed). The magnitude of the difference between the means ($MD = 2.37$, 95 % CI) was large ($\eta^2 = 0.24$). Additionally, the mild PA levels of male students ($M = 20.77 \pm 10.05$) were significantly higher than female students ($M = 10.55 \pm 5.60$; $t(608) = 1.56$, $p < 0.05$, two-tailed). The magnitude of the difference between the means ($MD = 1.56$, 95 % CI) was large ($\eta^2 = 0.32$).

4. Discussion

The present study commences by examining whether the quality of Physical Education (PE) programs in university settings enhances psychological needs satisfaction related to exercise among Saudi Arabian university students. It also explores whether the provision of Quality Physical Education (QPE) contributes to the sustainability of physical activity (PA) and whether this carry-over process is influenced by gender.

Perceived competence refers to an individual's assessment of their ability to derive satisfaction from exercise. The study revealed a significant difference in perceived competence related to exercise satisfaction between male and female students. Male students reported a higher mean score ($M = 27.22$, $SD = 6.73$) compared to female students ($M = 24.89$, $SD = 7.79$). This difference may be attributed to the fact that male students are more likely to associate their perceived competence with their enjoyment of physical activities, while individuals with lower self-esteem may perceive the opposite effect [36]. Notably, studies have consistently reported a high prevalence of physical inactivity, particularly among Saudi women [37,38], which has contributed to a significant increase in obesity rates among women [14]. Various barriers, including household responsibilities, limited gym facilities, cost considerations, and a lack of motivation, have been identified as reasons for low physical activity levels in Saudi women [39–42]. Additionally, societal and cultural norms play a significant role in shaping women's attitudes toward physical activity [43]. These norms have limited women's participation in public physical activity and social events, increasing mental pressure and restricting their ability to engage in physical activity [44]. Until 2019, women in schools and universities did not receive adequate information on health and physical activity, which further reinforced societal norms discouraging their participation in public physical activities [45,46]. In this context, the importance of designing exercise programs that consider individuals' perceived competence or attainable levels becomes crucial for promoting sustainable physical activity.

Perceived competence plays a vital role in the acquisition of new exercise skills. Additionally, perceived autonomy and perceived relatedness regarding exercise satisfaction did not exhibit significant differences between genders. This suggests that both male and female students perceive their university programs as effective in delivering Quality Physical Education (QPE). They may believe that PE curricula promote self-awareness about their bodies, weight management, and provide a structured curriculum with suitable equipment and facilities for QPE advancement. The lack of gender-based differences in responses suggests that both genders acknowledge the program's accountability and expectations. They may perceive QPE as instrumental in developing creativity, enhancing problem-solving skills, promoting moral behavior, and fostering socially acceptable thinking. QPE may also help students understand the connection between physical and sporting activities and personal and social growth.

Regarding the mean scores of PA levels (Strenuous, Moderate, and Mild Exercise), male students outperformed their female counterparts. This finding aligns with previous studies indicating a similar pattern of higher physical activity levels among males. Alqahani et al. (2020) reported that only 28.30 % of males participated in physical activity, while in females, only 8.90 % engaged in PA [47]. This gender disparity can be attributed to cultural factors limiting women's access to opportunities for physical activity compared to males. This may confine women to activities they can perform within their homes. The recent technological transformation has also contributed to increased screen time, sedentary behavior, and physical inactivity [14,37].

Aljehani et al.'s (2022) study on female university students further supports the reduction of physical activity among women. The study found that around 62 % of students failed to meet the WHO's guidelines for vigorous activity, and 70 % did not achieve 150 min of moderate activity per week [48]. Various barriers, such as heavy academic workloads, limited sports facilities, gender roles, and cultural norms, were identified as hindrances to women's participation in physical activity. Notably, female students prioritize academics over physical activity, often opting for rest in their free time. Challenges such as the lack of footpaths for pedestrians, hot environmental conditions, and cultural dress codes further discourage outdoor exercise. Parental safety concerns also limit the duration of physical activity outside the home. However, the study indicated that students who engage in physical activity tend to be motivated by factors such as body image, tangible results, and positive outcomes. Family support, general health concerns, and recognition also play a role in motivating participation in sports and physical activity.

5. Conclusion

In conclusion, this study enhances our understanding of gender differences in perceived competence related to exercise satisfaction among university students in Saudi Arabia. The findings highlighted that males tend to score higher in perceived competence, suggesting a strong association between their enjoyment of physical activities and their perceived competence. This reveals the need for a focused effort to increase the participation of female students in physical activity, as it may positively impact their self-assessment of abilities and contribute to enhancing perceived competence in exercise satisfaction. The study demonstrates the adequacy of QPE in the university setting, as both male and female students perceive these programs as instrumental in delivering a holistic and beneficial educational experience. The lack of significant gender-based differences in responses indicates that both genders acknowledge the accountability and expectations set by QPE curricula. They perceive these programs as essential contributors to self-awareness, weight management, and the advancement of Quality Physical Education.

6. Implications

Despite the effectiveness of QPE, the study brings attention to the observed lower levels of participation in physical activity among female students. To address these disparities, there is a crucial need for interventions that encourage and support female students' participation in physical activity. Tailoring university PE programs to be more inclusive, considering cultural and societal norms, can contribute to breaking barriers (*if any*) that hinder female students from engaging in physical activities. This approach aligns with the broader goal of promoting a healthier and more active lifestyle among all students. The study's findings suggest potential areas for further research, including exploring specific interventions that may effectively increase female participation in physical activity within the Saudi Arabian university context. Additionally, investigating the role of cultural and societal norms in shaping attitudes toward physical activity (mixed method analysis) among female students could provide valuable insights for designing targeted interventions.

Data availability

The data supporting the findings of the study are available upon request. Due to the nature of the data and ethical considerations, it cannot be publicly accessible. However, authors are committed to transparency in research.

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CRedit authorship contribution statement

Md. Dilsad Ahmed: Writing – review & editing, Writing – original draft, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Zuhair Al Salim:** Writing – review & editing, Formal analysis.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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