ORIGINAL ARTICLE

Health and skill-related physical fitness of physiotherapy students: An observational study

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ABSTRACT

Physiotherapy is a physically demanding profession. Health and skill-related physical fitness should be emphasized in physiotherapy students for both the personal benefit on their own health and injury prevention and for the sustainability of their ability to meet job demands. This study aims to assess levels of health and skill-related physical fitness in undergraduate physiotherapy students in Jordan. A cross sectional study of 109 physiotherapy students; 23 males aged 19.57 (1.44) years and 86 females aged 20.02 (2.61) years. The following health and skill-related physical fitness components were assessed: body mass index (BMI), modified sit and reach, partial curl-up, push-ups, vertical jump, 20-m shuttle run, handgrip strength, 4x10 shuttle run, and star excursion balance tests. Most of the students had normal BMI (65.1%) but levels of physical fitness were mainly poor and below average except for hamstring flexibility which was excellent. Lack of normative data on agility and dynamic balance in healthy adults who are not athletes limited determining their level in our students. The results mainly demonstrated poor levels of health-related physical fitness of Jordanian physiotherapy students, which could have a significant effect on their performance and increase their risk of injury. Dynamic balance and agility results are presented for the first time in healthy adults (not athletes) which could be used in future research. It is suggested to encourage commitment towards lifestyle modification and health behaviour and increase awareness of the physical demands of the profession.

Keywords: Sport medicine, Fitness assessment, Physiotherapy, Risk of injury, Injury prevention, Agility, Dynamic balance.

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INTRODUCTION

Physiotherapists are role models in commitment to a healthy lifestyle, they have a significant role in health and physical activity promotion (Bello, Bonney, & Opoku, 2016; Multani, Bhawna, & Singh, 2013). Also, physiotherapy as a profession is physically demanding. Therefore, it is expected of physiotherapists to have high levels of physical fitness to fulfil their roles (Bello et al., 2016; Multani et al., 2013). Physical fitness is defined as "*the ability to carry out daily tasks with vigour and alertness, without undue fatigue and with ample energy to enjoy leisure pursuits and to meet unforeseen emergencies*" (Caspersen, Powell, & Christenson, 1985). It is divided into health-related physical fitness which includes body composition, cardiorespiratory endurance, muscle strength, endurance, and flexibility, as well as skill-related physical fitness which involves speed of movement, balance, agility, and co-ordination (Corbin, Pangrazi, & Franks, 2000).

Physical fitness is to be emphasized in physiotherapy students for both the personal benefit on their own health and injury prevention and for the sustainability of their ability to meet job demands. Health-related physical fitness is necessary as students are required to attend multiple and lengthy practical sessions in different courses in addition to full days in clinical placements which involve performing a wide range of therapeutic exercises, transfer techniques, and gait training. Skill-related fitness mastery is similarly important to be able to demonstrate what they are asking patients to do and to decrease risk of injury, as decreased balance increased the risk of lower extremity injury in healthy adults (Phillip A. Gribble, Hertel, & Plisky, 2012). Furthermore, achieving a good level of physical fitness might be one possible solution to decrease work-related musculoskeletal disorders. Musculoskeletal pain is common among physiotherapy students worldwide, with pain was mainly reported in the neck, low back, and shoulder regions followed by the knees and ankles (Mirza, Roslan, & Bahri, 2019; Multani et al., 2013; Nyland & Grimmer, 2003).

Studies assessing health-related physical fitness in physiotherapy students focused on the evaluation of level of cardiorespiratory fitness and found poor and below average results in both genders (Fotynyuk, 2017; Juhkam & Vaher, 2019; Mahajan & Rawat, 2020; Multani et al., 2013; Parmar & Vaghela, 2015; Pawaria, Kalra, & Pal, 2017). However, assessing other health-related fitness components is similarly significant to meet the demands of the profession. A few studies investigated strength, flexibility, and body composition with variable results which could be explained using different tests and cut off points (Bello et al., 2016; Juhkam & Vaher, 2019; Mirza et al., 2019). Skill-related physical fitness components have not been extensively assessed in physiotherapy students. One study assessed the change over 10 years and reported a decrease in right and left spinning co-ordination over time, but levels of performance were not reported (Lewandowski, Sarwinska, Siedlaczek, & Piekorz, 2020). Another study found poor results of speed-power using long jump from the spot test, however their normative data were not accessible as they were reported in Ukrainian (Fotynyuk, 2017). Likewise, levels of balance performance have not been previously assessed in physiotherapy students.

Therefore, the purpose of this study is to assess levels of health-related and skill-related physical fitness in undergraduate physiotherapy students in Jordan. This data can be used to provide an insight into physiotherapy students' fitness levels to raise awareness and help plan appropriate measures to improve these levels, such as launching campaigns to increase awareness, incorporating exercise sessions for undergraduate physiotherapy students during their studies, or to include assessment of physical fitness level before enrolling into physiotherapy degree.

MATERIAL AND METHODS

Participants

A convenience sample of 109 physiotherapy students from the School of Rehabilitation Sciences at The University of Jordan were recruited through social media. Students with health conditions that could affect their participation such as asthma or rheumatoid arthritis (confirmed by self-report) were excluded from the study. The demographic characteristics of the participants are presented in Table 1. Of the 109 physiotherapy students, six male students (26.1%) and four female students (4.7%) were smokers.

Table 1. Characteristics of the participants. Results are represented as mean (SD) unless otherwise stated.

Gender (n)	Males (n = 23)	Females (n = 86)
Age (years)	19.57 (1.44)	20.02 (2.61)
Weight (Kg)	75.34 (15)	59.32 (10.94)*
Height (cm)	176.35 (5.51)	162.42 (5.87)*
BMI (Kg/m^2)	24.15 (4.15)	22.48 (3.9)
Hand Dominance n (%)	Left 6 (26.1%) Right 17 (73.9%)	Left 3 (3.5%) Right 83 (96.5%)
Systolic blood pressure (mmHg)	124.78 (16.41)	109.56 (8.55)*
Diastolic blood pressure (mmHg)	71.96 (7.03)	66.57 (7.87)*
Resting heart rate (beats/minute)	76.87 (9.66)	80.70 (9.05)
Exercising n (%)	8 (34.8%)	17 (19.8%)
Type of exercise/ sport n (%)	Gym 5 (21.7%), Volleyball 1 (4.3%), Taekwondo 1 (4.3%), Martial arts 1 (4.3%)	Walking 6 (7%), Online videos 2 (2.3%), Gym 4 (4.7%), Yoga 1 (1.7%), Swimming 1 (1.7%), Taekwondo/karate 2 (2.3%), Table tennis 1 (1.7%)
Frequency of exercise/sport per week	4.25 (1.83)	4.76 (1.39)
Exercise duration/session (minutes)	84.38 (27.70)	66.76 (48.02)

*Note. *Significant difference between male and female students ($p < .001$).*

Procedures

Ethical approval was obtained from the research ethics committee (IRB) at Jordan University Hospital. All methods were carried out in compliance with the latest guidelines and regulations of the Declaration of Helsinki. The participants provided informed written consent prior to participation in the study. To avoid bias in data collection, a research assistance unfamiliar with the students performed the assessments. To ensure their anonymity, participants were assigned identification numbers. Finally, our results were reported based on the Strengthening the Reporting of Observational studies in Epidemiology (STROBE) guidelines (von Elm et al., 2007).

Demographic data were recorded in addition to systolic and diastolic blood pressure and resting heart rate. To control for confounding variables, students were informed to wear loose and comfortable clothing, to drink enough water in the 24 hours before testing, and not to smoke, eat, or have caffeinated drinks for at least three hours before testing (American college of sports medicine, 2014).

Measures

The following physical fitness assessments were performed:

Body Mass Index (BMI)

BMI is commonly used as an indirect measure of body composition (American college of sports medicine, 2014). The prevalence of musculoskeletal disorders increased with high BMI (Narendrasinh & Mulla, 2015). It was calculated and classified as recommended by the World Health Organization (Weir & Jan, 2019).

The modified Sit and Reach test

Low back pain was associated with tight hamstrings (Mistry, Vyas, & Sheth, 2014). The modified sit and reach test assess hamstring extensibility (Mayorga-Vega, Merino-Marban, & Viciana, 2014). The test uses a wooden box (dimensions 30cm x 30cm x 30cm) and 1-meter-long wooden ruler attached to the top of it where the zero point of the ruler would touch the tips of the middle fingers of the students' extended arms while long sitting against a wall (starting point). The students were requested to reach forward as far as they can on the ruler with their arms straight without bending their knees. One practice trial was performed followed by three test trials and the average distance was used for analysis. The students were instructed to exhale as they reach forward, avoid fast or sudden movements, and stretch till they feel mild discomfort. Results were compared with normative data (McArdle, Katch, & Katch, 2000).

The partial Sit-up/curl-up test

Strengthening the abdominal muscles, as part of the core muscles, decreased low back pain (Kumar, Kumar, Nezamuddin, & Sharma, 2015). Curl-up test was done to assess abdominal strength and endurance. Students started in a crook lying position on a mat with the middle finger of each hand placed on a strip of tape located at a distance of 12cm away from the end of the mat (starting position). Abdominal strength was determined based on the number of curl-ups that reached the end of the mat performed continuously at rate of 2-3 repetition/second using a metronome (40 beats/minute). The test was stopped if the students were unable to reach the end of the mat, cannot perform another repetition, cannot perform the test with regular cadence, or reached 75 sit-ups (Canadian Society for Exercise Physiology, 2003). Results were compared with normative data (Faulkner, Sprigings, McQuarrie, & Bell, 1989).

Push-ups

Upper limb endurance is negatively correlated with shoulder pain (Eraslan, Gelecek, & Genc, 2013), a common complaint in physiotherapy students. Therefore, push-ups were performed to assess upper limb endurance; male students performed standard push-ups whereas female students did the modified technique. The maximum number of push-ups performed without rest was recorded. The test was terminated if the student failed to perform the test two consecutive times or strained forcibly (Canadian Society for Exercise Physiology, 2003). Results were compared with normative data (Canadian Society for Exercise Physiology, 2003).

Maximum handgrip strength

Handgrip strength was positively correlated with shoulder function (Horsley, Herrington, Hoyle, Prescott, & Bellamy, 2016). It was assessed using the Jamar analogue hand dynamometer in kilograms according to the recommendation of the American Society of Hand Therapists (Fess, 1992). Both hands were assessed and the mean of three trials for each hand with 1 minute rest in between was used for analysis. The dominant hand was determined by self-report. Normative data are available to interpret the results (Shaheen, Omar, & Ali, 2021; Werle et al., 2009).

Vertical jump test

Lower limb strength was positively associated with dynamic balance (Forte, Boreham, De Vito, Ditroilo, & Pesce, 2014). A decrease in dynamic balance would increase risk of injury in healthy adults (Phillip A. Gribble

et al., 2012). To assess lower limb strength, the distance between the standing reach height and the highest distance the students could reach jumping vertically was recorded to the nearest 0.5 cm. Three jumps were performed with 1-minute rest in between and the longest distance was used for analysis (Payne, Gledhill, Katzmarzyk, Jamnik, & Keir, 2000). Normative data for young adults have been reported (Payne et al., 2000).

20-m shuttle run test

A valid test for the assessment of cardiorespiratory endurance is the 20-m shuttle run test (Mayorga-Vega, Aguilar-Soto, & Viciana, 2015). The students ran between 2 points, 20m apart, pacing themselves according to an audio signal starting with a speed of 8.5 km/h, which was increased by 0.5 km/h per minute (1-minute equals to one stage). The test finished when the student failed to reach the end lines concurrent with the audio signals on two consecutive occasions. Otherwise, the test ended when the student stopped because of fatigue. The maximal oxygen consumption (VO_{2max}) was calculated from this test according to the equations of Leger et al. (Leger, Mercier, Gadoury, & Lambert, 1988):

$$VO_{2max} \text{ (for 18 years and older)} = -27.4 + 6.0\ S$$

where S is the final speed (S = 8 + 0.5 x number of last stage completed).

Normative data in healthy adults using the 20-m shuttle run test are unavailable. However, our VO_{2max} data were compared with normative values for VO_{2max} calculated from treadmill testing (gold standard) (American college of sports medicine, 2014).

4X10m shuttle run test

Adding agility training to a balance exercise program significantly decreased risk of lower limb injury (Hrysomallis, 2007). To assess speed of movement, agility and coordination, students ran as fast as they could between two parallel lines 10 meters apart picking up a sponge after crossing the lines on each side. The time taken to cover a distance of 40m was recorded (Ortega et al., 2008). Normative data are currently unavailable.

Star excursion balance test (SEBT)

Improved dynamic balance would decrease risk of injuries such as chronic ankle instability and patellofemoral pain syndrome (Phillip A. Gribble et al., 2012). It was assessed using the original protocol described by Robinson and Gribble (Robinson & Gribble, 2008). The farthest distance the students could reach in the anterior, anterior-lateral, anterior-medial, medial, lateral, posterior, posterior-lateral, and posterior-medial directions was assessed. To decrease learning effects; the leg to start with, the direction to start with, and the order of testing (clockwise or anticlockwise) were randomized (Robinson & Gribble, 2008). To account for lower limb length variations between participants, excursion distances were normalized to lower limb length measured in supine from the anterior superior iliac spine to the medial malleolus (P. A. Gribble & Hertel, 2003). Each participant started with four practice trials in each direction followed by three test trials with two minutes rest in between. The average of the three trials was used for analysis. Normative data for dynamic balance normalized to leg length are unavailable. Results are presented for the right and left legs as balance is not affected by leg dominance (Schorderet, Hilfiker, & Allet, 2021).

Analysis

Data were checked for normality using the Kolmogorov–Smirnov test. Means, standard deviations, frequencies, and percentages were calculated to describe the sample and levels of physical fitness. To enable comparison with other studies, the difference between male and female students in demographic

characteristics and in each of the physical fitness tests was investigated using the independent sample t-test for parametric data or the Mann-Whitney U test for non-parametric data. To compare between sides for both the SEBT and handgrip strength test, paired t-test or Wilcoxon signed-rank test were used for parametric and non-parametric data, respectively. All statistical tests were performed using SPSS (version 25, IBM, New York, USA), and level of significance was set at $p < .05$.

RESULTS

Body Mass Index (BMI)

Table 2 demonstrates the classification of BMI. There was not a significant difference between genders ($p = .08$).

Table 2. Classifications of BMI according to the World Health Organization (n (%)).

BMI	Males (n = 23)	Females (n = 86)	Total (n = 109)
Underweight <18.5 kg/m^2	0 (0%)	13 (15.1%)	13 (11.9%)
Normal 18.5-24.99 kg/m^2	15 (65.2%)	56 (65.1%)	71 (65.1%)
Overweight 25-29.9 kg/m^2	6 (26.1%)	13 (15.1%)	19 (17.4%)
Obese > 30 Kg/m^2	2 (8.7%)	4 (4.7%)	6 (5.5%)

The modified Sit and Reach test

The majority of students had excellent flexibility (Table 3). However, male students had significantly better results compared to females ($p = .006$).

The partial Sit-up/curl-up test

Most students had poor and below average abdominal strength and endurance (Table 3). However, the male students had significantly better results compared to females ($p < .001$).

Push-ups

Below average and poor results were found for upper limb endurance in most students (Table 3). There was not a significant difference between genders ($p = .17$).

Maximum handgrip strength

Both genders had below average grip strength (Table 3). There was not a significant difference in grip strength between the dominant and non-dominant hands in male ($p = .14$) and female students ($p = .3$). On the other hand, male students had a significantly stronger grip strength compared to females ($p < .001$).

Vertical jump test

All students had poor and below average performance on this test with significantly better results for male students ($p < .001$) (Table 3).

20-m shuttle run test

Levels of cardiorespiratory fitness are presented in Table 4. All physiotherapy students had poor cardiorespiratory fitness. However, male students had significantly better results compared to females ($p < .001$).

Table 3. Results of health-related physical fitness tests.

Physical fitness test	**Males (n = 23)**	**Females (n = 86)**	***p*-value**
Modified sit and reach test(cm)			
Mean (SD)	28.8 (7.6)	24.1 (7)	
Excellent n (%)	20 (87)	70 (81.4)	
Above average n (%)	3 (13)	3 (3.5)	<.001
Average n (%)	-	1 (1.2)	
Below average n (%)	-	-	
Poor n (%)	-	12 (14)	
Partial sit-up test (number)			
Mean (SD)	33.6 (26)	17 (15.7)	
Excellent n (%)	2 (8.7)	1 (1.2)	
Above average n (%)	5 (21.7)	4 (4.7)	<.001
Average n (%)	1 (4.3)	9 (10.5)	
Below average n (%)	7 (30.4)	21 (24.4)	
Poor n (%)	8 (34.8)	51 (59.3)	
Dominant handgrip strength (Kg)			
Mean (SD)	39 (7)	21.8 (5.2)	
Above average n (%)	1 (4.3)	16 (18.6)	<.001
Average n (%)	3 (13)	3 (3.5)	
Below average n (%)	19 (82.6)	67 (77.9)	
Push-up test (number)			
Mean (SD)	24 (15.2)	18.9 (10.9)	
Excellent n (%)	6 (26.1)	16 (18.6)	
Above average n (%)	4 (17.4)	11 (12.8)	.17
Average n (%)	2 (8.7)	22 (25.6)	
Below average n (%)	1 (4.3)	26 (30.2)	
Poor n (%)	10 (43.5)	11 (12.8)	
Vertical jump test (cm)			
Mean (SD)	44.3 (11)	24.9 (6.3)	
Excellent n (%)	2 (8.7)	2 (2.3)	
Above average n (%)	5 (21.7)	3 (3.5)	<.001
Average n (%)	1 (4.3)	12 (14)	
Below average n (%)	7 (30.4)	16 (18.6)	
Poor n (%)	8 (34.8)	53 (61.6)	
Non-dominant handgrip strength (Kg)			
Mean (SD)	40.3 (7.1)	22 (5.7)	
Above average n (%)	2 (8.7)	31 (36)	<.001
Average n (%)	7 (30.4)	10 (11.6)	
Below average n (%)	14 (60.9)	45 (52.3)	

4X10m shuttle run test

It was not possible to stratify the data according to levels of performance as normative data using this test are lacking. The male students needed less time to complete the test (15.1 (1.6) seconds compared to 17.8 (2.4) seconds) and were significantly better than females ($p < .001$).

Table 4. Cardiorespiratory fitness using the 20m shuttle run test (mean (SD)).

	Males (n = 23)	**Females (n = 86)**	***p*-value**
Level (number)	3.4 (1.4)	1.7 (0.8)	< .001
Shuttles (number)	4.0 (1.2)	3.1 (1.4)	< .001
VO_{2max} ($ml.kg^{-1}.min^{-1}$)	30.9 (4.3)	25.8 (2.5)	< .001
Speed (km/h)	9.7 (0.7)	8.9 (0.4)	< .001

Table 5. Mean and standard deviation results of star excursion balance test normalized to leg length.

	Males (n = 23)		***p*-value**	**Females (n = 86)**		***p*-value**
Direction (%)	Right	Left		Right	Left	
Anterior	104.5 (12.1)	107 (15.7)	.21	103.2 (12.3)	103.5 (12.1)	.75
Anteromedial	96.8 (14.5)	101.2 (20.2)	.10	97.5 (16.2)	98.8 (17)	.29
Anterolateral	98.8 (28.8)	99.9 (29.7)	.76	97.6 (20.8)	96.9 (20.4)	.83
Medial	84.3 (33.3)	86 (32.2)	.54	82.3 (31.6)	86.1 (30.4)	.06
Lateral	94 (30.7)	92 (32.2)	.43	80.3 (27.3)	80.3 (26.2)	.69
Posterior	92.2 (15.6)*	90.7 (22.1)*	.58	77.6 (16.4)*	80.2 (17.2)*	.13
Posteromedial	91.5 (18.3)*	87.4 (24.4)	.10	79.8 (19.5)*	80.4 (18.8)	.69
Posterolateral	97.4 (22.2)*	87.5 (25.6)	.07	80.3 (16.4)*	81.2 (16.5)	.52

*Note. *Significant difference between male and female students.*

Star excursion balance test

The results of dynamic balance are presented in Table 5. Non-significant difference was observed between the right and left legs in males and females ($p > .05$). Moreover, there was a non-significant difference between genders in all directions except for the posterior, posteromedial, and the posterolateral directions on the right leg ($p < .001$) in addition to the posterior direction on the left leg ($p < .001$), where male students showed better performance.

DISCUSSION

Good level of physical fitness is essential for physiotherapists to meet the demands of the profession and decrease risk of injury. This is the first study to comprehensively assess health-related and skill-related physical fitness in physiotherapy students. Most of our students had normal BMI but levels of physical fitness were mainly poor and below average except for hamstring flexibility which was excellent. Lack of normative data on agility and dynamic balance limited determining their level in our students. However, male students performed significantly better than females.

The BMI of our participants was in the normal range; however, they demonstrated poor levels of physical fitness. Conflicting results were reported on the association between BMI and physical fitness; Parmar and Vaghela (Parmar & Vaghela, 2015) reported they were inversely correlated, whereas Mahajan and Rawat (Mahajan & Rawat, 2020) found an insignificant correlation and justified their results by the small sample size of previous studies. Moreover, results were contradictory on the association between BMI and work-related musculoskeletal disorders; one study reported the prevalence increased in physiotherapists with high BMI (Narendrasinh & Mulla, 2015), while another study found the prevalence increased in physiotherapists (61%) with normal BMI (Mirza et al., 2019). Our participants had normal BMI and poor fitness levels which could increase risk of work-related musculoskeletal disorders because of sustained static postures and repetitive movements for long periods of time.

Previous studies investigating hamstring flexibility in physiotherapy students demonstrated it ranged between good (Juhkam & Vaher, 2019; Multani et al., 2013) and poor flexibility (Bello et al., 2016; Fotynyuk, 2017), where females had better flexibility using the sit and reach test (Bello et al., 2016) explained by their increased muscle viscoelasticity (Spernoga, Uhl, Arnold, & Gansneder, 2001). Our participants had excellent flexibility with significantly better results in males compared to females (28.8 (7.6) cm and 24.13 (7) cm, respectively), which could be justified by the higher percentage of exercising males compared to females (34.8% and 19.8%, respectively).

Contrary to our results, good abdominal muscle strength and endurance (Juhkam & Vaher, 2019) and good upper extremity endurance and lower extremity strength (Mahajan & Rawat, 2020) were found in physiotherapy students in Estonia and India, respectively. Moreover, students in one college in Estonia had average and below average upper extremity endurance compared to excellent results in another college, which was explained by the students' training regime (Juhkam & Vaher, 2019). As for handgrip strength, like our results, poor handgrip strength of the dominant and non-dominant sides was reported in one college in Estonia whereas it was significantly better in another college. This difference between colleges was attributed to variability in level of physical activity and participation in sports in addition to inconsistencies in the assessment method and use of different dynamometers by both colleges.

Our participants had poor cardiorespiratory endurance when comparing their VO_{2max} results in the 20m shuttle run test with those of the gold standard. Like our results, students from different countries had poor and below average levels of cardiorespiratory endurance (Bello et al., 2016; Fotynyuk, 2017; Mahajan & Rawat, 2020; Parmar & Vaghela, 2015). One study only with a small sample size (n = 40) reported average cardiorespiratory endurance using the Harvard step test (Pawaria et al., 2017). Currently there are not published norms for the 20m shuttle run test on healthy adult populations. Future studies should establish normative values in adult populations to help determine levels of cardiorespiratory fitness.

Speed of movement, agility and coordination could improve performance and decrease risk of injury (Hrysomallis, 2007). Results of agility assessment in adults using the 4X10 shuttle run test have only been reported in athletes (39). Lack of normative data in healthy adults hindered determining our participants' levels of performance. Furthermore, dynamic balance could predict risk of lower extremity injury (Phillip A. Gribble et al., 2012). Normative data for dynamic balance assessed using the SEBT normalized to leg length in healthy adults not athletes are also lacking. Our study reported results of dynamic balance normalized to leg length in the eight directions of the SEBT in healthy physiotherapy students to enable future comparisons with other studies. The significant difference in the posteriorly directed excursions in males compared to females could be explained by the increased muscle activation of medial hamstring and biceps femoris in these directions (Earl & Hertel, 2001). However, those were not assessed in this study.

Variation in results among studies should be considered as numerous physical fitness tests and age groups were investigated, small sample size, and mandatory physical education classes in some studies with limited details possibly affect the generalization of the results. A limitation to our study is lack of normative data in Jordan therefore comparisons were made with other populations. Normative data are influenced by ethnic variations thus the results should be interpreted taking this into consideration. Moreover, details of exercises performed by the students and their commitment were lacking thus comparing the level of fitness between exercising and non-exercising students was not possible. On the other hand, this is the first study to assess health and skill-related physical fitness components including agility and balance in physiotherapy students. Future studies should investigate normative data in Jordan populations and assess variables such as level of physical activity to assist in interpreting the results.

CONCLUSION

Across studies, the variation in levels of physical fitness among physiotherapy students was large possibly due to factors such as different cultures, program entry requirements and enrolment policies in different countries. Our results mainly demonstrate poor levels of health-related physical fitness of physiotherapy students, which could affect their performance and increase their risk of injury. Dynamic balance results using SEBT and agility results using 4X10 shuttle run test are presented for the first time in healthy adults not athletes which could be used in future research. It is suggested to encourage commitment towards lifestyle modification and increase awareness of the physical demands of the profession possibly within the curriculum. Moreover, it is recommended to provide sustainable opportunities that offer physical activity campaigns, exercise programs and sport participation to students to improve or maintain their fitness level. A feasible exercise program was delivered to our students and its effect on physical fitness will be published in a future study.

AUTHOR CONTRIBUTIONS

Conception: Al-Khlaifat L. Methodology: all authors. Data collection: Al-Khlaifat, L., Muhaidat, J., Qutishat, D., & Okasheh, R. Statistical analysis and results interpretation: all authors. Manuscript preparation: all authors. All authors approved the published version of the manuscript.

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DISCLOSURE STATEMENT

No potential conflict of interest were reported by the authors.

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The study complies with the current laws of the country in which they were performed.

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