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Normative Values of Six-Minute Walk Distance for Healthy Saudi Girls

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Abstract: The six-minute-walk test is a reliable and valid functional test for assessing exercise tolerance and endurance. The lack of the six-minute walk distance (6MWD) reference values from normal, healthy children hinders the clinical usefulness of this test for children. The purpose of this study is to provide reference values of the 6MWD for Saudi healthy girls. One hundred and thirty-six Saudi healthy students girls, aged from 6 to 11 years, participated in the study. Students were recruited from different local primary schools that are located in five sections of Riyadh city (central, north, south, west and east). Height, weight, body mass index (BMI) percentile and the 6MWD were measured for each student. The overall mean of the 6MWD was 595.77 ± 61.35 meters with a maximum value of 755 meters and a minimum value of 420 meters. The 6MWD was increased with age increment reaching to maximum mean value of 647.95±53.56 meters at 10 years. The results revealed a positive correlation between the 6MWD and age (r=0.580) as well as between the 6MWD and height (r=0.609). This study provided the first reference values for 6MWD for Saudi healthy girls in Riyadh aged from 6-11 years.

Key words: Functional capacity · Six-minute-walk test · 6MWT · Six-minute-walk distance · 6MWD

INTRODUCTION

Functional exercise capacity is a measuring method of the individual's ability to perform meaningful tasks on a safe and dependable basis aiming to collect information about the functional limitations of a person with medical impairment [1]. The assessment of functional capacity reflects the ability to perform activities of daily living (ADL) that require sustained aerobic metabolism. The integrated efforts and health of the pulmonary, cardiovascular and skeletal muscle systems dictate an individual's functional capacity [2].

There are several modalities of functional exercise testing designed to evaluate and answer different clinical questions. Some provide a very complete assessment of all systems involved in exercise performance, whereas others provide basic information but are simpler to perform. The selection of clinical exercise testing modality should be based on the clinical question to be addressed, facilities and available resources. The most popular clinical exercise tests in order of increasing complexity are stair climbing, six-minute-walk test (6MWT), shuttle-walk test, cardiac stress test and cardiopulmonary exercise test [3].

The current gold standard for assessing one's aerobic exercise response is the maximum incremental cardiopulmonary exercise test. However, most ADL are performed at submaximal levels of exertion. Using submaximal functional tests would provide a more realistic simulation of one's physical capability [4]. The 6MWT is a submaximal exercise test that could be performed by a patient not tolerating maximal exercise test such as those with congestive heart failure or chronic lung disease [5]. The walk tests require less technical expertise and equipment, making them inexpensive and easy to administer. The 6MWT is a reliable and valid functional test for assessing exercise tolerance and endurance [6].

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The 6MWT is a practical simple test that requires a 100-feet (30 meters) hallway. It measures the distance that a person can quickly walk on a flat, hard surface in a period of 6 minutes described as the six-minute-walk distance (6MWD). It evaluates the global and integrated responses of all the systems involved during exercise, including the pulmonary and cardiovascular systems, systemic circulation, peripheral circulation, blood, neuromuscular units and muscle metabolism. It does not provide specific information on the function of each of the different organs and systems involved in exercise or the mechanism of exercise limitation [3].

Most patients do not achieve maximal exercise capacity during the 6MWT; instead, they choose their own intensity of exercise and are allowed to stop and rest during the test. However, because most ADL are performed at submaximal levels of exertion, the 6MWD may better reflect the functional exercise level for daily physical activities [3].

According to the American Thoracic Society (ATS) [3], the strongest indication for the 6MWT is for measuring the response to medical interventions in patients with moderate to severe heart or lung disease. The 6MWT has also been used as a one-time measure of functional status of patients, as well as a predictor of morbidity and mortality. It can also be used to assess functional capacity in patients with heart failure, primary pulmonary hypertension, asthma, cystic fibrosis, ischemic heart disease and chronic lung disease by comparing values with norms. However, there is a lack of paediatric standard reference for the 6MWT.

Lack of 6MWD reference values for normal, healthy children hinders the clinical usefulness of this test in the paediatric age group [7]. Few studies established reference values of the 6MWT for healthy children. Roush *et al.* [8] have established reference values of 6MWT for healthy children aged between 7.5 to 9 years from Arizona. They reported a mean walking distance of 581.7 meters (m) for boys and 532.2 m for girls. Li *et al.* [7] reported a mean walking distance of 680.9 m for boys and 642.7 m for girls. Lammers *et al.* [9] reported a mean 6MWD of 470±59 m for children aged between 4-11 years. Geiger *et al.* [10] stated that the median 6MWD increased from the age of 3 to 11 years in boys and girls alike and increased further with increasing age in boys (from 667.3 m to 727.6 m), whereas it essentially plateaued in girls (655.8 m to 660.9 m). Alameri *et al.* [11] stated that Saudi adult populations have significantly shorter 6MWD than those reported for other ethnic groups. Casanova *et al.* [12] stated that in healthy subjects, there were geographic variations in 6MWD.

These previous studies showed that the normal references for 6MWD could differ among ethnic populations. Until now, data on normal values of the 6MWD performed according to ATS standards for healthy children living in Arabic countries are very rare and highly warranted in order to have comparative data for children with disease. Therefore; the purpose of this study was to provide reference standards values of the 6MWD for Saudi healthy girls aged between 6 to 11 years. We hypothesized that there is specific standard values of the 6MWD for the Saudi healthy girls aged between 6-11 years that may differ from other investigated healthy children of racial differences.

MATERIALS AND METHODS

Subjects: With a target population of school students between 6 and 11 years, a convenience sample of 136 Saudi healthy students girls were recruited (Table 1) from ten local primary schools located in five sections (central, north, south, west and east). Students were selected from two randomly selected schools in each section. Subjects were included if they: a) Saudi healthy girls, b) aged from 6 to 11 years, c) had normal weight according to BMI-for-age percentile for girls (from 5th percentile to less than the 85th percentile) [13].

Study Design: We conducted a cross-sectional study to specify normal reference values of the 6MWT for Saudi healthy girls aged between 6 to11 years.

Instrumentation for Data Collection: Vital signs monitor (2009 Shenzhen Mindary Bio-Medical Electronics Co., Ltd., China) was used to measure heart rate (HR), blood pressure (BP) and blood oxygen saturation (SpO_2). It is reliable for determining HR, BP and SpO_2 10 minutes before and one minute after the 6MWT [4]. A digital weight/height scale was used to measure height and weight. BMI-percentile-for-age Calculator [14] was used to measure BMI-percentile-for-age. Required equipments for 6MWT were stopwatch, mechanical lap counter, two

Table 1: Number of participants according to their age.

Age (Years)	6	7	8	9	10	11
Number of Students	22	23	29	21	20	21

small cones to mark the turnaround points, a chair that can be easily moved along the walking course, brightly colored tape and worksheets (Appendix I).

Procedures: Approval from the Ministry of Education and the participated schools as well as written consent from students' parents or legal guardians was obtained before starting the study. After collecting the consents forms, the students were examined by the school's physician for the inclusion and exclusion criteria. In the examination area that was prepared in each school, each student was asked to remove her shoes in preparation to stand on the digital weight/height scale. The height in centimeter (cm) and weight in kilograms (kg) of each student were measured. The BMI percentile was calculated by the use of an Internet website address [14]. The students with BMI percentile that was between 5th percentile to less than the 85th percentile participated in the study. From 160 examined students, only 136 were eligible and participated in the study.

A same corridor length was prepared with the same environment in each participated school. The 6MWT was performed in the morning at 7:30 am, indoors, along a long, flat, straight, enclosed corridor with a hard surface that is seldom traveled. The length of the corridor was 30-meters and marked every 3-meter. The turnaround points marked with a cone (such as an orange traffic cone). A starting line marked on the floor using brightly colored tape.

For 6MWT administration, students were asked to wear appropriate comfortable shoes, a light meal was acceptable before early morning test, students had not have exercised vigorously within 2 hours of beginning the test, no "warm up" period before the test was allowed and each student was tested separately with no other students in the examination area.

The Following Procedures were Applied Systematically with Each Student: Each student sat at rest in a chair, located near the starting position, for at least 10 minutes before the test. During this time, the examiner made sure that clothing and shoes were appropriate. The examiner also completed the data collection form and the first portion of the 6MWT worksheet. Finally, the examiner measured HR, BP and SpO_2.

The examiner set the lap counter to zero and the timer to 6 minutes. The examiner then assembled all necessary equipment (lap counter, stopwatch and 6-MWT worksheet) and moved to the starting point.

The examiner instructed the student as follows "The object of this test is to walk as far as possible for 6 minutes. You will walk back and forth in this hallway. Six minutes is a long time to walk, so you will be exerting yourself. You will probably get out of breath or become exhausted. You are permitted to slow down, to stop and to rest as necessary. You may lean against the wall while resting, but resume walking as soon as you are able. You will be walking back and forth around the cones. You should pivot briskly around the cones and continue back the other way without hesitation. Now I'm going to show you. Please watch the way I turn without hesitation". The examiner demonstrated by walking one lap, she walked and pivoted around a cone briskly. "Are you ready to do that? I am going to use this counter to keep track of the number of laps you complete. I will click it each time you turn around at this starting line. Remember that the object is to walk as far as possible for 6 minutes, but don't run or jog. Start now or whenever you are ready".

The examiner then positioned the student at the starting line. The examiner did not walk with the student. As soon as the student started to walk, the examiner started the stopwatch. Each time the student had returned to the starting line, the examiner clicked the lap counter once.

After each minute of the test, the examiner told the student in an even tone "You are doing well" and informed her about the remaining time. The examiner did not use other words of encouragement (or body language to speed up).

If the student stopped walking during the test and need a rest, the examiner said this: "You can lean against the wall if you would like; then continue walking whenever you feel able." The examiner would not stop the timer. If the student stopped before 6 minutes and refused to continue, the examiner wheeled the chair over for the student to sit on, discontinued the walk and noted on the 6MWT worksheet the distance, the time stopped and the reason for stopping prematurely. When the timer was 15 seconds from completion, the examiner said this: "In a moment I'm going to tell you to stop. When I do, just stop right where you are and I will come to you." When the timer had rung (or buzzed), the examiner said this: "Stop!" and walked over to the student. The examiner marked the spot where the student stopped by placing a piece of tape on the floor. Directly after the test, HR, BP and SpO_2 were re-measured.

The number of laps from the counter and the additional distance covered (the number of meters in the final partial lap) were recorded. The total distance walked was then calculated, rounding to the nearest meter and recorded on the 6MWT worksheet.

There was no need to stop the 6MWT for all the participated students as nothing of the following signs occurred during the application: chest pain, intolerable dyspnea, leg cramps, staggering, diaphoresis and/or pale appearance.

Data Analysis: All data were entered and analyzed in statistical package for the social sciences (SPSS) version 16 for Windows. A descriptive statistics including means and standard deviations for age, height, weight, BMI percentile and 6MWD were performed for the students in each age group as well as for all students. A descriptive statistics including means and standard deviations for HR, BP and SpO_2, were also performed for the students in each age group as well as for all students before and after the application of the 6MWT. Paired sample t-test was conducted to test the significant difference between the pre-measures and post-measures of HR, BP and SpO_2 for the students in each age group as well as for all students. Pearson correlation coefficients were calculated to determine the relationship between 6MWD and age as well as between 6MWD and height. Comparative studies were then conducted between the mean differences of the 6MWD in the six age groups by using one-way analysis of variance (one-way ANOVA) test to show the statistical significance at 0.05 level of probability among as well as within the age groups. In case of significance, Least Significant Difference (LSD) test was performed to detect pairs of age groups, significantly different at the 0.05 level of probability. In all statistical tests, the alternative hypothesis was accepted at 5% level of probability ($\alpha \leq 0.05$).

RESULTS

A total of 136 healthy children were included in the study. Participants' characteristics are shown in Table (2). All students completed the entire 6MWT according to the protocol and thus none of them had to be excluded from the study.

The results revealed that the mean 6MWD was 595.77±61.35 m with a maximum value of 755 m and a minimum value of 420 m (Table 3). The 6MWD was increased with age increment reaching to maximum mean value of 647.95±53.56 m at 10 years (Figure 1).

The results reveals a high significant differences between before and after application of the 6MWT regarding the means of HR, SBP, DBP and SpO_2 for the students in each age group as well as for all students (p=0.000) (Table 4 and Figure 2).

Pearson correlation coefficient was then conducted to determine the relationship between the 6MWD and age as well as between the 6MWD and height. Results revealed a positive correlation between the 6MWD and age (r=0.580) (p=0.000) as well as between the 6MWD and height (r=0.609) (Table 5).

Table 2: Means and standard deviations of the demographics of the participated students.

Age (Years)	Number of Students	Age (year)	Weight (kg)	Height (cm)	BMI-percentile
6	22	6.07±0.03	21.38±2.69	115.95±5.15	15.86±1.08
7	23	7.07±0.04	23.80±3.39	122.43±4.64	15.74±1.21
8	29	8.05±0.03	26.29±3.76	126.10±5.27	16.45±1.43
9	21	9.05±0.04	30.09±5.59	133.05±8.59	16.95±1.96
10	20	10.05±0.04	34.63±5.86	141.40±8.08	17.55±1.88
11	21	11.27±0.42	38.89±6.19	148.38±8.20	17.62±2.06
Total	136	8.51±1.73	28.83±7.53	130.60±12.71	16.65±1.75

kg: kilograms. cm: centimeter. BMI: Body mass index.

Table 3: Six-minute walk distance* according to age.

Age (Years)	Mean	Standard Deviation	Minimum	Maximum
6	543.68	44.77	420.00	621.00
7	564.26	51.30	480.00	669.00
8	586.03	41.42	510.00	687.00
9	600.86	57.12	477.00	705.00
10	647.95	53.56	519.00	755.00
11	643.52	51.10	558.00	720.00
Total	595.77	61.35	420.00	755.00

N: Number of students. *: Measured in meter.

Table 4: Comparison between measurements of heart rate, systolic blood pressure, diastolic blood pressure and blood oxygen saturation before and after the application of the 6MWT.

Age (Years)	Measures		HR (b\m)	SBP (mmHg)	DBP (mmHg)	SpO_2 (%)
6	Mean±SD	*Before*	89.27±2.60	102.95±3.95	65.36±4.18	97.23±1.23
	t-value	*After*	141.41±12.01	118.95±5.46	73.45±5.59	95.32±2.23
	p		-20.444	-14.017	-7.748	4.652
			0.000	0.000	0.000	0.000
7	Mean±SD	*Before*	86.43±4.34	104.52±3.86	64.09±4.51	97.35±1.34
	t-value	*After*	142.04±11.82	121.91±5.52	74.70±5.24	96.00±1.71
	p		-23.206	-13.853	-8.705	3.364
			0.000	0.000	0.000	0.000
8	Mean±SD	*Before*	86.76±4.77	104.55±4.10	65.72±4.82	97.21±1.11
	t-value	*After*	143.66±13.85	120.10±5.89	71.86±5.64	95.41±1.88
	p		-21.049	-13.355	-9.051	5.486
			0.000	0.000	0.000	0.000
9	Mean±SD	*Before*	87.81±4.47	106.38±5.39	66.52±5.94	97.24±1.04
	t-value	*After*	146.90±16.38	123.57±8.58	76.05±6.34	96.38±2.13
	p	-16.982	-11.483	-7.319	2.121	
		0.000	0.000	0.000	0.000	
10	Mean±SD	*Before*	86.45±5.83	105.25±3.85	65.95±3.61	98.15±0.93
	t-value	*After*	145.70±17.35	124.95±8.27	77.50±4.81	96.30±1.98
	p		-16.855	-11.525	-11.216	4.796
			0.000	0.000	0.000	0.000
11	Mean±SD	*Before*	86.33±5.24	108.95±5.62	66.19±4.18	97.90±0.77
	t-value	*After*	148.67±12.41	134.14±9.50	79.05±6.36	96.57±1.89
	p		-23.744	-16.845	-11.396	3.630
			0.000	0.000	0.000	0.000
Total	Mean±SD	*Before*	87.16±4.66	105.35±4.77	65.62±4.59	97.49±1.14
	t-value	*After*	144.60±14.02	123.64±8.65	75.18±6.10	95.96±1.99
	p		-48.404	-29.813	-20.502	9.814
			0.000	0.000	0.000	0.000

6MWT: 6-minute walk test. DBP: Diastolic blood pressure. b\m: Beats per minute.
HR: Heart rate. SpO_2: Blood oxygen saturation. %: Percentage.
SBP: Systolic blood pressure. SD: Standard deviation. mmHg: Millimeter of mercury.

Table 5: Correlation between 6MWD and age as well as height.

Variables	*r*	*P**
Age	0.580	0.000
Height	0.609	0.000

6MWD: 6-minute walk distance. *p*: probability value.
r: Pearson correlation *: Correlation is significant at 0.05 level.

Table 6a: ANOVA test for 6MWD for all students.

Source	DF	SS	MS	F. ratio	P. value
Between groups	5	188161.00	37632.20	15.287	0.000
Within groups	130	320024.93	2461.73		
Total	135	508185.93			

6MWD: 6-minute walk distance. P: Probability value. MS: Mean of squares.
DF: Degree of freedom. SS: Sum of squares.

Table 6b: Post hoc multiple comparison test (LSD) for 6MWD for all students.

Means	Age (Years)	6	7	8	9	10	11
543.68	6		0.167	0.003*	0.000*	0.000*	0.000*
564.26	7			0.118	0.016*	0.000*	0.000*
586.03	8				0.299	0.000*	0.000*
600.86	9					0.003*	0.006*
647.95	10						0.005*
643.52	11						

6MWD: 6-minute walk distance. *: Donates pairs of age groups significantly different at $\alpha \leq 0.05$.

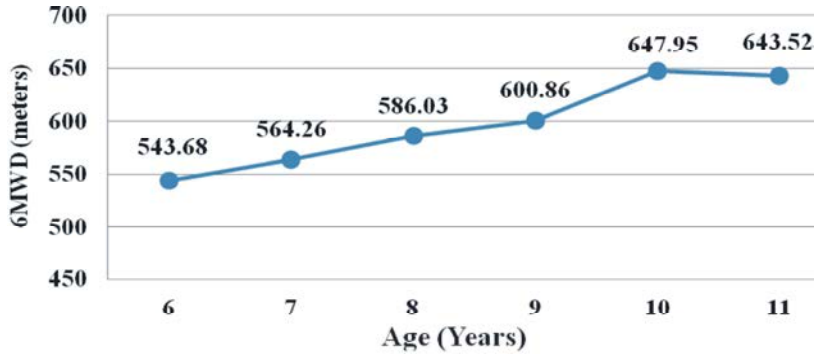

Fig 1: Association between 6-minute walking distance (6MWD) and age in healthy Saudi girls

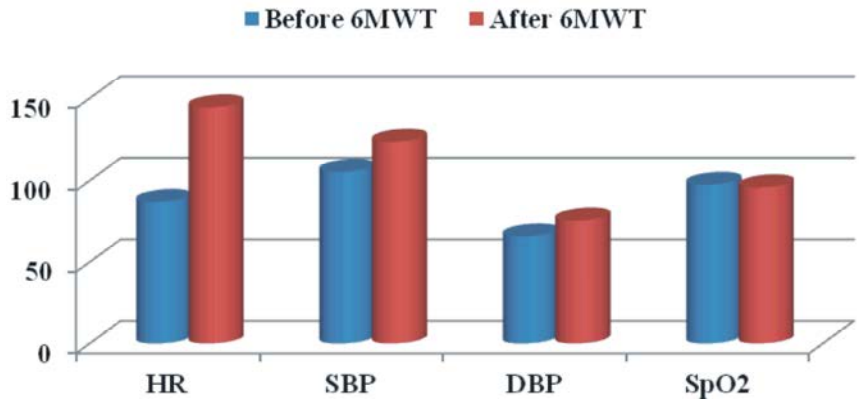

Fig 2: Heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP) and blood oxygen saturation (SpO_2) before and after the application of 6-minute-walk test (6MWT) for all participants.

The results showed significant differences among means of the 6MWD (F=15.287) (p=0.000) regarding to the age variable at $\alpha \leq 0.05$ (Table 6a). The LSD (Table 6b) reveals that at $\alpha \leq 0.05$, the significant difference of the means of 6MWD was observed between age 6 students and ages 8, 9, 10 and 11 students, between age 7 students and ages 9, 10 and 11 students, between age 8 students and ages 10 and 11 students as well as between age 9 students and ages 10 and 11 students. The highest mean value of the 6MWD was recorded at 10 years and the lowest mean value was recorded at 6 years) (647.95 and 543.68 m respectively).

DISCUSSION

The purpose of this study was to provide specific normal reference standards values of the 6MWD for the Saudi healthy girls aged between 6 to 11 years.

This study provides the first reported data on reference values for 6MWD in Saudi healthy girls aged from 6-11 years to help health professional in assessment of functional capacity for their patients by comparing with norms.

The 6MWT has become a standard in clinical practice and research as a simple tool to assess exercise performance, function and response to treatment in adults with cardiorespiratory disorders [3].

In the current study, the overall mean of the 6MWD was 595.77±61.35 m with a maximum value of 755 m and a minimum value of 420 m. The 6MWD was increased with age increment reaching to maximum mean value of 647.95±53.56 m at 10 years. This result come in agreement with Lammers *et al*. [9] who found that the distance walked did not increase significantly from one year to the next but there was a significant increase between 7 and 11 years of age. On the other hand, Klepper and Muir [15] and Pathare *et al.,* [16] suggested that the 6MWD increased with age with exception of the 10-year-old group, which had the lowest 6MWD as they had the highest prevalence of overweight (32%) and obesity (39%).

In the current study, results revealed a positive correlation between the 6MWD and age (r=0.580) (p=0.000). Age had a significant influence on the 6MWD; there is a negative correlation between age and 6MWD among healthy adult and elderly individuals and a positive correlation among children and adolescents [9, 17]. The negative correlation between 6MWD and age among elderly could be explained by the decrease in muscle mass and strength and the maximum oxygen consumption inherent to the aging process. On the other hand, the positive correlation between 6MWD and age among persons less than 20 years is the result of the higher degree of maturation among children and adolescents [17].

Klepper and Muir [15] suggested that the reference values for performance on the 6MWT developed for children residing in one country might not be applicable to those in other countries. The different protocols used to perform the 6MWT, mostly explains the variability of results observed in the different studies.

Discrepancies in reported 6MWD among these studies may be due to cultural differences among countries regarding physical activity level and fitness. As the 6MWT is a measure of submaximal exercise capacity, a sedentary lifestyle and low aerobic fitness may negatively affect a child's performance [17].

Casanova *et al.* [12] reported that the possible reasons for the important variations are unlikely to be due to anthropometric factors, because similar values were found across sites. If anything, subjects in the USA, where the values for walked distance was lower, were taller than those from the other regions. It is possible that the variability in 6MWD may be explained by inclusion of other factors, such as speed of habitual walking or cultural aspects related to lifestyle, mood, attitude and motivation of the subject and/or technician.

The explanation for the different performances observed among different ethnicities is not a simple one. The level of encouragement, the length and layout of the track and the number of tests performed for familiarization purposes significantly influence the 6MWD. Additionally, the demographic, anthropometric and nutritional differences observed among the different ethnicities evaluated must be considered. Greater height and higher amount of lean mass observed in Caucasians have a significant impact on the 6MWD. Therefore, ATS encourages the scientific community to use the standardization of the 6MWT suggested in its consensus and to develop reference values of the 6MWD for several ethnicities.

The results revealed a high significant effect of the 6MWT on HR, SBP, DBP and SpO_2 for all students. During exercise, there is an increase of sympathetic activity and a decrease of vagal discharge lead to an increase of HR, stroke volume and myocardial contractility to satisfy energy demands of working muscles. Javorka, *et al.* [18] stated that during exercise, cardiovascular parameters change to supply oxygen to working muscles and to preserve perfusion of vital organs. At the onset of exercise, HR and cardiac output elevation is mediated mostly by central command signals via vagal withdrawal. As work intensity increases and HR approaches 100 beats/min, sympathetic activity begins to rise, further increasing HR and plasma norepinephrine concentration and vasoconstricting vessels in visceral organs [18].

There is a positive correlation between the 6MWD and age as well as height. This was supported by Lammers *et al.* [9] who reported that the distance walked correlated with age, weight and height with no significant difference between boys and girls. Li et al[7] also found that height, age, weight and difference in HR before and after the walk test were significantly associated with 6MWD but height had the best correlation with 6MWD. Taller people could have larger stride length and thus greater walk distances. Casanova *et al.* [12] also confirmed the importance of age and sex in the distance walked and proposed new reference standards curves for the use of 6MWD in clinical practice. Goemans *et al.* [19] investigated the 6MWD in typically developing young children aged 5–12 years to generate reference

values and percentile curves for the 6MWT and reported a significant improvement in 6MWD with increasing age and that the strongest increase was found between the age of 5 and 8 years. On the other hand, Klepper and Muir [15] stated that there were no significant associations between the 6MWD and other variables with the exception of BMI in males.

Our results also revealed a correlation between the 6MWD and height which were confirmed by Li *et al.* [7] who performed 6MWT in healthy children aged 7–16 years in Hong-Kong and found a strong correlation with height. Ulrich *et al.* [20] also stated that height could affect 6MWD in Swiss and purely Caucasian children and adolescents aged 5-17 years.

The results showed significant differences of means of 6MWD among age groups and reveals that these significant differences were observed between two successive ages before 9 years but between each successive age after 9 years. This means that we could consider the same reference value of the 6MWD for grade 1 and grade 2 students, grade 2 and grade 3 students as well as for grade 3 and grade 4. However, there is a different reference value for the 6MWD for each of grade 4, 5 and 6 students. This may attributed to the increase in height with aging that had a high positive correlation with 6MWD as reported in the present study.

Limitations: In our study, the 6MWD was measured only once in every child. So we cannot provide information on the test–retest reliability. We did not include an instrument to measure specific motivation in our study. As we included several children of each age group, we believe that the inter-individual differences in motivation would somehow equilibrate around the average. Although we tried to include consecutive children living in different areas without any selection criteria, we cannot exclude a selection bias with potentially more motivated subjects being investigated by us. Our normative values are only usable for the age group we investigated. Thus, they will not apply for very young children and toddlers, in which a 6MWD test might as well be difficult to perform. Despite these limitations, in our experience, the present form of the 6MWT is easy performable and useful as comparative measures in the management and follow-up of children with cardiorespiratory diseases.

CONCLUSIONS

In summary, there are specific standard values for the 6MWD of Saudi healthy girls aged between 6-11 years that are differ from other investigated healthy children of racial differences. The 6MWD is highly affected by age and height and was increased with age increment reaching to a maximum mean value of 647.95±53.56 m at 10 years. We recommended application of this study on a sample of same aged Saudi boys to measure their references values of the 6MWD and compare between boys and girls regarding the 6MWD.

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APPENDIX I
6MWT Worksheet
(American Thoracic Society, 2002)

Student's Name:_____
Student's ID: _____
Grade: _____
School Name: _____
Age: _____
BMI percentile: _____ %
Date of Testing: _____

	Baseline	End of Test
Time:	___:___:___	___:___:___
Heart Rate:	_____	_____
Blood pressure:	__ / __	__ / __
SpO_2	____ %	____ %

Stopped or paused before 6 minutes? No___ Yes___
Reason: _____
Other symptoms at end of exercise: angina_____, dizziness_____, hip, leg, or calf pain_____
Number of laps: ____ (×60 meters) + final partial lap: _____ meters = _____
Total distance walked in 6 minutes: _____ meters
Examiner comments: _____