International Journal of Physical Education and Sports Sciences
Vol. 13, Issue No. 07, October-2018, ISSN 2231-3745

Guarding Effects on the Results of a Six-Minute Walk

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Abstract – The American Thoracic Society suggests not to spend six minutes strolling with the customer (6MWT). This proposal raises safety issues for those who are more likely to fall. The impacts of the 6MWT surveillance have yet not been examined. This research aimed to establish whether the control of the 6MWT influenced gear speed and distance. This investigation was carried out in two successive 6MWT trials, one of whom gave healthy younger students (n = 103, 24.2 ± 3.4 years) and older ones (n = 102, 71.1 ± 11.3 years). Participants were randomised to a "first guarded" rather than "second guarded." Intraclass correlation coefficients (ICCs), Bland-Altman plots and data were evaluated using a one-sample test. Signified a reduction in guarding distance (P< 0,001) and gait velocity (mean difference = 0,04 ± 0,11 m/sec, 95 percent of LOA = 0,36 m and −0,18 m/sec) (mean difference = 13,5 ± 40,3 m, 95 percent of LOA = 65,5 m and −92,4m). When separated between an older and younger group, guarding lowered distance and speed, but had a greater influence on the younger groups. Watchdogs altered the distance during the 6MWT. The results indicate that measurements are not interchangeable under the 2 walking circumstances.

Key Words – Guarding, Outcomes, 6-Minute, 6MWT

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1. INTRODUCTION

The 6-minute walk test (6 MWT) is a valid and reliable assessment of functional power when adopting standards issued by the American Thoracic Society (ATS). As a goal, the test and measurement submaximal exercise procedure gives functional status information, predicts future results and can assess changes resulting from intervention. The 6MWT is completed by a straight, level, 30 m route or trail in 6 minutes. as far as feasible. The test manager instructed the patient to halt at the end of 6 minutes and calculated the distance that walked in the allotted period. Distance and speed are recorded in metres and metres per second correspondingly throughout the 6-minute timeframe. Distance walking is a solid indicator of functional improvement in relation to the patient mortality, the hospitalisation, functionality, heart and breath symptom, and quality of life.

For healthy persons and those living with problems of health, the 6 MWT is a valid and reliable test which leads to limits on activity and participation regardless of age. Its usage has been validated for many patient categories, including individuals suffering from stroke, congestive heart failure, chronic blockage, arthritis, and Alzheimer's disease. The 6MWT is also a technique for determining the chance of success for the transplant of organ and is used for pre- and post-lung transplantation. For these reasons, it is regarded as an outstanding clinically useful instrument for the collection of data. It is possible to analyse and highly applicable all bodily systems, since most day-to-day activities have a submaximum capacity for exercise.

In the instructions for the 6MWT, the ATS advises that the participant walks independently. This is of concern since the 6MWT is routinely utilised with individuals with balance abnormalities related to cardiovascular deconditioning, neuromuscular abnormalities, and lower-extremity weakness. These individuals may be at higher risk of falls and need strict observation during ambulation to maintain safety. For example, as compared with healthy control participants, patients with chronic obstructive pulmonary disease (COPD) had considerably lower balance after exercising, which likely increases their fall risk. Increased fall risk is a key issue for therapists for numerous reasons including patient safety and therapist liability. These concerns typically motivate therapists to protect participants who are at fall risk during the exam, but ATS standards imply that guarding affects the validity of the exam.

The results of the 6MWT are concerned by pacing or guarding although the direct impacts are not measured, as can be seen in published instructions for administration of tests. Due to the required area requirements for the test, many studies have been carried out to investigate viable alternatives to the standard 6MWT ATS protocol. Studies assessing the performance of 6 MWT on a treadmill have found considerably shorter walking distances compared to the use of a circular track or a corridor as set forth in

the ATS Guidelines. For instance, when Bansal et al. studied the impact of circular paths on the 6MWT, the distance along the round path was much more than that of the straight path (P <001). The conclusion was that a standardised track for the 6MWT was required. These discrepancies may stem from the fact that the treadmill may be paceful and hence prevent minor variations in walking speed in response to the effects of exercise. A slight influence is also shown on the 6MWT results via the circular track approach.

If the protection does not influence the results of 6MWT significantly, the physical therapists may be assured that this test is legitimate when they walk with patients. Alternatively, if the 6MWT results vary while monitored, attention is also essential for comparing ambulatory tests in the case of an uncontrolled subject. The goal of this research was to examine if the watching distance and gait rate during 6MWT had substantially changed compared with a 6MWT trial, when participants had not been guarded for a healthy sample of younger and older persons in the community.

2. METHODS

This descriptive multicenter observational research was place at five separate locations in the U.S. The aim was to gather data for 40 participants at each institution, and between February 2013 and September 2017 the collection took place. Participant recruitment and information collection took place at Chatham University, Pittsburgh, PA, Concordia University St Paul, MN, Creighton University, Omaha, NE, D'Youville University, Buffalo, NY, and Widener University, Chester, PA. This research was funded with sponsorship from the American Physical Therapy Association cardiovascular and pulmonary division.

2.1 Participants

205 volunteers were recruited for this research. The participants were classified in age >50 (n=102) and younger (n=103) groups of 18-50 years old. Participants were recruited via flyers at several research locations by means of convenience sampling. The recruitment of research participants was also made via emails. By registering on sign-ups placed inside participating institutions, participants actively indicated their interest in the research. Includes universities, independent and supported living communities, and qualified nursing institutions in the areas where participants were recruited. The Research was authorised by the Institute Review Boards of each of the five academic establishments that completed the study with the written informed consent of all participants.

In the study, the participant had to be independent of ambulation to ensure that there were no need for physical help during the 6MWT and that the performance of the 6MWT were not indicated by relevant acute or chronic medical disorders (per ATS guidelines). 1 Participants in the elder group were required to comply with intact cognitive standards as assessed by the Mini mental status review score of 24 and a stable balance by scoring the functional reach test for a minimum of 18 cm (7 inches).

The criteria for exclusion from the research were based on the 6MWT ATS Guidelines. The participants had been excluded when one of the following conditions were reported or seen before and during the trial: unstable angina; myocardial infarction history 30 days before the trial; cardiac rest over 120 beats per minute; systeolic restless blood pressure above 180 mm Hg; blood restorative pressure above 100 mm Hg; symptoms reported; symptoms noted; Information on acute or chronic medical issues, such as a recent injury, operation or medical treatment, has been acquired before starting 6MWT and is utilised to detect acute active medical problems that could interfere with 6MWT. The elderly adult group additionally eliminated participants if they were identify the potential to fall at risk in the Functional Reach Test (< 18 cm or 7 inch) or if the Mini Mental Test (score < 24) were used to guard individuals who would not be able to follow the test's instructions.

2.2 Study Procedure

In all participating data collecting locations, ATS Guidelines were fully complied with throughout the 6MWT. The 6MWT course must be 30 metres long and the route must be straight and marked every 3 metres according to the ATS Guidelines. The patient education and encouraging recommendations were also followed in accordance with the ATS Directives. The research procedure employed and the instructions provided by the ATS are summarised in Appendix 1.

Upon receipt of the informed consent, a survey including demographic and a list of medical problems as well as symptoms was conducted to confirm that prior to testing individuals had no 6 MWT counterindication. The cognition and balance were evaluated using the Mini Mental Status Exam and the Functional Reach Test in the older adult group after demographic data had been gathered.

The participants were then randomised either "the first guarded" 6MWT or "the second guarded" 6MWT condition. Guarding was carried out via strolling next to, slightly behind and within the participant's reach without affecting the participant physically throughout the 6MWT. The participants complete 6MWT according to ATS guidelines under the unattended walking scenario. If a participant utilised an assistive tool for normal mobility throughout the assessment, they did so in accordance with ATS guidelines (both the guarded and unguarded trials).

The baseline was collected using blood pressure, perceived exercise rating (RPE) and heart rate, and puls oxymetry, and tested at adequate intervals. A participant had to stop and relax at any point and immediately after completion of the 6MWT Vital signs

were obtained. Vital indicators and the travelled distance were recorded using a standardised data gathering form derived from the ATS data collecting guidelines.

Between guarded and unsecured 6MWT trails, there were a minimum of 2 hour period for each participant to consider a potential learning impact. The participants were asked not to practise or exercise in any manner throughout that period. For each test condition, the data collection comprised a single 6MWT session. Appendix 1 shows the method taken for the 6MWT.

2.3 Data Analysis

Please use either average and SD figures or counts and percentages for demographics, equilibrium measurements, heart rate, and RPEs. In order that inter-group differences of distances walked and gait speeds during the 6MWT, perceived effort ratios after completion of 6MWT and the percentage of the maximum expected heart rate achieved at the end of the 6MWT, a repeat measurement variances analysis (age group by walking condition) has been implemented. A post-hoc test was carried out using either a stand-alone inter-group differences sample t test or paired inter-group differences sample t test.

4 statistical techniques were applied to evaluate the impacts of surveillance on measurement reliability. In order to test the assumption that the outcome was not substantially different from the null (α=0.05), the unguarded 6MWT performance was removed from the guarded condition. The research offered an early evaluation of the partiality owing to the guarding effects. A one-way intrinsic correlation factor was evaluated for absolute agreement between guarded and unprotected walking performance on the 6MWT (ICC). Each participant was measured on the basis of various assessors which examined a sub-set of the total number of people participating. The ICC model was picked For ICC values of less than 0.40, fair for values of between 0.40 and 0.59, good for values of between 0.60 and 0.74, and excellent for values more than 0.75, the reliability for the protected and unprotected circumstances was rated low. To achieve acceptable validity, the ICC for dependability should be higher than 0.90. To study the degree of this agreement, Bland–Altman plots are being applied. The possibilities for a bias are studied both in a visual and a minimal analysis of the regression of products, in order to anticipate the mean difference between the 6 MWT seen and the unguarded 6MWT. Mean difference was investigated, as well as the mean difference SD, the mean difference standard error and the 95 percent agreement limit (LOA) confidence interval. For all analyses SPSS 23.0 (IBM SPSS, Armonk, NY 10504) and alpha were set at 0.05.

3. RESULTS

Table 1 provides the participant with demographics. In all groups, study subjects were regarded healthy without any comorbidity preventing completion of the 6MWT. The participants were mostly women and Caucasians, in both young and older adult groups. The older and younger adult groups for the body mass index were not substantially different (BMI). The mean BMI in the younger group was 24.1 (± 3.9), and the average BMI was higher in the older group at 26.4 (± 5.5) with a mean total of 25.4 (± 5.0), which shows the over weighted sample of the group. For the whole sample, the average age was 49.8 (±24.9) years with the medium age of 24.2 (±3.4) and 71.1 (±11.3) of the younger and older adult groups respectively.

Table 1: Participant Demographics

	Younger Adult	Older Adult	Total Sample
Age, yr			
N	103	102	205
Mean	24.2	71.1	49.8
SD	3.4	11.3	24.9
Gender, n			
Female/male	73/30	61/39	134/69
BMI			
Mean	24.1	26.4	25.4
SD	3.9	5.5	5.0
Race, %			
African American	3.9	1.0	2.4
Asian	4.9	1.0	0.5
Caucasian	83.5	95.1	89.3
Hispanic	5.8	—	2.9
Other	1.0	—	0.5
No response	1.0	2.9	2.0
FRT, cm			
Mean	—	27.8	—
SD	—	8.5	—

BMI, body mass index; FRT, Functional Reach Test; y, years.

3.1 6-Minute Walking Test Performance istance and Velocity

Table 2 shows walking distance and speed. The interaction between group and movement was statistically significant for both the distance of [F(1, 201) = 5.77, P = 1.017] and the rate [F (1, 201) = 5.77, P = 0.023] when 6MWT performance were examined. The distance and speed of gait were substantially larger for the younger adult group under both guarded and unsecured situations (P < 001) (Table 2). The distance and speed of the gait were substantially larger for younger or older adult groups (P alternatively) and for total sample (P alternatively) during the unprotected trial when analysing the inter-group differences between the unguarded and protected walking conditions (Table 2).

Table 2: Distance Walked and Gait Speed during the 6-Minute Walking Test by Age Group and for the Total Sample

Walking Condition	Younger Adult	Older Adult	Total Sample
6MWT, m Ungraduate			
Mean	559.12	407.14	483.51
SD	77.96	122.67	127.64
Guarded			
Mean	538.94	402.99	470.97
SD	84.74	130.92	129.40
Gait velocity, m/sec Unguarded			
Mean	1.55	1.14	1.35
SD	0.22	0.35	0.36
Guarded			
Mean	1.50	1.13	1.31
SD	0.24	0.37	0.36

Between-group difference *P* < .001.

Within-group difference *P* ≤ .01.

Between walking-condition difference *P* < .001.

6MWT, 6-minute walk test.

3.2 Physiological Response to Walking Oxygen Saturation, Heart Rate, and Ratings of Perceived Exertion

The values for younger and older adult groups are shown in Table 3 for walking in safe and unsecured situations. The physiological responses observed were within the expectation of changes for a submaximum footing activity for oxygen saturation, pulse rate and blood pressure. The oxygen saturation was steady compared to the baseline, with a higher heart rate.

Table 3: Borg Rating of Perceived Exertion and Percentage of Maximum Heart Rate During the 6-Minute Walking Test

Age Group	Unguarded		Guarded	
	Borg RPE	% Max HR	Borg RPE	% Max HR
Younger adult				
Mean	6.7	46.1[a,b]	6.4	39.7[a,b]
SD	3.4	10.5	3.2	6.0
Older adult				
Mean	7.8[a,b]	59.6[a,b]	8.1[a,b]	53.2[a,b]
SD	4.1	12.2	4.0	6.4
Total sample				
Mean	7.3	52.8[c]	7.3	46.5[c]
SD	3.8	13.2	3.7	9.1

Between-group difference *P* < .05.

Within-group difference *P* < .05.

Between walking-condition difference *P* < .001.

RPE, perceived exercise rating; Borg PRE, perceived exercise rate; percent Max HR, age-foreseen maximal heart rate.

After completing the 6MWT for the RPE, the interaction of the group with the walking condition was statistically significant [F(1, 201) = 4.95, P = 027]. Older people reported considerably greater levels of perceived exercise under walking situations (P =>001) than younger ones (Table 3). Young adults saw no significant increases in perceived efforts (P=046) in the condition of their work compared to the unguarding condition when guarded, as different as when not guarded by an examiner (P=265).

In contrast, group interactions were not statistically significant for the age-projected maximum cardiac rating % obtained while walking [F(1, 201)= 5,77,P=972], but were not statistics significant. The values that are reported reflect more physiological exertion when walking unguarded (Table 3). The difference attained only statistical significance when data from younger and elderly adult groups were merged for the principal impact of the walking condition [F(1, 201) = 5.77 and P <.001]. Without surveillance, the age-predicted maximum cardiac frequency was statistically significantly increased. For the older adult group, the mean percentage of the anticipated maximum heart rate was higher (Table 3).

3.3 6-Minute Walking Test Measurement Reliability Guarded versus Unguarded

The results show that the level of agreement may be linked to the participant's age when assessing the connection between the guarded and the unguarded distance and speed. Table 4 shows the degree of consensus for the overall samples and groupings of younger and older adults. For the whole sample (0.946) and older people (0.977), ICC values for distance walk and gait speed were good. The ICC was excellent but weaker for the young adult group (0.787). The results of the ICC show a relative concord of 6MWT distance produced values with the speed of the surveyed and unprotected people.

Table 4: Intraclass Correlation Coefficients Examining Absolute Agreement Between the Guarded and Unguarded Conditions for the 6-Minute Walking Test Distance and Velocity

Group	ICC	95% CI		*P*
		Lower	Upper	
6 MWT, m				
Younger adults	0.787	0.700	0.851	<.001
Older adults	0.977	0.966	0.985	<.001
Total sample	0.946	0.929	0.959	<.001
Gait velocity, m/sec				
Younger adults	0.788	0.701	0.852	<.001
Older adults	0.977	0.967	0.985	<.001
Total sample	0.946	0.929	0.959	<.001

ICC, intraclass correlation coefficient.

A single-sample t test and Bland-Altman plots were used to further examine the concept of inter-walking conditions reliability and interchangeability. If measurement is effected under various task situations, that is to say, if the distance is not monitored and is protected, it should not differentiate

substantially from nil for a single sample t test to examine the means of differences. Walk and gait speeds were substantially different for the whole (P<0.001) and younger (P<0.001) samples, as well as older persons (P <0.012). The possibility of prejudice was so postulated and the repercussions of guarding were concerned.

The Bland–discloses disparities in walking performance when unsecured and guarded subjects. Guardianship led to a reduction in the distance, as seen by the negative mean difference. Demonstrate performance variability while watching and unguarding people while walking. The 95 percent LOA among older persons implies significant variations in performance in the group of individuals. Less variable was among recent adulthood. Visually, the whole range of walking performance showed no signs of bias. The regression analysis corroborated this (r =.036, P =.615). For analytical reasons, outliers were found in the data set and were not removed. In addition to the normally minimum clinically meaningful difference of 50 m for people with disease, the lower and higher confidence Intervals, which are the variability in performance between the protected and unprotected settings.

4. DISCUSSION

With relation to a healthy population, the statistics corroborate ATS' advice to protect the repetitiveness of the test in the 6MWT. Although the distance and gait velocity were within the standards for younger and older persons living in the community, the differences for all individuals were well within the least clinically meaningful difference. The statistics show that protected and unprotected tests cannot be interchanged. This conclusion is supported by the one-sample t test, which has been conducted for determining whether the difference between guarded and unprotected walking situations was statistically different to zero.

Surprisingly, a statistical increase in perceived efforts for the older adult group was due to the condition being monitored. This is therapeutically relevant given that the population is healthy and the data reveal that HR and RPE in healthy persons are highly correlated (Table 3). The 6MWT is described by the V Talent O2max as a sub-maximum exercise test. However, the outcomes of the research clearly show that the efforts of participants in the 6 MWT were below the sub-maximum level in both task circumstances. The age forecast percentage HR max was seen in young and elderly categories, as well as in the guarded and unprotected settings, which showed a less than sub-maximal effort. Depending on condition and age group, the effort based on the age-projected percentage HR max varied from 40% to 60%. These results need additional research.

This intensity shows lower efforts, as is predicted with a sub-maximum exercise test, based on the guidelines of the American College of Sport Medicine (ACSM). Further research should be done to discover if in a sicker, more conditioned group this would continue to occur. The recruitment requires subjects to move independently in the unprotected state in order to do this investigation. However, the health-related exercise needs might be greater or the distance walked may be lesser. The 6MWT may not be a sub-maximal exercise test based on the results of this investigation in a healthy younger or older population.

For a healthy population on 6MWT, the usual distance reached in the standard study guideline normally is between 571 ± 90 m (range 380 to 782 m). According to normative data, there is no impact on result distances/garter velocity on physical activities, co-morbidity and reduced spO2 and this research was not considered. Studies reveal, however, that ageing might contribute to a decrease in distance. According to regulatory statistics, the impact of age at the age of 60 years is substantial. According to Casanova et al.36, the prescribed distance of 559 ± 80 m is roughly 514 ± 71 m for a healthy person over 60 years old and 70 years old.

Accords to previous research in accordance with the SD of the standard 571 ± 90 m normally attained during a 6MWT medium distance for young participants in the unattended and guarded groups. The youthful group had distances of 559.1 metres to the unsecured test and 538.9 metres to the guarded state. The mean distance in the unprotected and protected group 407,1 m and 402,9 m was barely off the SD and somewhat shorter for the older healthy population, 514 ± 71 m, than the normative average. Distance and speed were within the anticipated standards for age for study participants and the results are generic.

Finally, the ICC reveals that the walking performance of the 2 task conditions is very dependable. However, in comparing guarded and uneven walking, the Bland-Altman plots demonstrate considerable variability that should be addressed when clinical judgments concerning changes in performance.

5. CONCLUSIONS

The results of a study corroborate the ATS guideline that guards may impact the results of 6MWT, which are sub-maximum in a healthy population. The unprotected condition led in increased work for the subject assessed by age-projected HR maximum, distance and speed. These results are useful for examiners who might explore various pre-post guarding methods in healthy populations who do 6 MWT as a basis of functional ability.

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