DOCUMENT RESUME

ED 103 412 SP 009 019

AUTHOR Bolonchuk, W. W.
TITLE The Accuracy of the Six Minute Run Test to Measure Cardiorespiratory Fitness.
SPONS AGENCY North Dakota Univ., Grand Forks.
NOTE 9p.

EDRS PRICE MF-$0.76 HC-$1.58 PLUS POSTAGE
DESCRIPTORS *Cardiovascular System; College Students; Males; *Physical Education; *Physical Fitness; Running; *Testing
IDENTIFIERS *Cardiorespiratory Fitness

ABSTRACT

One hundred and twenty-five freshman students, assigned to two groups, were used for this study. Each subject completed both 12-minute and 6-minute jogging tests. The reliability of the test was established by comparing the two groups' 12-minute test results. Six-minute test results were compared between the two groups, and there was no significant difference at the .01 level. The validity of the 12-minute test had previously been established (r=.90); thus, the 6-minute test scores were compared with the 12-minute test scores. The result was r=.85. (Author)

The Accuracy of the Six Minute Run Test to Measure Cardiorespiratory Fitness

Prepared by
W.W. Bolonchuk, MSc.,
Associate Professor, Dept. HPER
University of North Dakota
Grand Forks, North Dakota

This project was supported by a grant from the Faculty Research Committee of the University of North Dakota.

The Accuracy of the Six Minute Run Test to Measure Cardio-respiratory Fitness

William W. Bolonchuk
Associate Professor, Dept. HPER

Introduction

Fitness testing persists as a critical problem to those interested in this phenomena. Many tests which purport to measure a variety of aspects of fitness are being revised and updated as contemporary evidence becomes available. Currently it is agreed however, that the best single test of fitness is the maximum oxygen consumption test and that the best single measure of fitness is the maximum amount of oxygen that a subject can consume during exercise.

The twelve minute run devised by Cooper (4) has been validated by comparing the performance of air force personnel on a field test with the performance in the laboratory. The field test was an empirically established run for a duration of twelve minutes and the laboratory test was a test of maximal oxygen consumption employing a graded increase run on a motor driven treadmill. The correlation of the field test data with the laboratory test was $r = 0.897$ (4). This correlation value indicates an acceptable level of validity for the twelve minute run as a test of cardiovascular fitness.

Many teachers of physical education now use the 600 yard run-walk test as a test of cardiorespiratory fitness. This test is an item of the test battery which was published by the American Association for Health, Physical Education and Recreation in 1958 (1). Doolittle and Bigbee (5) compared the performance of adolescent boys for the 600 yard run-walk and the twelve minute tests. The results of each test were compared with estimates for maximal oxygen consumption, (N=9). Their findings showed a .62 correlation between the 600 yard run-walk and maximum oxygen consumption and a .94 correlation between the twelve minute test and maximum oxygen consumption. In

light of this evidence it appears as if the twelve minute test would be a more acceptable measure of cardiorespiratory fitness.

The original intention for including the 600 yard run-walk test in the AAHPER battery was to measure cardiorespiratory fitness. Since the establishment of the AAHPER fitness test, the study of cardiorespiratory tests and testing has been considerable, with much evidence to help delimit a valid field test. This has been done by Balke (3) and Cooper (4). However, these tests plus the other tests of the AAHPER battery seem to be too time consuming to administer in the usual physical education class period. A test which could accurately measure cardiorespiratory response to exercise and yet do this in a time period close to the 600 yard run-walk would seem to be the answer.

Reducing the time of the run increases the likelihood of affecting a change in the criterion measure. The initial problem, then, was to identify a test which was near to the duration involved for the administration of the 600 yard run-walk yet was of sufficient duration to elicit a cardiorespiratory response which would allow for accurate measurement of the criterion. The criterion measure for such a test is dependent upon the functional adjustment to the exercise and the succeeding aerobic and anaerobic output to meet the demands of the exercise.

There appears to be disagreement in the literature about the specific time of adjustment depending on exercise intensity, level of fitness and other factors. However, Astrand and Saltin (2) advice that a duration in excess of five minutes is necessary in studies of circulation and respiration. Balke (3) has illustrated the relationship between the anaerobic versus aerobic oxidation in terms of running duration. This relationship shows a greater aerobic component for running at maximum for longer durations.

The anaerobic component for running near maximum increases spiriously as the duration decreases under five minutes and was estimated between 10 and 15 percent at six minutes, whereas the average duration for the 600 yard run-walk test was less than three minutes thus increasing the anaerobic component to 30 or 40 percent. Therefore a six minute run would appear to be a more accurate measure of cardiorespiratory fitness than the 600 yard run-walk test and it could be administered in a shorter period of time than the twelve minute test.

The present study was designed to determine the reliability and validity of the six minute run by comparing performances for the six minute run and the twelve minute run.

Procedure

A finite population consisting of 575 male students enrolled in the physical education service program at the University of North Dakota was defined for use in the study. Since the study was carried out during the second semester of the 1969-70 academic year, this population was also delimited to this period. A random sample of 200 men was selected by the tag method. Of these 200 men, 125 completed both the six and twelve minute runs.

The testing was designed and administered in the operational setting. Service program classes at the University of North Dakota, meet twice weekly on a Monday - Wednesday or Tuesday - Thursday sequence. A Wednesday, Monday and Thursday, Tuesday sequence of repeated testing was employed to allow for sufficient recovery from one test before the repeated test was performed.

The tests were administered on a dirt surface indoor running track in the Fieldhouse on the University of North Dakota Campus. The track measures

1/12 miles per lap and scoring for the test was recorded in units of the number of laps to the nearest 1/4 lap. To facilitate the scoring a line approximately twelve feet in length was marked at a distance perpendicular to the inside edge of the oval at the starting point and at each 1/4 lap segment. (see figure 1)

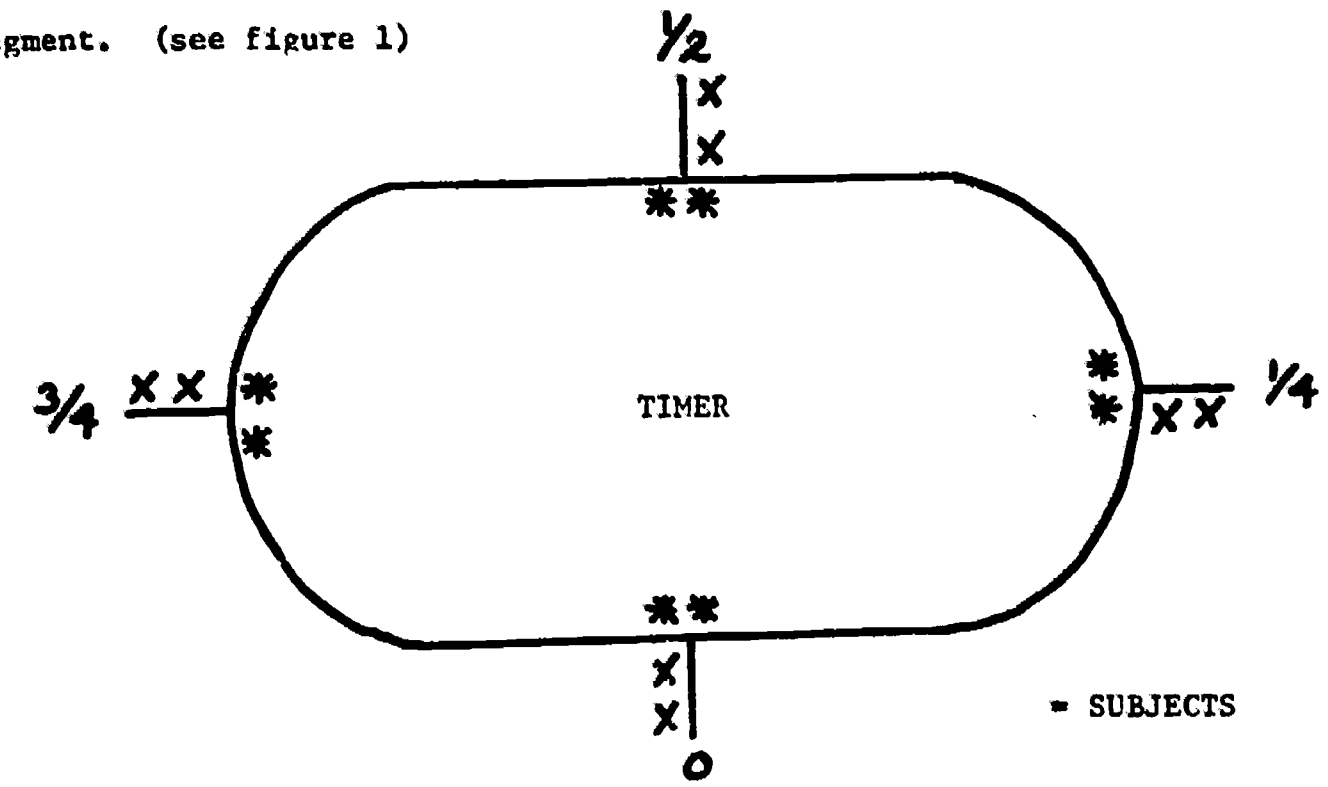

FIGURE 1 TRACK LAY OUT FOR THE ADMINISTRATION OF THE SIX AND TWELVE MINUTE TESTS.

*The subjects were divided into two equal groups on the test day. The test procedure was then explained and the track layout was diagrammed on a chalk board in the Fieldhouse. The groups were paired and alternated as runners and scorers. To avoid a systematic bias one group ran the six minute test and the other group ran the twelve minute test on each of the test periods. The assignment of the test was decided by a flip of a coin, if the group that won the toss chose to run the six minute test the first day, that group would run the twelve minute test on the next test day. This same procedure was repeated for each class over the test days.

To avoid bottlenecks on the track during the run, the subjects were assigned with their partners to starting positions at each of the 1/4 lap areas of the track. The counters were instructed to tally each lap as his partner crossed his starting line then record the last lap as that portion of a lap which was completed. Thus a subject who stopped running between .25 and .50 laps would have his score recorded as the number of whole laps (sum of the tallies) plus .25 for the last lap fraction. These data were recorded on individual score cards.

Results and Discussion

Prior to the testing, the subjects were assigned at random to two groups and identified as group one and group two. Group one consisted of 65 subjects and group two consisted of 60 subjects. Since all subjects completed one run of each the six minute and twelve minute tests, the data was analyzed between groups by the application of a t test for two independent and unequal groups. Two comparisons were made between group one and two; the first comparison was between the six minute scores for each group; the second comparison was between the twelve minute scores for each group. Accepting the Null hypothesis based on the calculated $t_{.01}$ value would establish the reliability of the tests.

Since the computed t values were less than the table values, the Null hypothesis of no significant difference between the results for the group comparisons was retained. Thus the reliability of the two tests was established. (see table 1)

TABLE 1 GROUP COMPARISONS FOR DISTANCES RUN IN LAPS OF THE 1/12 MILE RUNNING TRACK BETWEEN THE SIX MINUTE AND TWELVE MINUTE TESTS.

Group Comparison	N_1	N_2	M_1	M_2	SD_1	SD_2	$t_{.01}$	Computed t
12 Min. Test vs 12 Min. Test	65	60	19.37	19.63	2.510	1.925	2.576	0.651 N.S.*
6 Min. Test vs 6 Min. Test	65	60	10.95	10.90	.959	.811	2.576	0.285 N.S.*

*N.S. = not significant

Since Cooper (4) has established the validity of the twelve minute test and Doolittle and Bigbee (5) have established the reliability of the twelve minute test, the correlation between the six minute and twelve minute tests would serve to identify the validity of the six minute test. The Pearson Product Moment Correlation method was applied the data for this purpose. The resulting estimate for the relationship between the six minute test and twelve minute test was r = .85. All scores, N = 125 were included in the calculation of this estimate.

The .85 correlation coefficient for the validity estimate of the six minute run bears two major assumptions. Whereas the maximum oxygen consumption test was used by Cooper (4) to establish the validity of the twelve minute test (r = .90), the twelve minute test was accepted as a valid criterion on this study. This procedure would tend to inflate our validity coefficient. On the other hand it was evident from Balke's (3) estimates of the aerobic - anaerobic relationships over the duration of exercise that one would expect the criterion measure between the six minute and twelve minute tests would not be as close as the relationship between the twelve minute test and a treadmill tests for maximum oxygen consumption.

References

1. AAHPER Physical Fitness Test Manual, Washington, D.C., 1958.

2. Astrand, P.O. and Saltin, Bengt, Oxygen Uptake During the First Minute of Heavy Muscular Exercise, Journal of Applied Physiology, Vol. 16 No. 6:971, November 1961.

3. Balke, B., A Simple Field Test For The Assessment of Physical Fitness, CARI Report 63-18, Oklahoma City: Civil Aeromedical Research Institute, Federal Aviation Agency, September 1963.

4. Cooper, Kenneth H., A Means of Assessing Maximal Oxygen Intake, Correlation Between Field and Treadmill Testing, J.A.M.A., Vol. 203:201, January 15, 1968.

5. Doolittle, T.L. and Bigbee, R., The Twelve Minute Run-Walk, A Test of Cardiorespiratory Fitness of Adolescent Boys, Research Quarterly of the AAHPER, 39:491, October 1968.