A PROPOSED FIELD TEST FOR EVALUATING FITNESS IN ELDERLY HYPERTENSIVE PATIENTS

C J EALES
M.Sc (Physiotherapy)
RAND
Senior Lecturer,
Department of
Physiotherapy, University
of the Witwatersrand

A V STEWART
B.Sc (Physiotherapy)
RAND DPE (RAND)
M.Sc (Medicine) RAND
Senior Lecturer,
Department of
Physiotherapy, University
of the Witwatersrand

CORRESPONDENCE
Mrs C J Eales
Department of
Physiotherapy, Faculty of
Health Sciences,
University of the
Witwatersrand
7 York Rd
PARKTOWN 2193
South Africa

The incidence of hypertension in South Africa is as high as 82.1 % in elderly black women and 76.9 % in elderly black men, (Bester and Weich 1991) Patients were considered hypertensive if blood pressure exceeded 140/90 Hg mm.

Hypertension is a major contributing factor for strokes and death from strokes. Strokes become family catastrophes amongst the rural population in SA because of the unavailability of appropriate rehabilitative services. Hypertension is also a risk factor for congestive heart failure, chronic occlusive peripheral vascular disease and renal failure. There is increasing evidence showing that effective treatment of hypertension significantly lowers morbidity and mortality due to these diseases (Bester and Weich 1991).

Regular aerobic exercise lowers the blood pressure in hypertensive patients by as much as 11 mm Hg systolic pressure and 8mm Hg diastolic pressure. The proposed mechanisms include reduction in renin-angiotens in activity, resting sympathetic tone, baro-receptor sensitivity and total peripheral resistance (Houston 1992).

In South Africa there is a move away from tertiary medicine towards community-based primary health care. Within this context exercise could become an inexpensive intervention for the treatment of hypertension. In order for a prescribed exercise programme to be safe and effective, patients' exercise performance must be assessed. With a view to prescribing exercise for hypertensive patients in a community-based setting it becomes important to design an exercise test that can measure their exercise capacity, in an effective and inexpensive manner.

The criteria for such a test would be the following

- valid in both a hospital and community-clinic setting.
- inexpensive.
- easily administered so that various levels of health personnel would be confident to use the test.
- elderly hypertensive patients would have to understand the test instructions and safely complete the test.

A walking test seems to be an ideal test to use. This is a test of physical condition that is relevant to the demands of daily living and is a realistic method of continuous assessment of exercise performance. Bassey et al (1976) and Cunningham et al (1986) suggested that a self selected walking pace could be an adequate measure of cardiovascular fitness and physical activity in the elderly. They also suggested that this technique could be useful as a screening device to assess cardiovascular fitness in older subjects unable or unwilling to walk on a treadmill or ride a cycle ergometer. In the South African clinical situation such equipment is frequently not available and it was therefore decided on a walking test.

A six minute walking test appears to fit the above criteria. According to Guyatt et al (1985) a six minute walking test is a valid measure of exercise capacity in patients with chronic lung disease and chronic heart failure. The value of this test in the determination of exercise capacity in elderly patients with chronic hypertension has not been established.

The Borg scale subjectively measures the patient's perception of exercise exertion and also gives an indication of exercise intensity (Demello et al 1987). Using the Borg Scale to determine the perceived intensity of exertion, the predicted maximum oxygen uptake or MET (metabolic equivalent) level can be calculated (Wenger and Hellerstein 1984). This can also be calculated using

C J EALES; A V STEWART

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ABSTRACT

There is a very high incidence of hypertension amongst the black population in South Africa. Regular aerobic exercise has been shown to be an effective method of lowering blood pressure. In order to be able to prescribe exercise for patients in a community-based setting, an easily administered exercise test needs to be used. In this study the 6 minute walking test in conjunction with the Borg scale and the Duke Activity Status Index (DASI) were tested on three groups of hypertensive patients from different socio-economic communities. The mean age of the cohort was 64.1 years (SD±7.9) and males and females were included. The outcome was evaluated by determining the degrees of agreement between the DASI and the age predicted VO2max (-0.3295) as well as between the calculated VO2max and the age predicted VO2max (-0.3045). The tests were easy to administer and the calculations easily done. The agreement between the 6 minute walking test and the DASI test was clinically acceptable (-0.0250) . There was no agreement between the values obtained and the age-predicted values. It was concluded that the walking test is a useful field test for exercise performance.

Jones' formula (Jones and Campbell 1982).

According to Borg (1982), perceived exertion is the single best indicator of the degree of physical strain. The overall perceived exertion rating integrates various information including the many signals elicited from the peripheral working muscles and joints, from the central cardiovascular and respiratory systems and from the central nervous system.

The rate of perceived exertion (RPE) at the ventilatory thresholds and the lactate thresholds is constant and corresponds to a Borg scale rating of 13-14. The onset of hyperventilation and/or lactate accumulation in muscle and blood during exercise may provide an objective, physiological anchor point for the subjective RPE. A reported RPE of 9-10 which is the very light to fairly light feeling of effort suggests that oxygen transport and uptake are not at training levels (Birk and Birk 1987).

Exercise intensity, without a graded exercise test, is prescribed by determining the age predicted maximal heart rate and then calculating the training heart rate. This procedure may not always be accurate and maximal heart rate by this calculation could result in an error of as much as 10 beats/min standard deviation for each age category (Birk and Birk 1987). Pulse rate is sometimes difficult for elderly people to measure. This lends credibility to the use of the RPE for assessing exercise intensity and prescribing exercise.

An RPE of less than 11 corresponds to a heart rate of less than 70% of the patient's maximal heart rate. Similarly an RPE of 12-14 corresponds to a heart rate of 70-80% of the patient's maximum. Available evidence suggests that the RPE independently or in combination with pulse rate can be effectively utilised for prescribing exercise intensity (Birk and Birk 1987).

To check the accuracy of the six minute walking test as a measure of exercise capacity in elderly hypertensive patients the Duke Activity Status Index can also be administered. This is a brief self-administered questionnaire that measures functional capacity and assesses aspects of quality of life. This index correlates significantly with peak oxygen uptake and is measured in METS (Hlatky et al 1989, Froehlicher et al 1993).

A study was undertaken to assess the efficacy of these tests in the subpopulation chosen.

MATERIALS AND METHODS

Subjects

Patients were selected from a tertiary care hospital in a metropolitan area, a community health clinic in a depressed socio-economic area and a hospital situated in a remote rural community. Male and female patients in the age group 55 -75 were included. All had blood pressure readings above 140/90 Hgmm. All the patients attending the hypertension clinic on a specific day at the above three venues were asked to participate in the study. All the patients from the rural hospital agreed to participate but there were patients from the other two clinics who refused.

A total of 44 patients were selected from the three areas.

At the tertiary care hospital we assessed 17 patients. The sample included 3 black patients and 14 white patients (Group 1).

At the community clinic we assessed 14 patients (Group 2) and at the rural hospital 13 patients (Group 3). These patients were all black (Table 1).

The project was passed by the Committee for Human Ethics at the University of the Witwatersrand. (Clearance certificate no. M941130). All participants signed a consent form after being fully informed of the nature of the study.

Method

All patients were seated and the Duke Activity Status Index was completed. The researchers read the questions to the patients and recorded their responses. Immediately after the completion of the DASI, with the patient still seated, the resting blood pressure measurements were taken on the left arm.

The procedure for the six minute walking test was then explained to the patient.

The resting pulse rate was taken manually with the patient standing at the starting point of the distance to be covered. The patient then completed the six minute walking test . Directly on completion of the test the pulse rate was taken. The patient was again seated and the post exercise blood pressure measured. The patient rated his/her perceived exertion during the test on the Borg scale.

The distance walked was recorded in metres.

TABLE 1:
Mean Age (±SD) of hypertensive patients in three groups recruited from three different clinical sites

Groups	Mean Age (yrs) SD	Sample Size
1	63.3 ± 7.02	17
2	63.1 ± 6.30	14
3	66.2 ± 10.3	13
TOTAL	64.1 ± 7.9	44

Group 1 = Tertiary Hospital
Group 2 = Urban Community
Group 3 = Rural Community

A walking test is a test of physical condition that is relevant to the demands of daily living

TABLE 2

Mean (±SD) duration of hypertension in years in all three groups of patients

Groups	Mean ± SD (yrs)
1	14.9 ± 7.9
2	8.2 ± 4.3
3	7.9 ± 3.8
TOTAL	**10.7 ± 7.4**

CALCULATION OF THE DATA

The DASI score was obtained by adding the sum of weights for the "yes" replies. The oxygen uptake was calculated in the following way:

VO_2 = 0.43 x DASI + 9.6 This formula was suggested by the researchers who designed the test (Hlatky et al 1989)

To convert the result to MET values the VO_2 was divided by 3.5. The MET value of the walking test was calculated using the following formula:

VO_2 ml/kg. min = (distance in metres)/ Time x 0.1 +3.5 = x
METS = x / 3.5
(American College of Sports Medicine 1991)

Using this MET value and the rate of perceived exertion as scored on the Borg Scale by the patient it was possible to calculate the predicted maximum oxygen uptake using the conversion method as described by Wenger and Hellerstein (1984) This conversion was done in the following way:

There is a constant relationship between the RPE and the percentage of maximum oxygen uptake. From the RPE the percentage of maximum oxygen uptake can be read from the conversion graph and thus the maximum oxygen uptake can be calculated as the test METS are known.

The age predicted maximum oxygen uptake (METS) was also calculated using the formula by Jones and Campbell (1982):

Female = (48-0.37 x age)/ 3.5
Male = (60-3.7xage)/ 3.5

The following information on exercise capacity was thus available:
1. Patients' Test METS
2 Patients' VO_2 max calculated from the test and the RPE (METS)
3. Age predicted maximum oxygen uptake (METS)
4. DASI METS

RESULTS

The mean age of the patients was slightly higher at the rural hospital but not significantly so (p=0.5222) (Table 1).

The hypertensive patients at the tertiary care hospital had been identified and treated for a significantly longer period of time than the patients in the other two groups (p = 0.0168). Perhaps this implies that medical care was more readily available. (Table 2)

The agreement between two tests can be established by calculating the limits of agreement as proposed by Bland and Altman, (1986). The calculation is as follows:

Upper limit = d + 1.96 x SE
Lower limit = d - 1.96 x SE

Where d is the mean of the differences in the scores for two tests and SE is the standard error of these differences (sd/√rn)

The average distance covered in the six minute walking test was the greatest for the tertiary hospital group (433 metres), 354 metres for the urban group and 347 for the rural group. This difference in distance walked was significant (p=0 0066) and therefore the test METS also differed significantly (p=0 0091).

DISCUSSION

In a study by Guyatt et al (1985) the mean distance covered by cardiac patients in the six minute walking test was 450 metres, which is considerably more than the distance covered by the hypertensive patients in this study. It would appear that the exercise capacity of the groups studied was impaired.

The variation between the MET values for the DASI and the VO_2 max MET values calculated from the walking test is small and clinically acceptable and therefore the results of these two methods were judged to be in agreement (Table 4). This indicates that the walking test results when converted to VO_2 max, yields results that are in agreement with the DASI results and that the VO_2 max values from the walking test minus the mean of the differences between the two

TABLE 3

Tabulation of Exercise test, DASI, calc VO_2 max and age predicted peak METS in hypertensive patients from three groups.

	Distance metres	Test METS	DASI METS	VO_2 max calculated in METS	Age pred peak METS
Tertiary Hosp	433	3.0	6.6	6.9	7.1
Urban Clinic	354	2.7	6.3	6.2	7.0
Rural Hosp	246	2.6	7.0	6.8	6.7
Mean	382	2.8	6.6	6.6	6.9
SD	±79.1	±0.38	±1.50	±2.08	±0.96
p	0.0066	0.0091	0.5405	0.6301	0.5121

TABLE 4
Limits of agreement between the tests

	DASI - VO_2 max.calc	DASI - Age pred VO_2 max	VO_2 max.calc - Age pred VO_2 max
mean (d)	-0.0250	-0.3295	-0.3045
standard error (sd/rn)	0.2621	0.1855	0.2710
Limits of agreement	(-0.539; 0.489)	(-0.701; 0.371)	(-0.847; 0.238)

tests will equal the DASI value (VO_2 max calc - 0.025 = DASI)

The Duke Activity Scale Index gives a valuable assessment of the VO_2 max and one could argue that this test alone would suffice (Hlatky et al, 1989). Peak oxygen uptake is the gold standard against which exercise capacity is measured. Because the DASI has been validated against peak oxygen uptake and there exists a significant correlation between the two tests we feel that the six minute walking test has potential as a field test. The exercise test provided very valuable information on patients' responses to exercise and would be essential to use when formulating an individual exercise prescription.

The variation in limits of agreement between the DASI and the age predicted VO_2 max and between the calculated VO_2 max and the age predicted VO_2 max was clinically unacceptable especially the lower limit in both cases (-0.701; and -0.847, Table 4). The VO_2 max calculated from the six minute walking test and the VO_2 calculated from the DASI reflected the values of hypertensive patients. The age predicted VO_2 max is a value for healthy people and does not reflect the VO_2 max of patients with hypertension. This would explain the lack of agreement illustrated in the results. These results would require further validation by direct measurement.

CONCLUSION

The walking test seems to have potential as a useful field test. The majority of the patients were enthusiastic about participating in the test and no complications were experienced during the test procedures. The test was not difficult to administer or to calculate and specialised personnel would not be required for the testing procedures. ❖

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