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Military fitness of young South African adults: Does it comply with requirements?

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Abstract

The fitness of today's young people is reported to be at a very low level, and this is disconcerting considering that some are needed as military recruits but will not be accepted if they do not pass the military fitness tests. The aims of this study were to investigate the pass rate of young adults (n=41) in the standard South African National Defence Force (SANDF) fitness test, and to establish whether the pass rate of the male (n=31) and female (n=10) participants differed significantly. A cross-sectional case report design was used as the research method. All participants aged 18.0 to 22.9 years underwent tests for body composition, handgrip strength, vertical jump and multistage shuttle run. After a 48-hour rest period the SANDF tests were carried out. For analysis the descriptive statistics and the non-parametric Mann-Whitney U-Test were used. The p-value was set at 0.05. The following results were obtained: 85.4% of the cohort failed the test, of that 90.6% of the males (*m*) failed and 60.0% of the females (*f*) failed. Significant differences ($p<0,01$) were found between the male and female participants in their height (*m*=171.9 m; *f*=164.2 m); weight (*m*=76.9 kg; *f*=63.6 kg); percentage body fat (*m*=19,2%; *f*=28.0%); explosive power (*m*= 1254.5 watt; *f*=947.1 watt); handgrip dynamometer strength (*m*=99.4 kg; *f*=67.9 kg); and SANDF passing scores ($p\leq0.05$) (*m*=2 006; *f*=2 567). No significant differences were observed on the indirect relative Vo_{2max} reading (*m*=41.7 ml/kg/min; *f*=38.2 ml/kg/min); body mass index (*m*=24.3 kg/m²; *f*=23.5 kg/m²); and the sit-and-reach test (*m*=33.6 cm; *f*=36.5 cm). It was concluded that female participants performed better than their male counterparts but that all the young people tested did not comply with the fitness requirements of the SANDF. As the majority of the cohort complied with the normal limits set for the general fitness tests, it was concluded that the level of fitness needed to pass the SANDF fitness test was higher than the level of fitness prescribed for the general population.

Keywords: Fitness, military, male, female.

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Introduction

Physical fitness refers to a combination of attributes that individuals possess or attain. Physical fitness can be defined as the individual's ability to carry out everyday tasks with sufficient energy and awareness, and without the interruption of fatigue and exhaustion, to partake in and enjoy leisure, recreational and sporting activities that are part of people's lives (Caspersen, Powell & Christenson, 1985).

Studies have shown a sharp decline in the levels of physical activity among the younger generation and therefore a decline in physical fitness (Dennison, Straus, Mellits & Charney, 1988; Gordon-Larsen, McMurray & Popkin, 2000; Wedderkopp, Froberg, Hansen & Andersen, 2004*).* This reduction in the physical activity levels of the South African youth has been directly related to an increase in crime levels, a decrease in the participation in physical education activities at schools and community recreation programmes, and socio-demographic factors (Gordon-Larsen *et al.*, 2000). Research indicates that inactive young children and adolescents are likely to become inactive young adults (Dennison *et al.*, 1988; Hills, King & Armstrong, 2007). A reduction in physical activity causes an increase in body mass index and fat mass which increases the risk of certain diseases (Berkey, Rockett, Gillman, & Calditz, 2003)

A decline in the level of physical fitness among the younger generation of adults is of great concern to the military (Engelbrecht, 2009). This decline theoretically suggests that the recruits of today will not have the minimal fitness requirements needed to defend our borders when required. Physical fitness is a fundamental requirement for military personnel.

Military forces around the world assess fitness through standardised military fitness tests. These tests are aimed at assessing the components of health-related fitness which include cardio-respiratory endurance, muscle endurance, muscle strength, body composition and flexibility (Caspersen *et al*., 1985). The standardised fitness test of the South African National Defence Force (SANDF) consists of a cardio-respiratory component (2,4 km run and 4 km walk), muscular endurance component (2 min sit-up and 2 min push-up), and a speed component (10x25 m shuttle runs) (South African Department of Defence, 2000). The composition of the battery of military tests differs between countries; for instance, the British and Israeli tests differ in the sense that they include a muscle strength component (handgrip strength), flexibility component (sit and reach), and a body composition component (skin-fold measurements) (Caspersen *et al*., 1985; Yanovich, Evans, Constantini, Sharvit, Merkel, Epstein & Moran, 2008).

Physical fitness capabilities in military settings have been reported to differ between males and females (Blacker, Wilkinson & Rayson, 2009). The training of army recruits in Britain, for instance, includes less intense cardio-respiratory exercise for female recruits than for male recruits. The reason given for this is that male recruits have a greater aerobic fitness capacity than female recruits. Yanovich *et al.* (2008) state that after training, Israeli female recruits had the ability to enhance their basic training test scores as well as laboratory test scores while the males were only able to improve on their physical fitness test scores. Once basic training was completed the gender differences between males and females decreased by 4% in all tests, except for the upper body strength tests. These decreased differences were attributed to the

males not being strained enough during training as they had higher baseline fitness levels (Yanovich *et al*., 2008).

Males and females who participate in the SANDF physical fitness tests undergo the same tests, and their scores for each test vary among the sexes. However, males tend to outperform females in military physical fitness tests (Yanovich *et al*., 2008; Blacker *et al*., 2009). In each SANDF test, separate scores are allocated for males and females (South African Department of Defence, 2000) even though the SANDF follows a mixed training policy.

The purpose of the study was firstly to determine how well the test group of young people, who all reside in Hatfield in Pretoria, perform in the SANDF and in general physical fitness tests, and secondly to establish the differences in scores between males and females.

Material and methods

Study design and subjects

A cross-sectional, observational study design, utilising an analytical descriptive correlation method, was used. All testing took place at the Institute for Sport Research Laboratory and the L.C. de Villiers Sport Centre. A total of 41 young adults aged 18,0 to 22,9 years volunteered to particpate in this study. A sample of convenience from the Hatfield suburb in Pretoria was used. Of these, 31 participants were male and 10 were female.

Measurements and procedures

The researchers obtained ethical approval from the Ethical Committee of the University of Pretoria. All eligible participants were informed about the purpose of the study and the risks associated with the specific tests. Before participation commenced the participants signed consent forms and were assured confidentiality of their results. The PAR-Q & You questionnaire (ACSM, 2009) and the Frequency Intensity Time (FIT) Index of Kasari (1976) had to be completed. Each participant was allocated a participation number to ensure anonymity, and their results were recorded on score sheets. The test procedure was explained in depth before testing began and an opportunity for questions was provided.

The first day of testing began at 16:00, lasted approximately two hours, and included the general fitness tests. The order of the tests was as follows: anthropometry (Lohman, Roche & Matorell, 1988), body composition (Durnin & Womersley, 1974), handgrip strength (Donald, 1995), sit and reach (Meiring, Loots, Liendenberg, Marais, Van Heerden, Coetzee & Jacobs, 1993; Kendall, Kendall McCreary &

Provance, 1993), vertical jumping (Adams, 1998), and multi-stage shuttle running (Leger & Lambert, 1982).

The second day of testing commenced with the SANDF fitness tests after a 48-hour rest period. Before the tests began, a five-minute standardised dynamic warm-up was conducted. The test order was as follows: 2.4 km run, 2 min. sit-up, 2 min. push-up, 10x25 m shuttle run, and a 4 km walk. A rest period of two minutes was taken between each test, except in the case of the 2.4 km run which was followed by a rest period of 10 to 15 minutes. According to the Policy on physical training of the Department of Defence (DOD) (South African DOD, 2000) the results of each test must be given a score, and the cumulative values of these tests must be $\geq 3\,000$ points in order to pass.

Statistical anaylsis

The data were analysed using the Statistical Package for the Social Sciences (SPSS) software version 17.0. A descriptive statistical analysis, as well as the non-parametric Mann-Whitney U-Test, was used to compare male and female performances (MacFarland, 1998). The data were considered significant at p-value of ≤ 0.05.

Results

Participants scored a mean 36 points out of a maximum of 100 on the FIT Index of Kasari (1976) which indicated that most participants exercised on average two to three times a week for more than 30 minutes at a moderate intensity. The mean values for the measurements done on Day one are outlined in Table 1. Table 2 reflects the mean values of the measurements obtained from the male and female participants on Day two.

Figure 1 highlights the statistically significant difference between the male and female results on the tests done on Day one. These differences were significant at the 1% level of significance ($p \leq 0.001$).

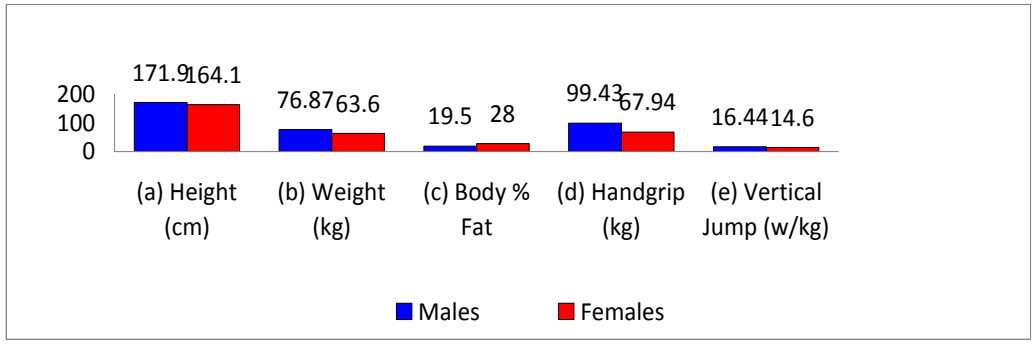
Figure 2 presents the results regarding the statistically significant differences between males and females on the SANDF tests. A significant statistical difference between the points allocated for the number of push-ups completed and the total fitness score for the male and female participants was also shown (Figure 2). In both cases the female scores were significantly higher than the male scores. Values for the 2.4 km run and the 10x25 m shuttle run show that males recorded statistically significant faster times than females ($p \leq 0.05$). There were no statistical differences between the males and females in the additional military tests.

Table 1: Means and standard deviations of the performance variables on day one

Test	Males (Mean ± SD)	Females (Mean ± SD)	Difference	Norms
FIT Index (points)	36 ; ~	*36 ;* ~	0	48
Body fat percentage (%)	19.2 ± 4.4	28 ± 3.7	8.8	Male: 10-22 Female: 20-32
Body mass index (kg/m^2)	24.3 ± 2.9	23.5 ± 2.7	0.8	18.5-24.9
Sit and reach (cm)	33.6 ± 11.2	36.5 ± 12.4	-2.9	Male: 25-29 Female: 28-32
Vertical jump (w/kg)	16.4 ± 1.6	14.6 ± 2.3	1.8	Male: 14.5-15.4 Female: 13.5-14.4
Multi-stage shuttle run: VO2 max (ml/kg/min)	41.7 ± 6.6	38.2 ± 4.5	3.5	Male: 43-52 Female: 33-42
Hand grip dynamometer (kg)	99.4 ± 11.2	67.9 ± 11.2	31.5	Male: 106-112 Female: 61-64

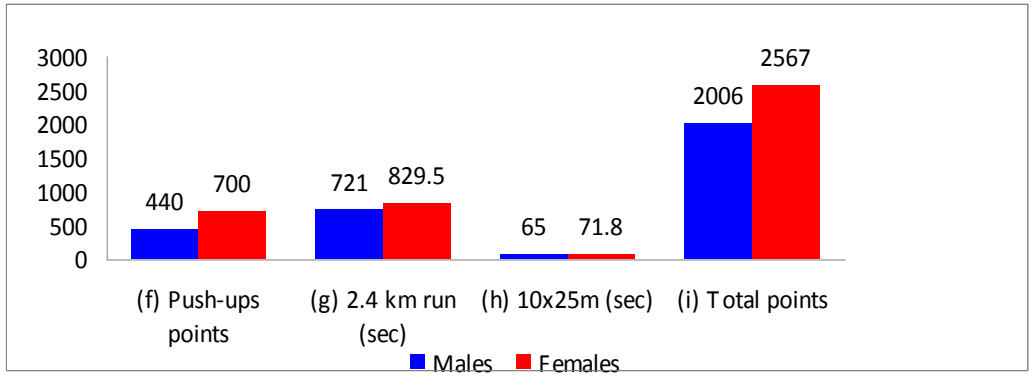
Table 2: Means and standard deviations of the parameters measured on day two

Test	Males (Mean ± SD	Females (Mean ± SD)	Difference	SANDF pass rate
2.4 km (sec) Points	721 ± 116.5 483.1 ± 354.7	829.5 ± 47.1 690 ± 96.9	-108.5 -206.9	Males: 720 Females: 870 Points: 600
Sit-ups Points	65 ± 16.5 686.5 ± 231.4	54 ± 18.2 814 ± 181.9	11 -127.5	Males: 55 Females: 31 Points:600
Push-ups Points	60 ± 35.4 840 ± 14.9	42.4 ± 11.2 700.8 ± 133.7	17.6 139.2	Males: 40 Females: 34 Points 600
10x25 m Points	65 ± 13.3 374.4 ± 286.2	71.5 ± 328.6 362.5 ± 328.7	-6.8 11.9	Males: 60 Females: 70 Points: 600
4 km walk (sec) Points	2 273.0 ± 163.5 29.0 ± 161.7	2 326.5 ± 118.9 0 ± 0	-53.5 29.0	Males: 1 800 Females: 2 100 Points
Total points	2 006.9 ± 847.7	2 567.3 ± 649.0	-560.4	3000
Pass rate (%)	9.4	40	-30.6	~



(a) p=0.001, (b) p=0.003, (c) p=0.001, (d) p=0.001, (e) p=0.013

Figure 1: Statistically significant difference between male and female participants' data



(f) p=0.020, (g) p=0.01, (h) p=0.034, (i) p=0.043

Figure 2: Statistically significant difference in the SANDF fitness test points allocated

Discussion

The majority (85.4%) of the cohort failed the SANDF military fitness test. The percentages that failed were 90.6% males and 60% females, which corroborated the findings of Gordon-Larsen *et al.* (2000) that the physical fitness of young people is declining. The total points accumulated after each test showed that males obtained a mean value of 2 006 points, while females obtained a mean value of 2 567 points ($p \leq 0.01$). Both scores are below the required 3 000 points to pass. Contrary to studies by Yanovich *et al*. (2008) and Blacker *et al*. (2009) which indicate that males perform better than females in military physical fitness tests, the females performed better than the males in the SANDF fitness test. However, the small sample of women tested in this study could have skewed the results.

Additionally, this study suggested that the information regarding the total accumulated points might be misleading, as the males still performed better than the females in the test, but the points did not reflect this because the females were scored

differently from their male counterparts. It could be argued that as both male and female soldiers must fulfill similar tasks they should have similar fitness levels irrespective of their sex. Therefore, the allocation of different fitness points based on sex should be revisited.

When compared to recommended guidelines, the total Body Mass Index (BMI) for males (24. 32) and females (23.53) was within the normal range (Rimm, Stampfer, Giovannucci, 1995). The body percentage fat measurements showed that the males (19.15%) fell in the "fair" category and the females (28%) in the "poor" category, respectively ($p \leq 0.001$) (Lohman, 1982). The sit-and-reach flexibility scores for both males and females were interpreted as "very good" (ACSM, 2009). In the multi-stage shuttle runs, males on average had a "fair" VO_2 max value, whereas females had an "excellent" VO_2 max value (ACSM, 2009).

The hand-grip strength of the males reflected a "good" mean score, while the females' score placed them in the "very good" category (Nieman, 2007). The vertical-jump results placed the males in the 45% percentile (Patterson & Peterson, 2004), and the females in the 55% percentile. Therefore, when the results were compared to an absolute norm it appeared that the female participants performed better than their male counterparts even though the male participants jumped higher and produced more power than the females. Both male and female participants were classified as "average".

Gordon-Larsen *et al*. (2000) state that the youth of today are physically inactive compared to the youth of the past and therefore they achieve below average fitness test results. However, this was not supported by the findings of this study. The FIT Index of Kasari indicated that this study sample of young people was physically fit, exercising two to three times a week for 30 minutes a day at a moderate intensity. It is possible that physically inactive people were apprehensive and unwilling to participate in this test, therefore a sample of convenience was used. The fitness level demonstrated by the sample group was still insufficient to comply with the fitness requirements of the SANDF.

Although the female participants performed better than their male counterparts in the SANDF physical fitness tests, the mean results of the total participants suggested that the youth tested would not comply with the fitness requirements set by the SANDF. This is disconcerting in view of the need for border protection and control. As the majority of the cohort were within the normal limits of the general fitness tests that were done, it is possible that the fitness needed to pass the SANDF fitness test is higher than that prescribed for the normal population.

Recommendations

Further research is recommended using a larger sample group of both males and females and including participants who are not physically active so as to be a true reflection of the youth aged 18.0 to 22.9 who would be potential candidates to join the SANDF. Researchers can also include the tests used by other essential services such as the South African Police Services and the Fire Services to determine youth fitness benchmarks in these tests.

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