Original Article

A Prospective Cohort Study on the Impact of a Modified Basic Military Training (mBMT) Programme Based on Pre-enlistment Fitness Stratification Amongst Asian Military Enlistees

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Abstract

Introduction: This study objectively evaluates the effectiveness of a 6-week Preparatory Training Phase (PTP) programme prior to Basic Military Training (BMT) for less physically conditioned conscripts in the Singapore Armed Forces. Materials and Methods: We compared exercise test results of a group of less fit recruits who underwent a 16-week modified-BMT (mBMT) programme (consisting of a 6-week PTP and 10-week BMT phase) with their 'fitter' counterparts enlisted in the traditional 10-week direct-intake BMT (dBMT) programme in this prospective cohort study consisting of 36 subjects. The main outcome measures included cardiopulmonary responses parameters ($\dot{V}O_2$max and $\dot{V}_{O2AT}$) with clinical exercise testing and distance run timings. Results: Although starting off at a lower baseline in terms of physical fitness [$\dot{V}O_2$max 1.73 ± 0.27 L/min (mBMT group) vs 1.97 ± 0.43 L/min (dBMT), *P* = 0.032; $\dot{V}_{O2AT}$ 1.02 ± 0.19 vs 1.14 ± 0.32 L/min respectively, *P* = 0.147], the mBMT group had greater improvement in cardiopulmonary indices and physical performance profiles than the dBMT cohort as determined by cardiopulmonary exercise testing [$\dot{V}O_2$max 2.34 ± 0.24 (mBMT) vs 2.36 ± 0.36 L/min (dBMT), *P* = 0.085; $\dot{V}_{O2AT}$ 1.22 ± 0.17 vs 1.21 ± 0.24 L/min respectively, *P* = 0.303] and 2.4 kilometres timed-run [mBMT group 816.1 sec (pre-BMT) vs 611.1 sec (post-BMT), dBMT group 703.8 sec vs 577.7 sec, respectively; overall *P* value 0.613] at the end of the training period. Initial mean difference in fitness between mBMT and dBMT groups on enlistment was negated upon graduation from BMT. Conclusion: Pre-enlistment fitness stratification with training modification in a progressive albeit longer BMT programme for less-conditioned conscripts appears efficacious when measured by resultant physical fitness.

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Key words: Exercise capacity, Oxygen uptake, Recruits, Singapore

Introduction

Basic military training (BMT) is seen as a vital initiation phase into military service when new recruits are conditioned to the rigours of military training in terms of physical and combat fitness. This training period assumes a great significance in Singapore where all able-bodied males between the ages of 17 to 24 years are conscripted to serve more than 2 years of compulsory full-time National Service in the various services of the Singapore Armed Forces (SAF).

As with other armed forces, the issue of vastly varied physical fitness levels among enlistees is a significant one. In an attempt to identify the different training requirements in transforming new conscripts with varying fitness levels into combat-fit soldiers, the SAF triages the pre-enlistees' fitness using the National Annual Physical Fitness Award (NAPFA) test conducted prior to enlistment. The NAPFA test performance standards are shown in Appendix 1. Since 1992, pre-enlistees who attain *GOLD* or *SILVER* NAPFA pass standards are eligible for the shorter 10-weeks direct-intake BMT (dBMT) programme; whereas those who have either failed to meet NAPFA pass standard or achieved only a *BRONZE* standard are channelled into the modified BMT

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(mBMT) programme. The latter comprises of an enlistment date 6 weeks earlier for the Preparatory Training Phase (PTP) programme, followed by the 10-weeks BMT proper together with their dBMT contemporaries.

The PTP programme aims to improve the fitness level of less-fit recruits through focused body strengthening training right at the beginning of enlistment and attempts to progressively match or reduce this fitness 'gap' with the fitter cohort. To date, the perceived benefits of this PTP programme have yet to be objectively studied and quantified.

The aim of this study was to evaluate the objective effectiveness of such a modified BMT programme based on pre-enlistment fitness stratification, in improving the aerobic fitness and physical performance profiles of our BMT recruits.

Materials and Methods

Study Design

This was a prospective cohort parallel group study involving recruits undergoing mBMT or dBMT programmes. The main outcome measures of interest were cardiopulmonary responses during clinical exercise testing, 2.4 km run timing and body mass index (BMI).

Study Population

The subjects in this study were selected from a group of recruits who underwent their BMT from August to November 2000 at the Naval Diving Unit of the SAF. These recruits were 18 to 23 years old Asian men who were medically fit with no outstanding medical ailments and were not taking any medication at time of assessment. Based on their pre-enlistment NAPFA test results, the subjects were pre-stratified and enrolled into either a 10-week dBMT programme (for GOLD or SILVER NAPFA awardees) or the longer 16-week mBMT programme (BRONZE or failed NAPFA standards) which was inclusive of the 6-week PTP training. The recruits were subjected to additional stringent medical screening upon enlistment, with further medical review/investigations on top of the usual pre-enlistment screening to ensure medical fitness for the study. This consisted of a history review, physical examination by a Diving Medical Officer, chest X-ray (CXR), complete blood count, electrocardiogram and spirometry.[1] Obese subjects with a body mass index (BMI) >28 kg/m^2 were excluded from the selection. Selection of subjects from the dBMT and mBMT cohort for the study was by use of random numbers generated by computer. All selected subjects were volunteers who gave written consent to participate in this study.

To minimise disruption from the routine BMT training schedule, in addition to logistical constraints, the study population was limited to about 40 subjects. Random selection process produced a total of 42 subjects with 19 in the mBMT programme and 23 in the dBMT programme.

Exercise Testing

Symptom-limited cardiopulmonary exercise testing (CPET)[2] was performed for all subjects at the beginning and end of BMT, as well as at completion of the 6-week PTP for the mBMT cohort. BMT instructors were advised to allow the test subjects to have at least 7 hours of sleep the night before and adequate rest prior to each exercise test. On the day of CPET, anthropometric measurements of height (in centimetres) and weight (in kilogrammes) were made, as well as percentage body fat estimation using the Omron Body Fat Monitor HBF-300 via Bioelectrical Impedance (BI) method. Symptom-limited CPET was performed using an electrically braked cycle ergometer (Ergometrics 800S, SensorMedics, Yorba Linda, CA). CPET was performed under the supervision of a physician with defined criteria for stopping, such as serious cardiac arrhythmias, hypotension and electrocardiographic changes and severe oxygen desaturation. An incremental exercise protocol was used in which the work rate was increased by 20 watts every minute after an initial 3 minutes of unloaded pedalling. Blood pressure was measured using a standard cuff sphygmomanometer at rest, every 3 minutes during exercise, at peak exercise and for 5 minutes into the recovery phase. Subjects wore a tight-fitting facemask (Rudolph Face Mask for Exercise Testing; Hans Rudolph Inc., Kansas City, MO) connected to a pneumotachograph. Measurements of mixed expired oxygen, mixed expired carbon dioxide and expired volume were determined at rest and for each breath throughout exercise using a metabolic cart (Vmax 229, SensorMedics, Yorba Linda, CA). The gas analyser was calibrated for both accuracy and linearity prior to each test run series. Oxygen uptake ($\dot{V}O_2$ in mL/min, standard temperature and pressure, dry), carbon dioxide production ($\dot{V}CO_2$, in mL/min), gas exchange ratio, minute ventilation ($\dot{V}E$, in L/min, BTPS), respiratory rate (RR), tidal volume (VT) and ventilatory equivalent for carbon dioxide ($\dot{V}E/\dot{V}CO_2$) was determined and averaged every 20 seconds. Oxygen saturation (SaO_2) via pulse oximetry and heart rate by electrocardiography were recorded continuously throughout exercise and during recovery.

Maximal exercise was defined as fulfilment of at least 2 of the following 3 conditions:[3,4] (1) failure of $\dot{V}O_2$ to rise with increasing work-load of exercise, (2) respiratory gas exchange ratio greater than 1.15, (3) heart rate within 15 beats of predicted maximal heart rate as determined by the following equation: HRmax = 210-0.65age (beats per minute).

$\dot{V}O_2$max was selected as the highest values obtained from any 30-s measurement period. Work load at maximal effort (W_{max}) was also noted. Anaerobic threshold ($\dot{V}_{O2AT}$) was identified for each subject using the ventilatory equivalent threshold method.[5]

The Borg score of perceived exertion was obtained from each subject at peak exercise during the initial CPET and at isoworkrate during the subsequent exercise test.[6,7]

Training Programme

Emphasis of the 6-week long PTP training was on physical strengthening, to which more than two thirds of the designated training programme (totaling approximately 197 hours) were appropriated and progressively graded in terms of duration and intensity over 6 weeks. The physical training (PT) block syllabus consisted of modules as follows:

i. Endurance Training
ii. Interval and Circuit Training
iii. Flexibility and Psychomotor Skill Training
iv. Partner Resistance Exercise
v. Weight Lifting
vi. Swimming
vii. Games
viii. Education on Principles of Fitness and Training
ix. Individual Physical Proficiency Test

A typical routine consisted of approximately 2 hours of land evolutions like static physical training, runs and circuit training in the morning, followed by another 2 hours of pool swim in the afternoon, interspersed with visits to the gymnasium for weights training and subsequent progression to endurance training.

The training programme for the subsequent 10 weeks of BMT (similar for all enlistees) was more diverse; other than impartation of general military knowledge and military skills training, at least 2 hours were set aside for land or water-based physical training almost daily. Route marches and standard obstacle course were also introduced to the recruits towards the later half of the course.

Statistical Analysis

Descriptive statistics (mean and standard deviation) was computed for each parameter separately for pre- and post-BMT, for both the dBMT and mBMT programmes. Two sample t-test assuming unequal variance and the Mann-U Whitney test were used to compare baseline characteristics between the dBMT and mBMT programmes. The paired t-test was used to compare pre-BMT, post-PTP and post-BMT scores for both types of BMT programmes. Finally, we used the analysis of the covariance (ANCOVA) model to study the difference in post-BMT parameters between the 2 groups, after adjusting for age and baseline values of the respective parameters. Data analysis was carried out on SPSS for Windows Version 8 (SPSS Inc., Chicago, IL) and level of significance was set at <0.05.

Results

Thirty-six out of 42 subjects eventually completed the study – there were 3 drop-outs from each of the 2 groups largely due to injuries sustained during training which hindered $\dot{V}_{O2max}$ testing. Two trainees were found to be newly diagnosed asthmatics during BMT course proper and were hence eliminated from the study as per exclusion criteria. In total, 16 trainees from the mBMT group and 20 trainees from the dBMT group completed the study.

Table 1 summarises the baseline characteristics of subjects in the dBMT and mBMT groups. Recruits entering the PTP phase of mBMT tend to be heavier (by 3.6 kg in mean weight), a greater BMI of 0.8% more body fat as compared to their dBMT compatriots but these were not statistically significant. As subjects were classified for the type of BMT based on their NAPFA test results, pre-BMT 2.4 km timed run outlined this disparity in physical fitness-mean timing of 703.81 sec (for dBMT group) as compared to 816.11 sec (for mBMT group) – a difference of 16.0%. This was statistically significant (P = 0.005). Mean $\dot{V}_{O2max}$ of enlistees undergoing dBMT was 1.97 L/min, which was higher than the mBMT group mean of 1.73 L/min (difference of 13.9%). Ability to work against imparted load at maximal effort was also greater, at mean W_{max} of 189.30 watts as compared to 171.95 watts for mBMT, a difference of 9.2%. Disparity in $\dot{V}_{O2max}$ and W_{max} values between both dBMT and mBMT groups were notably statistically significant, suggesting enhanced aerobic fitness in the former. A similar

Table 1. Baseline Characteristics* of Subjects in the 10-week dBMT and 16-week mBMT Programmes

	dBMT (n = 23)	mBMT (n = 19)	*P* value
Age, y	21.0.3 ± 1.0	20.3 ± 1.1	0.032++
Weight, kg	64.6 ± 6.6	68.2 ± 7.2	0.105
Height, cm	171.1 ± 4.2	172.6 ± 4.8	0.296
Body mass index, kg/m^2	22.15 ± 2.35	23.02 ± 2.31	0.238
Body fat %	16.00 ± 4.55	16.86 ± 4.15	0.531
W_{max}/Watts	189.30 ± 31.35	171.95 ± 24.44	0.050
$\dot{V}_{O2\,Max}$ /L/min	1.97 ± 0.43	1.73 ± 0.27	0.032
$\dot{V}_{O2AT}$/L/min	1.14 ± 0.32	1.02 ± 0.19	0.147
Borg Scale	5.05 ± 1.35	6.50 ± 2.07	0.030++
2.4 km run/s	703.81 ± 86.76	816.11 ± 132.08	0.005

Values are expressed as mean ± SD

* These measurements were obtained just prior to commencement of BMT for both the dBMT and mBMT cohort.

\+ All *P* values calculated from 2-sample *t*-test assuming unequal variance unless otherwise stated

++ *P* value calculated from Mann-Whitney U Test

Table 2. Comparison of Pre- and Post-BMT Scores Amongst Subjects on the 10-week dBMT Programme (n = 20)

	Pre-BMT	Post-BMT	*P* value*
Body mass index, kg/m^2	22.15 ± 2.35	21.65 ± 1.85	0.02
Body fat %	16.00 ± 4.55	14.41 ± 3.19	0.001
W_{max}/Watts	189.30 ± 31.35	225.55 ± 33.52	<0.001
$\dot{V}_{O2\ Max}$/L/min	1.97 ± 0.43	2.38 ± 0.36	<0.001
$\dot{V}_{O2AT}$/L/min	1.14 ± 0.32	1.21 ± 0.24	0.103
Borg Scale	5.05 ± 1.35	3.48 ± 1.20	<0.001
2.4 km run/s	703.81 ± 86.76	577.68 ± 45.79	<0.001

Values are expressed as mean ± SD
* All *P* values calculated from paired *t*-test

Table 3. Comparison of Pre- and Post-BMT Scores Amongst Subjects on the 16-week mBMT Programme (n = 16)

	Pre-BMT	Post-BMT	*P* value*
Body mass index, kg/m^2	23.02 ± 2.31	22.10 ± 1.86	0.010
Body fat %	16.86 ± 4.15	15.93 ± 2.98	0.098
W_{max}/Watts	171.95 ± 24.44	224.00 ± 23.56	0.001
$\dot{V}_{O2\ Max}$/L/min	1.73 ± 0.27	2.34 ± 0.24	<0.001
$\dot{V}_{O2AT}$/L/min	1.02 ± 0.19	1.22 ± 0.17	0.008
Borg Scale	6.50 ± 2.07	4.28 ± 1.41	0.022
2.4 km run/s	816.11 ± 132.08	611.06 ± 57.57	<0.001

Values are expressed as mean ± SD
* All *P* values calculated ffrom paired *t*-test

trend could be seen for $\dot{V}_{O2AT}$ and Borg score for perceived exertion at the end of testing which was subjectively lower for the dBMT group.

Comparisons of selected variables before and after BMT for the dBMT and mBMT groups are shown in Tables 2 and 3. All the subjects included in the analysis met the criteria for maximal exercise during CPET as stated above.

In the shorter 10-week dBMT cohort, BMI improved from 22.15 ± 2.35 kg/m^2 to 21.65 ± 1.85 kg/m^2 (P = 0.02), body fat decreased from 16.00 ± 4.55 % to 14.41 ± 3.19 % (P = 0.001) and W_{max} from 189.30 ± 31.35 watts to 225.55 ± 33.52 watts (P <0.001). Absolute $\dot{V}_{O2max}$ at maximal effort bettered from 1.97 ± 0.43 L/min to 2.38 ± 0.36 L/min (P <0.001) and Borg score for perceived exertion improved from 5.05 ± 1.35 to 3.48 ± 1.20 (P <0.001). Run time for 2.4 km improved from 703.81 ± 86.76 sec to 577.68 ± 45.79 sec (P <0.001).

Likewise with 16 weeks of mBMT training, improvements were noted in BMI and body fat, from 23.02 ± 2.31kg/m^2 to 22.10 ± 1.86 kg/m^2 (P = 0.01) and 16.86 ± 4.15 % to 15.93 ± 2.98 % (P = 0.098), respectively. Absolute $\dot{V}_{O2max}$ increased from 1.73 ± 0.27 L/min to 2.34 ± 0.24 L/min

Table 4. Sub-analysis of Pre-BMT and Post-PTP Scores Amongst Subjects on the 16-week mBMT Programme (n = 16)

	Pre-BMT	Post-PTP	*P* value*
Body mass index, kg/m^2	23.02 ± 2.31	22.10 ± 1.86	0.002
Body fat %	16.86 ± 4.15	15.93 ± 2.98	0.098
W_{max}/Watts	171.95 ± 24.44	213.47 ± 21.91	0.001
$\dot{V}_{O2\ Max}$/L/min	1.73 ± 0.27	2.26 ± 0.30	<0.001
$\dot{V}_{O2AT}$/L/min	1.02 ± 0.19	1.18 ± 0.16	0.003
Borg Scale	6.50 ± 2.07	4.28 ± 1.41	0.022
2.4 km run/sec	816.11 ± 132.08	672.44 ± 61.00	<0.001

Values are expressed as mean ± SD
* All *P* values calculated from paired *t*-test

(P <0.001) and W_{max} from 171.95 ± 24.44 watts to 224.00 ± 23.56 watts (P = 0.001). Borg score dropped from 6.50 ± 2.07 to 4.28 ± 1.41 (P = 0.022). There was an improvement in $\dot{V}_{O2AT}$ from 1.02 ± 0.19 L/min to 1.22 ± 0.17 L/min (P = 0.008) and for 2.4 km timed run from 816.11 ± 132.08 sec to 611.06 ± 57.57 sec (P <0.001).

Within each BMT group, there were statistical improvements in BMI, W_{max}, $\dot{V}_{O2max}$, Borg score and 2.4 km timed run (P <0.05). There was also a significant improvement in $\dot{V}_{O2AT}$ in the mBMT group.

Further interval analysis was performed for subjects in the mBMT cohort upon completion of their PTP training as compared to their pre-BMT/enlistment performance and is summarised in Table 4. There was statistically significant enhancement of almost all parameters under study. These rather remarkable improvements underlined the vital role that PTP alone had played with just 6 weeks of concerted body-strengthening training.

Table 5 summarises the comparative performance of subjects in both dBMT and mBMT groups prior to enlistment and upon completion of BMT. Notably, the significant pre-BMT difference especially in mean $\dot{V}_{O2max}$ and W_{max} values as well as 2.4 km timed run had been negated upon completion of BMT. These parameters provided objective evidence that with additional PTP training, less-fit conscripts may be brought to a corresponding level of physical as well as aerobic fitness as their dBMT counterparts.

Discussion

The main findings of this study were as follows:

1. Pre-enlistment NAPFA criteria can be used as a triage system for identifying military enlistees for modified BMT based on aerobic capacity and physical fitness
2. The additional Preparatory Training Phase (PTP) programme was able to achieve its objective of bringing the exercise performance of 'less fit' enlistees

Table 5. Comparison of Change in Scores Between the dBMT and mBMT Programmes

Variable	Period	dBMT	mBMT	Difference	*P* value*
BMI	Pre	22.15	23.02		
	Post	21.65	22.10		
	Difference	0.51	0.92	0.41	0.302
Body fat (%)	Pre	16.00	16.86		
	Post	14.41	15.93		
	Difference	1.59	0.93	-0.67	0.226
W_{max}/Watts	Pre	189.30	171.95		
	Post	225.55	224.00		
	Difference	-36.25	-52.05	-15.81	0.283
$\dot{V}_{O2\ Max}$/L/min	Pre	1.97	1.73		
	Post	2.36	2.34		
	Difference	-0.38	-0.61	-0.23	0.085
Borg Scale	Pre	5.05	6.50		
	Post	3.48	4.28		
	Difference	1.57	2.22	-0.65	0.04
$\dot{V}_{O2AT}$ /L/min	Pre	1.14	1.02		
	Post	1.21	1.22		
	Difference	-0.07	-0.20	-0.14	0.303
2.4 km run/s	Pre	703.81	816.11		
	Post	577.68	611.06		
	Difference	126.13	205.05	78.92	0.613

* All *P* values are from analysis of covariance, with age, BMT type and baseline reading of each variable as the covariates

to a corresponding level of their 'fitter' counterparts by the end of BMT

3. There were significant physiologic responses to exercise induced by training in individuals undergoing the standard and modified BMT programme with the potential for improvement in performance being greater in 'less fit' enlistees undergoing mBMT

With the enlistees for dBMT identified by their achieving either the *GOLD* or *SILVER* NAPFA standards prior to enlistment, it was not surprising that there was significant disparity between this group compared to the subjects identified for mBMT with regard to their pre-BMT 2.4 km timed run results. The consequence of initial stratification of enlistees based on pre-enlistment NAPFA physical fitness test results also identified 'less fit' individuals in terms of their physiologic responses to exercise viz., mean $\dot{V}_{O2max}$, W_{max}, Borg score for perceived exertion and $\dot{V}_{O2AT}$, with statistical significance noted for the above parameters pre-enlistment other than for $\dot{V}_{O2AT}$ as with the unidirectional nature of the observation that all the physiologic variables were worse for the mBMT group. With larger sample sizes, it was possible that significant differences in these other variables were likely to be found with regards to type II error. Similarly, this form of initial stratification for BMT was also likely to identify more individuals with higher percentage body fat.

It was not surprising that mBMT subjects made more substantial improvements in almost all measured parameters at the end of BMT, especially since they started at a lower baseline. This was especially evident in W_{max}, $\dot{V}_{O2max}$ and $\dot{V}_{O2AT}$, whereby improvements in excess of 30 ~ 35 % were observed, as compared to the dBMT group whose improvements were <20%. Run timings for the 2.4 kilometres also improved by about 25.1% (for mBMT) as compared to 17.9% (for dBMT). Such marked and significant improvements in fitness were not without precedence and had been demonstrated in subjects with low initial levels of fitness and with endurance trainings.[8-11] It was notable with the intermediary physiologic measurements taken for the mBMT cohort by the end of the PTP phase that these 'less-fit' recruits had already caught up with the fitness of the dBMT cohort who were beginning their BMT training proper (Tables 2 and 4). At the end of BMT, all subjects did not have a statistical difference with regard to almost all physiological parameters, indicating that PTP with BMT had almost negated the gap between the 'less fit' mBMT and the fitter dBMT subjects.

Physical fitness can be evaluated by the measurement of peak oxygen uptake and the anaerobic threshold. Indeed, the American Heart Association's classification of cardiorespiratory fitness[12] is based on maximal oxygen uptake. Exercise training increases maximal O_2, both because arteriovenous oxygen content difference widens and maximal cardiac output is higher.[9] Improvements in the order of 8% to 15% are commonly reported. In this study, there was significant improvement in $\dot{V}_{O2}$ after PTP and the increment in $\dot{V}_{O2}$ was higher in subjects after completion of mBMT compared to those who underwent dBMT. The potential for improvement in performance, when expressed as a percent increase, is known to be highest in previously sedentary subjects and lowest in subjects already fit.[9,13] Anaerobic threshold (AT) is considered an estimator of the onset of metabolic acidosis caused predominantly by the increased rate of rise of arterial lactate during exercise. AT determination is also helpful as an indicator of the level of fitness and to monitor the effect of physical training.[14] Based on the finding of a higher AT after exercise training, we have shown that improvement in exercise performance after the 2 forms of BMT in our subjects were due to physiologic responses induced by training and not due solely to motivational factors.

The BMT and PTP training programmes as described above in our study were implemented in accordance to the general BMT training directives of the SAF but with an emphasis towards water sports-related training in view of the study Unit involved. As such, although the results of this study was intended to reflect on the status of the SAF's BMT programme, one might be cautious to extrapolate the findings to all new military enlistees alike. In addition, individual motivational factors would likely have also influenced physical performance to some extent at the respective stipulated time-points of assessment.

Another perceived benefit of the mBMT programme was a reduction of training injuries. This could be achieved with the introduction of a progressive intensity-graded training programme to allow adequate acclimatisation periods during BMT.[15,16] Objective assessment of training-related injuries was not performed as this was beyond the scope of the study. Nonetheless, a graded albeit longer BMT programme may have implications for the more obese enlistees in weight and body fat loss, while maintaining fat-free weight and a low injury rate.[8]

Conclusion

The Singapore Armed Forces' two-tier direct and modified Basic Military Training programme (dBMT and mBMT) was devised primarily in response to the diverse fitness standards in its conscripts enlisted for national service. This study has demonstrated that pre-enlistment fitness stratification with consequent training modification with a more progressive albeit longer basic military training programme for the less conditioned appear to be effective in reconditioning physically unfit individuals with notable physiological improvements.

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Appendix 1. Pre-enlistment National Physical Fitness Award (NAPFA) Criteria

Age group	Performance grade	Points	No. of Sit-ups in 1 min	Standing Broad Jump	Sit & Reach Distance	No. of Pull-ups in 30 secs	4 X 10 m Shuttle Run time	2.4 km Run-Walk time (min : sec)
17 years of age	A	5	>42	>249 cm	>50 cm	>9	<10.2 sec	< 10:11
	B	4	40-42	240-249	44-50	8-9	10.2-10.3	10:11-11:00
	C	3	37-39	230-239	37-43	6-7	10.4-10.5	11:01-11:50
	D	2	34-36	220-229	30-36	5	10.6-10.7	11:51-12:40
	E	1	31-33	210-219	23-29	3-4	10.8-10.9	12.:41-13:30

Age group	Performance grade	Points	No. of Sit-ups in 1 min	Standing Broad Jump	Sit & Reach Distance	No. of Pull-ups in 30 secs	4 X 10 m Shuttle Run time	2.4 km Run-Walk time (min : sec)
18 years of age	A	5	>42	>251	>50 cm	>10	<10.2 sec	< 10:01
	B	4	40-42	242-251	44-50	9-10	10.2-10.3	10:01-10:50
	C	3	37-39	232-241	37-43	7-8	10.4-10.5	10:51-11:40
	D	2	34-36	222-231	30-36	5-6	10.6-10.7	11:41-12:30
	E	1	31-33	212-221	23-29	3-4	10.8-10.9	12:31-13:20

Age group	Performance grade	Points	No. of Sit-ups in 1 min	Standing Broad Jump	Sit & Reach Distance	No. of Pull-ups in 30 secs	4 X 10 m Shuttle Run time	2.4 km Run-Walk time (min : sec)
19 years of age	A	5	>42	>251cm	>50 cm	>10	<10.2 sec	< 10:01
	B	4	40-42	242-251	44-50	9-10	10.2-10.3	10:01-10:50
	C	3	37-39	232-241	37-43	7-8	10.4-10.5	10:51-11:40
	D	2	34-36	222-231	30-36	5-6	10.6-10.7	11:41-12:30
	E	1	31-33	212-221	23-29	3-4	10.8-10.9	12:31-13:10

Age group	Performance grade	Points	No. of Sit-ups in 1 min	Standing Broad Jump	Sit & Reach Distance	No. of Pull-ups in 30 secs	4 X 10 m Shuttle Run time	2.4 km Run-Walk time (min : sec)
20-24 years of age	A	5	>39	>242 cm	>50 cm	>10	<10.4 sec	< 10:21
	B	4	37-39	234-242	44-50	9-10	10.4-10.5	10:21-11:00
	C	3	34-36	225-233	37-43	7-8	10.6-10.7	11:01-11:40
	D	2	31-33	216-224	30-36	5-6	10.8-10.9	11:41-12:20
	E	1	28-30	207-215	23-29	3-4	11.0-11.1	12:21-13:00

NAPFA Award Scheme:
GOLD - Minimum performance grade C in all 6 stations and a total score of more than 21
SILVER - Minimum performance grade D in all 6 stations and a total score of more than 15
BRONZE - Minimum performance grade E in all 6 stations and a total score of more than 6