AN EVALUATION OF THE PHYSICAL TRAINING OF OFFICER CANDIDATES AT CANADIAN FORCES OFFICER CANDIDATE SCHOOL

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DEPARTMENT OF NATIONAL DEFENCE — CANADA
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DEPARTMENT OF NATIONAL DEFENCE - CANADA
# Table of Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abstract</td>
<td>v</td>
</tr>
<tr>
<td>Introduction</td>
<td>1</td>
</tr>
<tr>
<td>Methods</td>
<td>1</td>
</tr>
<tr>
<td>Aerobic Power</td>
<td>1</td>
</tr>
<tr>
<td>Body Composition</td>
<td>2</td>
</tr>
<tr>
<td>Pulmonary Function</td>
<td>2</td>
</tr>
<tr>
<td>Flexibility and Muscle Strength</td>
<td>2</td>
</tr>
<tr>
<td>Results</td>
<td>2</td>
</tr>
<tr>
<td>Aerobic Fitness</td>
<td>2</td>
</tr>
<tr>
<td>Body Composition</td>
<td>5</td>
</tr>
<tr>
<td>Discussion</td>
<td>10</td>
</tr>
<tr>
<td>Aerobic Power</td>
<td>10</td>
</tr>
<tr>
<td>Muscle Strength and Flexibility</td>
<td>16</td>
</tr>
<tr>
<td>Body Composition</td>
<td>17</td>
</tr>
<tr>
<td>Sick Parade Attendance</td>
<td>18</td>
</tr>
<tr>
<td>Conclusion</td>
<td>19</td>
</tr>
<tr>
<td>Recommendations</td>
<td>21</td>
</tr>
<tr>
<td>References</td>
<td>22</td>
</tr>
</tbody>
</table>
ABSTRACT

DCIEM was tasked to examine the physical training aspects of the syllabus at Canadian Forces Officer Candidate School. Changes in aerobic power, body composition, muscular strength and flexibility were monitored for 2 courses, one direct entry candidates and one with commissioned from the ranks candidates. The incidence of injury and lost training times was also monitored with a special register.

All candidates, especially the younger direct entry personnel arrived on course with higher than anticipated levels of fitness and consequently showed small improvements during training. There were significant changes in body composition with smaller changes in strength and flexibility. The relative influence of the scheduled physical activities and the field exercises on these changes are discussed. The incidence of sick parade attendance and consequent time lost from training is small (about 1%) and probably cannot be further reduced.

Recommendations to achieve greater efficiency and utilization of time and existing resources are included.
INTRODUCTION

DCIRM was tasked by Canadian Forces Training System (CFTS) to examine certain aspects of the basic training courses for officer candidates and recruits to the Canadian Forces. This report deals with two courses of officer candidates at Canadian Forces Officer Candidate School (CFOCS) CFB Chilliwack. The trainees in CFOCS 7609 comprised 46 direct entry officers (DEO) with the addition of 14 candidates from other countries, who will be referred to in this report as foreign nationals. The trainees in CFOCS 7610, which ran almost concurrently with 7609, were 71 experienced CF personnel who had been selected for officer training. These personnel, who will be referred to collectively as commissioned from the ranks, (CFR), are generally older than the DEO trainees, and of course have the benefit of previous military experience. The CFR course was somewhat shorter with less emphasis on the physical nature of the training.

This report examines the conditioning response of the candidates to the CFOCS training syllabus from several aspects: aerobic power, changes in body composition, muscular strength and flexibility, compliance with the requirements of CFAO 50-1 and sick parade attendance. Some of the interrelationships are discussed and conclusions are drawn from the data presented. Recommendations for changes in certain aspects of the training are included for consideration by the appropriate agencies.

METHODS

The personnel tested in this study were officer candidates attending two CFOCS courses, 7609 and 7610, from Sept to Dec 1976. Course 7609 included young direct entry candidates from Canada and foreign national candidates from Caribbean and African countries. Forty-six direct entry candidates and fourteen foreign national candidates, all males, were tested at the beginning, during the third week and at the end of the course (initial, interim and final tests, respectively). Course 7610, composed of CFR personnel comprising seventy-one men and one woman, was tested twice, at the beginning and at the completion of training.

Aerobic Power – Aerobic power (VO₂ max) was predicted from submaximal exercise performed using the MONARK bicycle ergometer. The total work period lasted ten minutes at a pedalling speed of 50 rpm. The first five minutes at a workload of 600 kpm/min allowed the subject to warmup after which a second five minute workload (usually 1200–1500 kpm/min) was selected to produce a heart rate
which was about 85% of maximum predicted from age. Heart rate during
the final minute, recorded using a Cambridge ECG, and workload, was
used to predict VO₂ max according to the nomogram of Astrand and
Rhyming. Individuals were classified into one of four categories
of VO₂ max proposed by Cooper and shown in Figure 1.

**Body Composition** - Skinfold thickness was measured at three sites
(triceps, subscapular, and suprailiac) using Harpenden calipers. These
measurements provide an estimate of body fat content since about
50% of body fat is located subcutaneously. A total for the three
sites of 35 mm is considered "ideal" for a young male whereas 50 mm
is a value above which he can be described as obese. Skinfold thick-
ness measurements can also be used to calculate percent body fat
using the equations of Durnin (1973) and Brozek et al (1963). Lean
body mass is obtained by subtracting the weight of body fat from
body weight.

**Pulmonary Function** - Forced vital capacity (FVC) and forced expiratory
volume (FEV₁) was measured using the Monaghan M403 pulmonary function
analyser. Values for FVC which are at least 90% of that predicted
from height and age and ratios of FEV₁/FVC x 100 which are greater
than 70% indicate normal lung function.

**Flexibility and Muscle Strength** - Hip and trunk flexibility were
measured using the Leighton flexometer. Hand grip strength was
measured by the Stoelting hand dynamometer, while other indirect
tests of muscle strength, as specified in CFAO 50-1, were carried
out by the B per O staff.

**RESULTS**

Figure 2 compares candidates from courses 7609 and 7610 by
age. Whereas 78% of the candidates on course 7609 were aged 18
to 24 years, 76% of 7610 were between 30 and 39. The data in this
study can therefore be compared with values for CF personnel aged
18-24 and 30-39 tested on previous occasions and considered to
represent the average for the Canadian military population.

**Aerobic Fitness** - Table 1 shows mean values for VO₂ max and running
time for 1.5 mile. Although candidates on course 7609 increased
their VO₂ max by an average of 8% during the first three weeks, no
further improvement was observed at the end of the course. Candidates
on 7610, tested at the beginning and the end of the course, showed
no significant change in VO₂ max. On the other hand, both courses
were able to significantly reduce their time to run the 1.5 mile
distance. Table 1 also contains data for other CF personnel of
FIGURE 1:

Categories of aerobic power based on standards of Cooper for age 25 and using Astrand age correction.
Figure 2: Distribution of courses 7609 and 7610 into categories by age.
comparable age and it is evident that the candidates of both 7609 and 7610 achieved above average levels of VO2 max.

Figure 3 shows the percentage of course 7609 candidates in each category of poor, fair, good or excellent, according to the standards in Figure 1, and corresponding to levels 2, 3, 4 and 5 respectively. Also included in Figure 3 is a similar treatment of data from 360 other CF personnel aged 18-24 years. At the beginning of the course, 77% of the candidates tested had achieved levels 4 or 5. After three weeks, and until graduation, 95% had achieved and maintained these levels. Among other CF personnel of the same age, only 54% were categorized as level 4 or 5.

Figure 4 shows the distribution of VO2 max into the four categories for course 7610 and for 554 CF personnel aged 30-39. At the beginning of the course, 76% were rated as level 4 or 5 with a decrease to 66% at graduation. By contrast, only 43% of other similar age CF personnel had achieved these levels of aerobic fitness. If level 5 alone is considered the percentages at the beginning of each course were 33% and 15% for 7609 and 7610 respectively, compared with 52% and 17% at graduation. By comparison, the proportion of other CF personnel in the excellent category was 19% for age 18-24 and 4% for age 30-39.

Categories of VO2 max can be compared with performance in running the 1.5 mile. At the beginning of course 7609, 61% and 35% of the candidates were rated as level 5 and 4, respectively, according to standards in CFAO 50-1. At the end of the course 7609, 81% were rated as level 5 and 19% as level 4. At the beginning of course 7610, the percentage rated as level 5 and 4 were 37% and 56%, respectively, and this improved to 57% and 43%, respectively, by the end of the course. Both courses showed an improvement during the training and, at graduation, all candidates were able to meet the minimum requirement for the 1.5 mile distance (level 4).

Body Composition - Table 2 shows mean values for skinfold thickness, body weight and lean body mass. Candidates on course 7609 showed an average decrease of 5 mm in skinfold thickness indicating a loss of body fat.

Since there was no significant change in body weight, this represents a gain of 1.6 kg. in lean body mass, presumably an increase in muscle tissue. Candidates on course 7610 showed an average decrease of 9 mm in skinfold thickness. Again since body weight was unchanged, this represents a loss of fat and a gain of 1.8 kg in lean body mass, presumably reflecting an increase in muscle tissue. Table 2 also contains skinfold thickness data for CF personnel of
TABLE 1

AEROBIC FITNESS

Comparison of 7609 and 7610 with other CF personnel

<table>
<thead>
<tr>
<th>Course</th>
<th>Test</th>
<th>VO₂ max (ml/kg. min)</th>
<th>Running time for 1.5 mile (min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7609</td>
<td>initial</td>
<td>48.7</td>
<td>10.1</td>
</tr>
<tr>
<td>(n = 60)</td>
<td>interim</td>
<td>52.7*</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>final</td>
<td>53.2*</td>
<td>9.6*</td>
</tr>
<tr>
<td>CF Personnel aged 18-24 years (n = 369)</td>
<td></td>
<td>44.1</td>
<td>-</td>
</tr>
<tr>
<td>7610</td>
<td>initial</td>
<td>40.6</td>
<td>11.1</td>
</tr>
<tr>
<td>(n = 72)</td>
<td>final</td>
<td>40.9</td>
<td>10.5*</td>
</tr>
<tr>
<td>CF Personnel aged 30-39 years (n = 554)</td>
<td></td>
<td>34.5</td>
<td>-</td>
</tr>
</tbody>
</table>

Values are means. Significant differences from the initial measurement by paired t-test (p<0.01) are indicated by an asterisk.
Figure 3: Distribution of course 7609 into categories of VO₂ max.
Figure 4: Distribution of course 7610 into categories of VO$_2$ max.
TABLE 2

BODY COMPOSITION

Comparison of 7609 and 7610 with other CF personnel

<table>
<thead>
<tr>
<th>Course</th>
<th>Test</th>
<th>Sum of three Skinfolds (mm)</th>
<th>Body weight (kg)</th>
<th>Lean body mass (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7609</td>
<td>initial</td>
<td>35.5</td>
<td>72.2</td>
<td>56.9</td>
</tr>
<tr>
<td></td>
<td>interim</td>
<td>35.4</td>
<td>72.1</td>
<td>56.9</td>
</tr>
<tr>
<td></td>
<td>final</td>
<td>30.6*</td>
<td>72.7</td>
<td>58.5*</td>
</tr>
<tr>
<td>CF Personnel aged 18-24 years (n = 327)</td>
<td></td>
<td>46.4</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>7610</td>
<td>initial</td>
<td>50.3</td>
<td>76.5</td>
<td>57.3</td>
</tr>
<tr>
<td></td>
<td>final</td>
<td>41.5*</td>
<td>76.6</td>
<td>59.1*</td>
</tr>
<tr>
<td>CF Personnel aged 30-39 years (n = 556)</td>
<td></td>
<td>53.2</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Values are means. Significant differences from the initial measurement by paired t-test (p<0.01) are indicated by an asterisk.
comparable age. Candidates on course 7609 carried much less fat than others at the same age in the CF and 7610, while not very different at the beginning of the course, graduated with an average skinfold thickness which was markedly less than the average for the CF.

The sum of three skinfold thickness measurements for course 7609 are categorized in Figure 5 as less than 35 mm (lean), 35-50 mm (acceptable) or greater than 50 mm (too much body fat). Also included is a similar treatment of data for 327 other CF personnel aged 18-24 years. At the beginning of the course 7609 only 12% of the candidates had total skinfold thickness greater than 50 mm and this proportion declined to 5% at graduation. By comparison, among other CF personnel of the same age the percentage was 19%. Figure 6 shows the distribution into the same three categories for course 7610. Although 46% of the candidates had a total skinfold thickness in excess of 50 mm at the beginning, the percentage declined to 24% at graduation. By contrast, other CF personnel of comparable age showed 52% with total skinfold thickness greater than 50 mm.

DISCUSSION

Aerobic Power - The principle aim of this study was to examine the effects of the CFOCS training syllabus on the trainees with additional attention to changes in fitness and the accompanying incidence of injuries and complaints resulting in a loss of training. The response to training involves many changes including increases in aerobic power, gains in muscular strength and alterations in body composition, all of which may be regarded as the training effect. In the context of CFOCS training, this derives from both scheduled physical training activities and the field exercises which are an important component of the courses. While it was anticipated that some benefit would accrue from the field exercises, improvement in fitness levels is not a major objective; the teaching of military skills and the application of stress through fatigue and hard work being paramount considerations.

Nevertheless, it is possible to assess the potential aerobic training effect of an exercise by considering the energy cost. The only field activity which lends itself to assessment with regard to training for aerobic fitness is walking with and without loads on level and uphill terrain (in the Chilliwack area this is largely over gravel roads). Tables 3 and 4 show the energy cost of this activity expressed as a percent of VO2 max. For exercise lasting 1-2 hours, an intensity which is 60% of VO2 max should produce some improvement in aerobic fitness. It is apparent that for personnel in the good (level 4) category, carrying a 40 lb pack at
Figure 5: Distribution of course 7609 into categories of skinfold thickness.
Figure 6: Distribution of course 7610 into categories of skinfold thickness.
4.0 mph will produce the required training effect. Tables 3 and 4 provide guidelines whereby times, distance and terrain can be selected to ensure that field exercises produce an improvement in aerobic fitness.

Most of the aerobic training effect from the scheduled physical education classes and early morning runs occurred in the first few weeks. Our interim report (after 3 weeks on course) showed significant improvements in aerobic power, particularly for those candidates at the lower end of the range, with no significant change thereafter. This non-linear response was not unexpected; the greatest rate of improvement normally occurs early in any training regimen. However, the lack of significant change after 3 weeks indicates that an increased stimulus at this point was necessary to continue the improvement. It must also be remembered that these candidates, particularly the DED personnel, were exhibiting a high level of fitness after 3 weeks and further improvement would have required a much greater investment of time and effort.

To achieve the maximum gain from time and effort, the design of any program to improve aerobic fitness should consider the initial fitness level, the desired level and the appropriate weighting of duration, intensity and frequency of exercise. Having determined a safe initial activity level, the parameters of duration, intensity and frequency can be adjusted as desired to maintain a stimulus and prevent the development of a fitness plateau. With respect to the CFOCS program, the early morning run of 1.5 miles has proved effective. However, as proficiency increases the length of time at which the heart rate is sufficiently elevated to provide a training stimulus decreases. Typically, if the run is completed in 12 minutes or less, the training stimulus will apply for only the last 5 to 8 minutes. A longer distance, say 3 miles, will provide a stimulus for about 20-25 minutes, if the elapsed time is 30 minutes (level 4).

A sample program for CFOCS candidates might include the following progression of events:

a) introduce a daily walk/run of 1.5 miles with no specified time for completion.

b) when all candidates can cover this distance in less than 15 minutes, increase the distance to 3 miles of jogging with a target time of 35 minutes.

c) gradually reduce the time allotted to 30 minutes (level 4) and finally 25 minutes (level 5).
TABLE 3

TRAINING EFFECT OF WALKING WITH AND
WITHOUT LOADS (LEVEL TERRAIN)

Body weight = 160 lb; terrain factor for gravel road = 1.1

<table>
<thead>
<tr>
<th>Load weight (lbs)</th>
<th>Walking speed (mph)</th>
<th>Energy cost (kcal/hr)</th>
<th>% VO₂ max (good)</th>
<th>% VO₂ max (excellent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>3.0</td>
<td>321</td>
<td>27</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>3.5</td>
<td>400</td>
<td>35</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td>4.0</td>
<td>489</td>
<td>53</td>
<td>44</td>
</tr>
<tr>
<td>25</td>
<td>3.0</td>
<td>358</td>
<td>39</td>
<td>32</td>
</tr>
<tr>
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<td>3.5</td>
<td>449</td>
<td>48</td>
<td>40</td>
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<td>4.0</td>
<td>552</td>
<td>59</td>
<td>49</td>
</tr>
<tr>
<td>40</td>
<td>3.0</td>
<td>385</td>
<td>41</td>
<td>34</td>
</tr>
<tr>
<td></td>
<td>3.5</td>
<td>485</td>
<td>52</td>
<td>43</td>
</tr>
<tr>
<td></td>
<td>4.0</td>
<td>595</td>
<td>64</td>
<td>53</td>
</tr>
<tr>
<td>50</td>
<td>3.0</td>
<td>406</td>
<td>44</td>
<td>36</td>
</tr>
<tr>
<td></td>
<td>3.5</td>
<td>509</td>
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<td>45</td>
</tr>
<tr>
<td></td>
<td>4.0</td>
<td>626</td>
<td>67</td>
<td>56</td>
</tr>
</tbody>
</table>

VO₂ max = 51.6 ml/kg/min for excellent and 42.6 ml/kg/min for good
(Cooper, 1968)
### TABLE 4

**TRAINING EFFECT OF WALKING WITH AND WITHOUT LOADS (5% GRADE)**

Body weight = 160 lb; terrain factor for gravel road = 1.1

<table>
<thead>
<tr>
<th>Load weight (lbs)</th>
<th>Walking speed (mph)</th>
<th>Energy cost (kcal/hr)</th>
<th>% VO$_2$ max (good)</th>
<th>% VO$_2$ max (excellent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>2.5</td>
<td>412</td>
<td>44</td>
<td>37</td>
</tr>
<tr>
<td></td>
<td>3.0</td>
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<td></td>
<td>3.5</td>
<td>618</td>
<td>67</td>
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</tr>
<tr>
<td>25</td>
<td>2.5</td>
<td>463</td>
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<td>41</td>
</tr>
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<td></td>
<td>3.0</td>
<td>573</td>
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<td>51</td>
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<td>701</td>
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<td>40</td>
<td>2.5</td>
<td>498</td>
<td>54</td>
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<td>3.0</td>
<td>617</td>
<td>66</td>
<td>55</td>
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<td>3.5</td>
<td>756</td>
<td>81</td>
<td>67</td>
</tr>
<tr>
<td>50</td>
<td>2.5</td>
<td>524</td>
<td>56</td>
<td>47</td>
</tr>
<tr>
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<td>3.0</td>
<td>650</td>
<td>70</td>
<td>58</td>
</tr>
<tr>
<td></td>
<td>3.5</td>
<td>796</td>
<td>86</td>
<td>71</td>
</tr>
</tbody>
</table>

VO$_2$ max = 51.6 ml/kg/min for excellent and 42.6 ml/kg/min for good

*(Cooper, 1968)*
The guiding principle throughout should be a gradual increase of activity and energy expenditure. Near maximum effort should be avoided, especially for the CFR personnel, until near the end of the course when adequate conditioning will have occurred to render such attempts safe; and then only as a means of assessing fitness. The graded approach to aerobic conditioning, aside from reducing the risk of an unfortunate cardiac event will also reduce the incidence of trauma of muscle and ligament injury. It is worth noting that the 1.5 mile run was introduced into the CF as a test of aerobic fitness and it was never intended that this distance should be regarded as an adequate training stimulus.

MUSCULAR STRENGTH AND FLEXIBILITY

The increase in lean body mass, presumably muscular development, suggests that an increase in muscular strength should have occurred during the training period. The only direct measurement was handgrip strength which showed a small but significant increase for both groups. Indirect measurements (sit-ups, chin-ups and vertical jumps) were administered by the BPERO staff to candidates on both courses. While some improvement was evident, it is difficult to quantify since the candidates were expected to meet the CFAO 50-1 standards and were not required to put forth a maximum effort except where this was necessary to meet the standard. Although 28 out of 76 were unable to meet the chin-up requirements initially, all but three were successful in the final test.

The reported difficulties with some aspects of the confidence course, notably the overhead rope traverse and the wall climbs were attributed to insufficient upper body strength. Since nearly all of the candidates were able to meet the CF standards for chin-up during the final testing period, it may be necessary to rationalize the current standards and the military skills requirements. Inadequate upper body strength is sometimes accompanied by back problems when strenuous activity is undertaken. The absence of reported back problems in the MIR sick parade register does not support the contention that this is a limiting factor in the severity of physical training stress currently applied at CFOCS.

Although there are no flexibility standards applicable to the CFOCS training, DCIEM conducted two trunk and hip flexibility measurements on all candidates on each testing occasion. Both measurements showed a significant improvement in both groups. The improvement was evident at 3 weeks (interim test 7609) with no further change at the final test. While there is no evidence to suggest that this early improvement in flexibility is related to the low incidence of back problems, the emphasis on conditioning in the early phases of
CFOCS training syllabus would certainly be beneficial.

BODY COMPOSITION

Changes in body weight are not always an accurate reflection of body composition. While an increase in body weight usually reflects an imbalance between caloric intake and energy expenditure, it may not mean an increase in the proportion of fat to lean tissue. In the same vein, response to a program of exercise frequently reduces the proportion of fat with no change in total body weight. Indeed, a frequently heard complaint about no weight loss after a few weeks of exercise indicates the lack of understanding of the changing relationships of the major components of body composition.

Measurement of skinfold thickness provides a reliable estimate of total body fat and is therefore a more useful indication of body composition than changes in body weight. Criteria for the sum of three skinfold measurements (Σ3SKF) used by DCIEM are those recommended by the International Biological Program 1968 and used in Fig. 5 where three categories are recognized:

a) lean - less than 35 mm,

b) acceptable - 35 to 50 mm, and

c) unacceptable - greater than 50 mm.

Of greatest concern is the third category where the risk to health is considered to increase as the skinfold thickness increases.

The initial differences, evident in mean values for Σ3SKF for 7609 (35.5 mm) and 7610 (50.3 mm) represent the usual increase with age. In both cases there is a significant decrease at the end of training with no change in body weight, indicating an increase in lean body mass. These values contrast sharply with similar data accumulated by DCIEM from other CF personnel in the same age ranges (Table 2). For both age groups, the CFOCS candidates, even before training, demonstrated less body fat. Whether this is the result of the selection process within the CF or represents a natural selection on the part of current prospective candidates is not known.

The changes in body composition are especially interesting in relation to the overall physical intensity and resulting energy expenditure by the trainees. Although there were a few complaints of not enough time to eat, most of the candidates commented on their increased food consumption while on course. This was particularly true for 7610 (CFR) candidates, many of whom had become conscious
of increasing weight and were restricting their caloric intake prior to arrival at CFOS. The significant reduction in skinfold thickness coupled with an augmented food intake suggests a particularly sedentary lifestyle before selection for training at CFOS. This observation was confirmed through individual discussions with members of the course, many of whom ruefully admitted to not having worked so hard for years.

SICK PARADE ATTENDANCE

One of the original aims of the study was to ascertain the relationship, if any, between the level of physical fitness, the frequency and the type of injury and the progression of the course. At the request of DCIEM, the base medical clinic set up a special sick parade register (CF 2100) which was used to record all visits to the clinic by members of CFOS 7609 and 7610. A total of 238 entries are listed between 30 September and 8 December 1976.

After exclusion of the data for the foreign nationals there were 104 visits to the clinic by 45 candidates. Of these visits, 76 were "initial" visits occasioned by a specific injury or complaint while 28 were follow-up visits. There were 6 admissions to hospital accounting for 17 days and the "light duty" disposition accounted for 94 man-days. The "light duty" involved excusal from participation in the field exercises and physical training sessions.

A further sub-division of the 76 initial visits disclosed 24 which were considered to be purely "medical" and unrelated to participation in the physical aspects of the course in instruction. The remaining 52 initial visits are assumed to have been more directly related to the physical demands of the course and in this sense, could be considered "preventable". Table 5 lists the anatomical location.

To what extent these injuries or trauma were truly preventable is difficult to determine. It can be speculated that, had the reporting individual possessed a higher level of physical fitness, many of these injuries would not have occurred. In some cases, this is probably true as e.g. the examining physician describes the patient as being "too fat" whereas in other cases the problem is "blisters" resulting from ill-fitting footwear and not attributable to physical conditioning per se.

It has also been suggested that many of these problems could be avoided if the candidates were better prepared for the rigors of field exercises during the early part of the course. This may have some validity since many of the complaints occur during or immediately
after the field exercises. Whether additional time should be pro-
grammed early in the course to accommodate this will depend on the
several other time demands and objectives of the training staff. The
ratio of MIR visits to candidates on course (foreign nationals ex-
cluded) is 117/114 = 1.1 for 7609 and 7610 combined, compares with
a ratio of 1.8 and 2.6 recorded for 2 courses in 1975.\(^3\) So long
as one of the objectives of the course is to provide a stressful
situation in a military environment where chronic fatigue and
"pressure" are intentional, some injuries and trauma are almost in-
evitable. Slipping from a rock and turning an ankle will not neces-
sarily be prevented by more physical preparation although the likeli-
hood of severe injury is reduced.

It is probably also inevitable that there will be some voluntary
withdrawals occasioned by the physical nature of the training. These
losses are not fully accounted for above since some may have with-
drawn before appearing in the sick parade register. Analysis of the
initial physiological testing data and subsequent withdrawals does
not reveal any correlation suggesting that attitude and other psycho-
logical considerations as well as physical capacity, or the lack of
it, is an important factor in determining whether an individual will
persevere and graduate from the course.

CONCLUSION

It is apparent that the candidates on CFOCS courses 7609 and
7610, upon arrival at CFOCS, possessed above average levels of
aerobic fitness compared to other CF personnel of comparable age.
Personnel on 7609 achieved a further improvement after three weeks
which was maintained throughout the remainder of the course. Per-
sonnel on 7610 showed no improvement during the course although they
were able to reduce the time to run the 1.5 mile distance. These
findings indicate that the scheduled physical conditioning activities
are effective in the early part of the course for the DEO (7609)
candidates. If it is desired to continue the improvement throughout
the remainder of the training it will be necessary to increase the
time and effort devoted to this phase of the training. The reduced
level of physical activity scheduled for the CFR (7610) candidates
is not sufficient to provide a significant training effect for the
group although many individuals did achieve an increase in aerobic
fitness.

Changes in flexibility, body composition and muscle strength
were evident for personnel from both courses. With the exception
of indirect measurements of strength (push-ups etc.), there are no
applicable standards in the CF. For those in the combat arms
specialties there may be a requirement for a higher level of mus-
### TABLE 5

ANATOMIC DISTRIBUTION AND FREQUENCY OF INJURIES OR COMPLAINTS

<table>
<thead>
<tr>
<th>Anatomical Site</th>
<th>Number of Visits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shoulder</td>
<td>1</td>
</tr>
<tr>
<td>Thorax</td>
<td>1</td>
</tr>
<tr>
<td>Back</td>
<td>1</td>
</tr>
<tr>
<td>Upper Leg</td>
<td>1</td>
</tr>
<tr>
<td>Lower Leg</td>
<td>6</td>
</tr>
<tr>
<td>Knee</td>
<td>11</td>
</tr>
<tr>
<td>Ankle &amp; Heel</td>
<td>16</td>
</tr>
<tr>
<td>Foot</td>
<td>15</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>52</strong></td>
</tr>
</tbody>
</table>

92% of the visits involve the lower extremity.

The reported weakness in upper body and back strength is not reflected in complaints involving the upper body or back.
cular strength. The DCIM criteria for skinfold thickness have been accepted but have not been promulgated by the Surgeon General. All of the changes indicated are considered to be beneficial and each candidate should be encouraged to maintain these levels of accomplishment.

The incidence of sick parade visits and the resulting lost training time is approximately one percent of the scheduled syllabus. This is notably less than the incidence reported earlier and probably represents a minimum when the physical nature of the course is considered.

RECOMMENDATIONS

The following recommendations are offered with the realization that the overall objectives and time constraints of the CFOCS syllabus may necessitate compromises.

1. Liaison and consultation between the BPERO staff and CFOCS training staff should be used to greater advantage in planning and implementing the physical training and conditioning aspects of the syllabus.

2. Subject to (1) the early morning exercise period should be modified to gradually increase the duration of the exercise to approximately 30 minutes and a distance of 3 miles.

3. As a corollary to (2) the 1.5 mile distance should be used only for its original purpose as a test procedure.

4. So far as is possible, the conditioning activities should be progressive and continuous without interruptions longer than 2 or 3 days. Long interruptions followed by a period of intensive activity are more likely to result in injury and severe discomfort.

5. An attempt should be made to communicate to the trainees an understanding of the principles of conditioning, an awareness of the positive relationship to health and an encouragement to maintain a high level of proficiency after graduation.
REFERENCES

1. ASTRAND, P.O. & RHYMING, I., A nomogram for the calculation of aerobic capacity (physical fitness) from pulse rate during submaximal work. J. Appl. Physiol. 7: 218-221, 1954.


**ABSTRACT**

DCIEM was tasked to examine the physical training aspects of the syllabus at Canadian Forces Officer Candidate School. Changes in aerobic power, body composition, muscular strength and flexibility were monitored for 2 courses, one direct entry candidates and one with commissioned from the ranks candidates. The incidence of injury and lost training times was also monitored with a special register.

All candidates, especially the younger direct entry personnel arrived on course with higher than anticipated levels of fitness and consequently showed small improvements during training. There were significant changes in body composition with smaller changes in strength and flexibility. The relative influence of the scheduled physical activities and the field exercises on these changes are discussed. The incidence of sick parade attendance and consequent time lost from training is small (about 1%) and probably cannot be further reduced.

Recommendations to achieve greater efficiency and utilization of time and existing resources are included.
physical fitness, physical training, exercise, aerobic power, body composition, training injuries