THE NORWEGIAN DEFENCE UNIVERSITY COLLEGE

Physical Fitness Tests in the Nordic Armed Forces

- A Description of Basic Test Protocols

Moving Soldiers - Soldaten i bevegelse • 01/2011

Jarmo Malmberg (Ed.)

NORWEGIAN SCHOOL OF SPORT SCIENCES
Defence institute

Editor Moving Soldiers - Soldaten i bevegelse:
Anders McDonald Sookermany

Editorial Staff Moving Soldiers - Soldaten i bevegelse:
Lene Røe
E-mail: fi-publikasjoner@nih.no

Publisher:
The Norwegian Defence University College
Norwegian School of Sport Sciences/Defence Institute
Oslo, 2011

Photo:
The Norwegian Defence Media Centre
Finnish Defence Forces
Danish Armed Forces
Swedish Armed Forces Sports Centre (FMIF)

Design & Printing:
Beta Grafisk as

ISSN 1891-8751

Physical Fitness Tests in the Nordic Armed Forces

- A Description of Basic Test Protocols

Jarmo Malmberg (Ed.)

Editor's Column MS 0111

In this edition of Moving Soldiers – Soldaten i Bevegelse, we address a field of interest for the Norwegian School of Sport Sciences, Defence Institute (NSSS/DI), that over the last 40 years or so has been heavily debated throughout the armed forces community – namely that of physical fitness testing.

At the same time, this issue should be seen as a follow-up of the last edition (MS 0210) that was dedicated to the Nordic Military Sports Cooperation, which is the formalized network comprised of the governing bodies in the field of sports and physical education within the armed forces of Denmark, Finland, Norway and Sweden. Their jurisdiction within the national armed forces includes the physical fitness test regime, setting official standards and the responsibility of developing and describing the test protocols.

During the annual Nordic Sports Leader Conference in Stockholm 2010, the four Chiefs of Delegation gave their support to a project proposal from the Norwegian delegation to: a) describe and compare the basic physical fitness test protocols used in the four Nordic countries, so as to b) provide an international/Nordic "empirical" foundation for national discussions on the topic, and c) offer a baseline for further/future Nordic debates on issues relating to physical fitness testing.

This issue of Moving Soldiers is the official report from the Project Group on Physical Fitness Tests in the Nordic Armed Forces.

From the Norwegian perspective, this project has great relevance since the Norwegian Armed Forces (NoAF) has started to revise its physical fitness testing regime, as searching for knowledge about what other nations are doing on the field seems to be a relevant step to take.

The current (Norwegian) protocol has roots dating back to the late 1960s, when the General War-Commissioner (National Service Administration) took the initiative of supplementing data on conscript's physical ability by inviting the Norwegian Armed Forces Medical Staff (FSAN) and the Norwegian Armed Forces Sports Council (FIR) to a meeting in March 1968 to discuss a possible national system for assessing physical fitness standards. Only one week later, a proposal from FIR was debated at the Institute for Job Physiology (AFI). The proposal suggested simple functional tests such as a step-test, push-ups and the standing long-jump. The AFI's Professor Kåre Rodahl AFI argued for the use of less complicated tests, and suggested the use of a bicycle ergometer test, with a much clearer scientific "stringent" test protocol. Furthermore, he also said that the use of other tests needed to be put on hold. Nevertheless, the professor pointed out that the suggested tests from FIR were suitable for more practical use. The bicycle test was conducted on a national level in 1969, and the test protocol was undertaken two years later and included a test of maximal static muscle strength.

After the protocol was implemented as part of the draft system, a debate started in relation to the one year of compulsory military service. Consequently, the same protocol was implemented in 1973, though with little success. Thus, in 1977 a new group was given the task of: a) evaluating the existing protocol, b) considering and suggesting new

protocols, c) considering and suggesting physical fitness testing of both commissioned and non-commissioned officers, and d) considering and suggesting how female officers and pupils at military schools were to fit into the testing system.

The group delivered their report in 1979, and concluded that the bicycle ergometer test should be substituted with a 3,000-meter running test, and the static muscle strength test should be replaced with more endurance-oriented muscle strength tests. With these small changes, the groups' suggestions were implemented on a trial basis in 1980, and made permanent in 1983. An evaluation by Capt. Ulf Willhelmsen (MSc), which led to some relatively non-substantial changes, was conducted and implemented in 1994. There have only been minor adjustments to the test protocols since then.

An interesting observation from this small piece of history and the present study is that it seems as if time has stood still. We are still debating the same issues: What are the physical (as in physiological) demands for soldiering, and how can we best assess them given the context of the armed forces? This is basically the same question USAF Major Kenneth H. Cooper sought to answer in 1968 when he came up with the 12-minute running test – or the Cooper test, as it is better known.

Even so, there are few topics within the military community that evoke such an emotional debate on so many levels, in a number of different practices, and across a multitude of branches as does physical fitness testing. A commonality of these debates, or rather discussions, are that they have a tendency to be a sort of either/or debate; either you think physical fitness testing is important or you do not; either you argue for physical fitness standards that every soldier (e.g. male or female, young and old) should meet or you feel that there are good and sound reasons for why standards should be differentiated; either you feel that the test should be scientifically stringent and based on an objective rationale, or you are a strong believer in tests that are contextualized or even "custom fitted."

The report at hand shows that even though all four nations' emphasize physical fitness testing, there is still a great deal of variance in the "conceptual" background, methodological approach and validity of their test regime. Hence, it should be an interesting read for those interested in obtaining some empirical data on how physical fitness testing is performed elsewhere.

The International Congress of Soldiers' Physical Performance (ICSPP) looks to be the most important (scientific) venue for the NSSS/DI field of interest. It has been a goal of the project group to finish their work so it could be presented at the 2nd ICSPP, which is to be hosted in Jyväskylä in May 2011. By presenting the project at the ICSPP, we wish to offer a joint Nordic contribution on physical fitness testing, hopefully giving the push for a broader working group under the umbrella of the ICSPP.

The aim of this edition of Moving Soldiers has been to offer an overview of the basic physical fitness test protocols used in the Nordic armed forces, so as to provide an empirical foundation for future discussion on strategies and methods for assessing physical fitness in the armed forces. This work could not have been done without the collaboration of our Nordic partners. Therefore, on behalf of the editorial staff of Moving Soldiers – Soldaten i Bevegelse, I wish to thank the Nordic Military Sports Cooperation and the Chiefs of Delegations for their willingness to support this project.

Anders McD Sookermany

Author's Summary

The purpose of this report is to give an overview of the basic physical fitness test protocols used in the Nordic Armed Forces.

Information on the background, aim, content, validity, reliability, application and future prospective was used to describe and compare the basic physical fitness test protocols of the Danish, Finnish, Norwegian and Swedish Armed Forces.

The comparison revealed a fundamental difference in the background of the test protocols. The Danish test protocol was based on field observations and experiences from battlefield physical performance and requirements, while the other test protocols were based on scientific test models related to components of aerobic and muscular fitness.

Although the aim of using the physical fitness test protocols in the Nordic Armed Forces was similar, the emphasis on physical fitness in the test protocols varied. The Norwegian test protocol emphasized the importance of aerobic fitness, while the other test protocols focused more on the importance of overall physical fitness. The Finnish and Danish test protocols also defined physical requirements for their personnel based on the skills and fitness level needed to perform various military duties, especially when it came to military assignments performed by professional soldiers. The other two test protocols defined such requirements from a minimum physical standard needed for all military personnel, although with more stringent requirements for those military categories with greater physical demands.

The physical fitness test protocol of the Danish Armed Forces demonstrated a greater diversity, in both fitness components and test items, in comparison with the other Nordic test protocols. With the exception of the Swedish test protocol, all of the

Jarmo Malmberg, MSc, *is a researcher at The Norwegian School of Sport Sciences Defence Institute. He has nine peer reviewed articles in epidemiology and physiology and several other professional and community-oriented publications in the area of physical activity, fitness and health.*

physical fitness test protocols in the Nordic Armed Forces included the 12min. run (or 3000m run) for the assessment of aerobic fitness. All of the test protocols also included a push-up (or pull-up) test for the assessment of muscular fitness of the upper body and upper limbs and a sit-up test for the assessment of muscular fitness of the trunk and hips. With the exception of the Norwegian test protocol, they also included some type of test for the assessment of muscular fitness of the lower limbs.

The Danish physical fitness test protocol has been less scrutinized in regard to its reliability and validity compared with the other Nordic fitness test protocols. The Yo-Yo IR 1 from the Danish test protocol was shown to have high reproducibility and validity as a measure of aerobic and anaerobic fitness performance among athletes of intermittent sports. In contrast, the Bicycle Ergometer Test from the Finnish test protocol was found to be an accurate and valid measure of maximal aerobic capacity and 3000m field running times in male subjects with combat gear. Additionally, the 3000m running times of the Norwegian test protocol were strongly correlated with the 8km cross-country running times and 30km marching times, and a strong correlation was also found between the running times for the Field Test 2000m and the 2000m running times from the Swedish test protocol. In terms of muscular fitness tests, the Multitest Strength from the Swedish test protocol was found to be an accurate and valid measure of soldiers' capabilities to perform military tasks. The Standing Long Jump and loaded Marching from the Finnish test protocol were also found to be valid predictors of military operational capabilities and military field performance, respectively.

The experiences related to the application of the Nordic physical fitness test protocols were different. The Finnish Armed Forces reported of synchronization of a new data system, PVSAP HCM SAP MilFit, for the evaluation of physical fitness tests as part of personnel administration. The Norwegian Armed Forces reported a continuous decline in the use of the proficiency badges in Test Groups B and C. The Danish and Swedish Armed Forces pointed to similar problems with the standardization of their sit-up test. In addition, the Danish Armed Forces reported problems with standardization of their Danish Military Speed Test.

The physical fitness test protocol used by the armed forces in Sweden and Norway will be revised in the near future, although there are no immediate plans for revisions of the test protocols used by the armed forces in Finland and Denmark. During this year, the Swedish Armed Forces will revise the tasks of their operational units, including potential revisions for the additional physical requirements that ground combat personnel should meet. Also, within 2011, the Chief of the Norwegian Armed Forces has given The Norwegian Defence University College a mandate to evaluate the Norwegian physical fitness test protocol. The task will be performed by the School of Sport Science Defence Institute.

It is hoped that this overview can be of use when sharing experiences and information related to the discussion on how to adjust and improve strategies and methods for assessing physical fitness so that they may better serve the demands that soldiers meet in their military environment.


2036
FOS BS

Physical Fitness Tests in the Nordic Armed Forces

- A description of basic test protocols

Content

1

Introduction to the Basic Physical Fitness Test Protocols in the Nordic Armed Forces

Introduction

Introduction to the Basic Physical Fitness Test Protocols in the Nordic Armed Forces

Jarmo Malmberg

It is well known that physical fitness is an important element for military tasks and daily human activities. Good aerobic and muscular fitness have been shown to be essential for soldiers attempting to optimize their operational field performance (Santtila, 2010). It seems that recent technological advancements and mechanization have not reduced this physical fitness requirement of the modern soldier (Sharp et al., 2008; Dyrstad et al., 2006).

Concept of Physical Fitness

The term "physical fitness" has been defined in many ways. Most often, it has been related to the capacity for movement. It refers to a set of health- or skill-related attributes that people have or achieve which is related to the ability to perform physical activity, i.e. any bodily movement produced by skeletal muscles that results in an expenditure of energy (Caspersen et al., 1985). In general terms, physical fitness can be considered to be the matching of soldier's physical performance to his or her physical, psychological and social environment. The health-related attributes of physical fitness include body composition, cardiorespiratory fitness, flexibility, muscular endurance and muscular strength. The skill-related attributes of physical fitness are comprised of agility, balance, coordination, speed, power and reaction time (Bouchard & Shephard, 1994; Caspersen et al., 1985). The degree to which soldiers have these attributes can be assessed with specific tests.

Assessment of Physical Fitness

It has been proposed that assessing and monitoring relevant attributes of physical fitness have an important role for the promotion of soldiers' work ability and health, as well as for the prevention of injuries in soldiers' field duties (Jones et al., 1993; Jette et al., 1992). Consequently, physical fitness may be understood by the assessment of those attributes that need to be taken into consideration according to the context in which soldiers' physical fitness is operationalized (Bouchard & Shephard, 1994). When a health-related fitness assessment is used as a method for increasing physical activity, it serves to: (a) assess the need for physical activity in reference to physical fitness and health; (b) provide a safe basis for individual physical activity counseling and exercise prescription; (c) follow individual changes in physical fitness; and (d) educate and motivate with respect to regular physical activity (ACSM, 1995; Jette et al., 1992). Effective physical training programs and reliable fitness testing protocols that reflect changes in society and the requirements of warfare are needed.

Purpose of the Report

It has been a desire of the armed forces of the Nordic nations to compare their physical fitness test protocols. Therefore, the aim of the present report is to:

1) Describe and compare the basic physical fitness test protocols used in the Danish, Finnish, Norwegian and Swedish Armed Forces;
2) provide a foundation for a comparison of the ongoing, national discussion on how to adjust and improve the strategies and methods for assessing physical fitness in the armed forces so that they serve better the demands that soldiers meet in their military environment and daily activities;
3) give input to the discussion of introducing common strategies and methods for assessing physical fitness in the Nordic Armed Forces.

Methodology

Data Collection Procedure

The Nordic Military Sport Leader Meeting 2010 decided to initiate the work to evaluate physical fitness testing in the Nordic Armed Forces. Thereafter, in November 2010, The Norwegian School of Sport Sciences Defence Institute organized a meeting with its Nordic partners in the Project Group on Physical Fitness Tests in the Nordic Armed Forces to discuss and decide upon the content of a report on physical fitness test protocols used in the Nordic Armed Forces. The aim and input from the meeting drove the selection and creation of the themes in the present report. It was decided that each representative from the armed forces in Denmark, Finland, Norway and Sweden would submit descriptive information about their basic physical fitness test protocols, including explanations for their background, aim, content, validity, reliability, application and future prospective.

Evaluation of Data

The descriptive information of the four Nordic physical fitness test protocols was evaluated thematically for both their differences and similarities. The evaluation was based on the reading of the four independent reports of descriptive information when they have been available. This means that while the content and level of detail in the themes of the reports may vary between the four Nordic nations, an attempt has been made during the evaluation process to follow the agreed upon thematic structure for comparing the test protocols. It has been important to use common concepts and formulations to tie the information from the four Nordic nations together to ensure that the readers receive the correct association to the content of each specific theme.

Limitations

The present report has some limitations. It is difficult to avoid the fact that some institutions and individuals may feel that the physical fitness tests used for all the different personnel groups in the Nordic Armed Forces should have been described in this overview. However, an attempt has been made to describe the information in the present report in as much detail as possible based on the findings in the four independent reports. Only the basic physical fitness tests used in the armed forces of the four Nordic nations has been presented due to the limited time and resources available. Nevertheless, it is acknowledged that several other fitness tests which are

not presented here may be utilized by the armed forces of the four Nordic nations. For example, different types of task related fitness tests may be applied to units in the Special Forces.

Nordic Physical Fitness Test Protocols

Background
The background of the Danish physical fitness test protocol was fundamentally different compared with the other Nordic test protocols. It evolved from battlefield physical performance and requirements test models in Afghanistan, based on observations and experiences from platoon commanders, soldiers and investigative teams. In contrast, the test protocols used by the other Nordic nations were based on scientific test models related to distinct components of physical fitness, namely aerobic and muscular fitness.

Aim
The overall aim of using the physical fitness test protocols in the Nordic Armed Forces was to promote regular physical activity and training to ensure that the military personnel remain physically fit, motivated and healthy for war, crisis and peacetime activities. However, the emphasis on physical fitness in the Norwegian test protocols was somewhat different compared with the other test protocols. The Norwegian test protocol emphasized the importance of aerobic fitness, while the other test protocols focused on the importance of overall physical fitness. The Finnish and Danish test protocols also contained somewhat different requirements for physical fitness than the other two protocols, especially in relation to performing military duties. The Finnish and Danish test protocols defined the physical requirements for their personnel based on the skills and fitness level needed to perform different military duties, particularly in relation to military assignments performed by professional soldiers. Correspondingly, the Norwegian and Swedish test protocols defined such requirements as part of a minimum physical standard needed for military personnel, although with an option for more stringent requirements for those military categories with greater physical demands.

Content
The physical fitness test protocol of the Danish Armed Forces demonstrated a greater diversity in both fitness components and test items compared to the other Nordic test protocols. With the exception of the Beep Test (or 20m shuttle-run) in the Swedish test protocol, all the test protocols included the 12min run (or 3000m run) for the assessment of aerobic fitness. The Finnish test protocol included two other tests of aerobic fitness, namely the Bicycle Ergometer Test for civilians and soldiers over 45 years of age and the optional UKK Walk Test for older civilians and reservists over 45 years of age. In a similar manner, the Danish test protocol included the Yo-Yo UH 1 (or 20m shuttle-run) as an alternative test for assessing aerobic fitness and the Yo-Yo IR 1 (or 20m shuttle-run with pauses) and Danish Military Speed Test as two alternative tests for assessing aerobic and anaerobic fitness.

All the Nordic test protocols included the push-up (or pull-up) for assessing muscular fitness of the upper body and upper limbs, in addition to the sit-up test for assessing muscular fitness of the trunk and hip. Except for the Norwegian version, all the Nordic test protocols also included some type of test for assessing the muscular fitness of the lower limbs. The Finnish and Swedish test protocols included specific tests for assessing the explosive force production of the lower limbs. In contrast, the Danish test protocol included Lunges as a test for muscular strength of the lower limbs, although as part of four other tests for assessing the overall muscular fitness level in movements typical for soldiers patrolling with heavy carriage. The Lunges were also included as part of four other tests for assessing the overall core muscular fitness level.

All the Nordic test protocols included some type of fitness tests for field duty. The Finnish and Norwegian test protocols contained field tests that primarily taxed aerobic capability, namely by walking, skiing, bicycling and orienteering. In contrast, the Swedish test protocol included a 2000m run and the Danish test protocol included a military obstacle course, with both of these tests taxing aerobic and strength capabilities by requiring the subjects to wear battle equipment in the tests.

Reliability and Validity

The Danish physical fitness test protocol has been less scrutinized regarding its reliability and validity. The Yo-Yo IR 1 (20m shuttle-run with pauses) from the Danish test protocol demonstarted high reproducibility and validity as a measure of aerobic and anaerobic fitness performance among athletes of intermittent sports (Bangsboet al., 2008; Krustrup et al., 2003). However, no other reliability and validity data iscurrently available for the Danish test protocol. In contrast, the Bicycle ErgometerTest in the Finnish test protocol was found to be an accurate and valid measure of maximal aerobic capacity and 3000m field running times in male subjects with combat gear (Santtila et al., 2010). The 3000m running test from the Norwegian test protocol correlated strongly with both the 8km cross-country running times and 30km marching times (Testutvalget, 1979), and a strong correlation was also found between the Field Test 2000m in the Swedish test protocol and the 2000m running times (Bergh et al., 2008).

In terms of muscular fitness tests, the aggregated measure of Multitest Strength in the Swedish test protocol was found to be an accurate and valid measure of soldiers' capabilities to perform military tasks such as digging, lifting and carrying (Sing et al., 1991). Similarly, existing reliability and validity data supported the use of the Standing Long Jump as a predictor of military operational capabilities (Nindl et al., 2007) and loaded Marching as a measure of military field performance (Sharp et al., 2008) in the Finnish test protocol. The Finnish Armed Forces also found that in large groups of great inter-individual variations in physical fitness, Sit-ups, and especially Push-ups, accurately measured not only muscular endurance, but also maximal strength to a certain degree (Vaara et al., 2011).

Application

The experiences related to the application of the Nordic physical fitness test protocols were substantially different. The Finnish Armed Forces reported of synchronizing a new

data system, PVSAP HCM MilFit, for evaluation of physical fitness as a part of personnel administration. In contrast, the Norwegian Armed Forces reported of a continuous decline in the use of the proficiency badges in Test Groups B and C, although some questions were raised as to what extent the physical fitness tests were properly registered and conducted by military personnel. Nevertheless, it was concluded that the majority of military personnel in the Norwegian Armed Forces performed physical fitness tests according to the test arrangement. The experiences of the Danish and Swedish Armed Forces pointed to similar problems with the standardization of the sit-up test. Difficulties were reported in finding the correct hip angle in the Danish 90°Static Sit-up and in performing the correct test movement in the Swedish Sit-ups due to stiff backs. Other problems with standardization were reported in the Danish Military Speed Test in relation to the possibility of tactical runs and their subsequent benefits. Soldiers with a great deal of experience with sports featuring intermittent types of running also demonstrated a higher readiness to adapt to the Danish Yo-Yo UH 1 than soldiers with no such experience.

The Danish Armed Forces reported of some changes in training models among their soldiers. An important point was that the soldiers were very focused on the test results in regard to their military assignment. Thus, they tended to use training models specific to a given test, particularly in terms of static training related to the Core Test. The soldiers also aimed for the highest fitness level in the tests, without taking into account the guidelines for physiological adaptations to training, as described in the Danish Concept of Military Training. The concept stated that soldiers should train in various functional ways and in order to improve their overall physical fitness level. Still, the Danish Armed Forces saw this cultural change in training models as a positive outcome in terms of a new emerging focus on the training of core muscular fitness.

Future Prospective

The physical fitness test protocol used by the armed forces in Sweden and Norway will undergo some revisions in the near future, while there are no immediate plans for revisions of the test protocols used by the armed forces in Finland and Denmark. In 2011, the Swedish Armed Forces will revise the tasks of their operational units, including revisions of the additional physical requirements in the FM Physical Standards that ground combat personnel should meet. Accordingly, the physical requirements for the Field Test 2000m and Multitest Strength may be changed to meet the new revised tasks of the operational units. The Chief of the Norwegian Armed Forces has given The Norwegian Defence University College a mandate to evaluate the Norwegian physical fitness test protocol in 2011. The task will be performed by the School of Sport Science Defence Institute. So far, a maximal treadmill running test for the assessment of aerobic fitness and two maximum isometric tests for the assessment of muscular fitness have been added to the test program for drafted personnel. The test protocols for these three tests are under construction and will be finished in June 2011. The physical fitness test protocol used by the Finnish Armed Forces has recently been revised. Therefore, the Finnish Armed Forces have no immediate plans to revise their test protocol, with the same for the Danish Concept of Military Physical Training, which is still fairly new and in the middle of its implementation and evaluation phase.

Consequently, the Danish Armed Forces have only made minor adjustments to their test protocol. The intention of the Danish Armed Forces is not to make too many small revisions to their test protocol because that may confuse and frustrate the soldiers, thereby resulting in a wrong focus in their physical training.

Discussion

The finding that the Danish physical fitness test protocol evolved from battlefield physical performance and requirements test models may provide additional knowledge beyond the scientifically based test models of the other Nordic test protocols. In accordance with the theory of assessment according to the context in which the concept of fitness is operationalized (Bouchard & Shephard, 1994), the Danish field test model may offer new strategies and methods for the development of more effective training and testing protocols, especially when preparing soldiers for more demanding military duties. However, it must be taken into consideration that tests designed for professional soldiers can be too demanding for other military personnel. In the Finnish Armed Forces, for example, the conscripts are the largest target group for physical fitness testing. The heterogeneity in physical fitness in this group suggests that tests designed for professional soldiers cannot be the same for conscripts and professional soldiers.

Compared with the other Nordic physical fitness test protocols, the greater requirements for physical fitness and the greater diversity of fitness components and test items found in the Danish physical fitness test protocol may indicate that there is a need to assess and monitor the overall physical fitness level to more effectively counteract the multiple stressors of demanding military duties. The Finnish test protocol defined the physical requirements of their soldiers from the skills and overall physical fitness level needed to perform demanding military duties based on the act of the Finnish Defence Forces (§43/2008), which states that a professional soldier must foster the professional skills and fitness level needed to perform his/ her duties. The Danish requirements were based on direct operational field observations and experiences from Afghanistan. The current emphasis on aerobic fitness in the Norwegian test protocol and the current minimum physical fitness standard used for military personnel (with an option of more stringent requirements for those military categories with greater physical demands) in the Norwegian and Swedish Armed Forces, may seem insufficient in this context as far as meeting the current need for soldiers' physical performance requirements for more demanding military duties. The reliability and validity data of the Nordic fitness test protocols provide continued support for the use of aerobic fitness tests, including the bicycle ergometer test and running tests, as valid measures of lighter combat loaded running tests - tests which apparently have relevance for some of the operational demands in combat situations. In addition, the data on the Danish test protocol support the use of the Yo-Yo IR 1 as a valid measure of a soldier's capacity to perform more intense, intermittent types of military tasks and exercises, taxing both aerobic and anaerobic capabilities. The fact that the aggregated measure of the Multitest Strength of the Swedish test protocol, the Standing Long Jump and the loaded Marching of the Finnish

test protocol were found to be valid measures of soldiers' military field performance or operational capability provides further support for their use as muscular fitness tests with relevance to a military operational context.

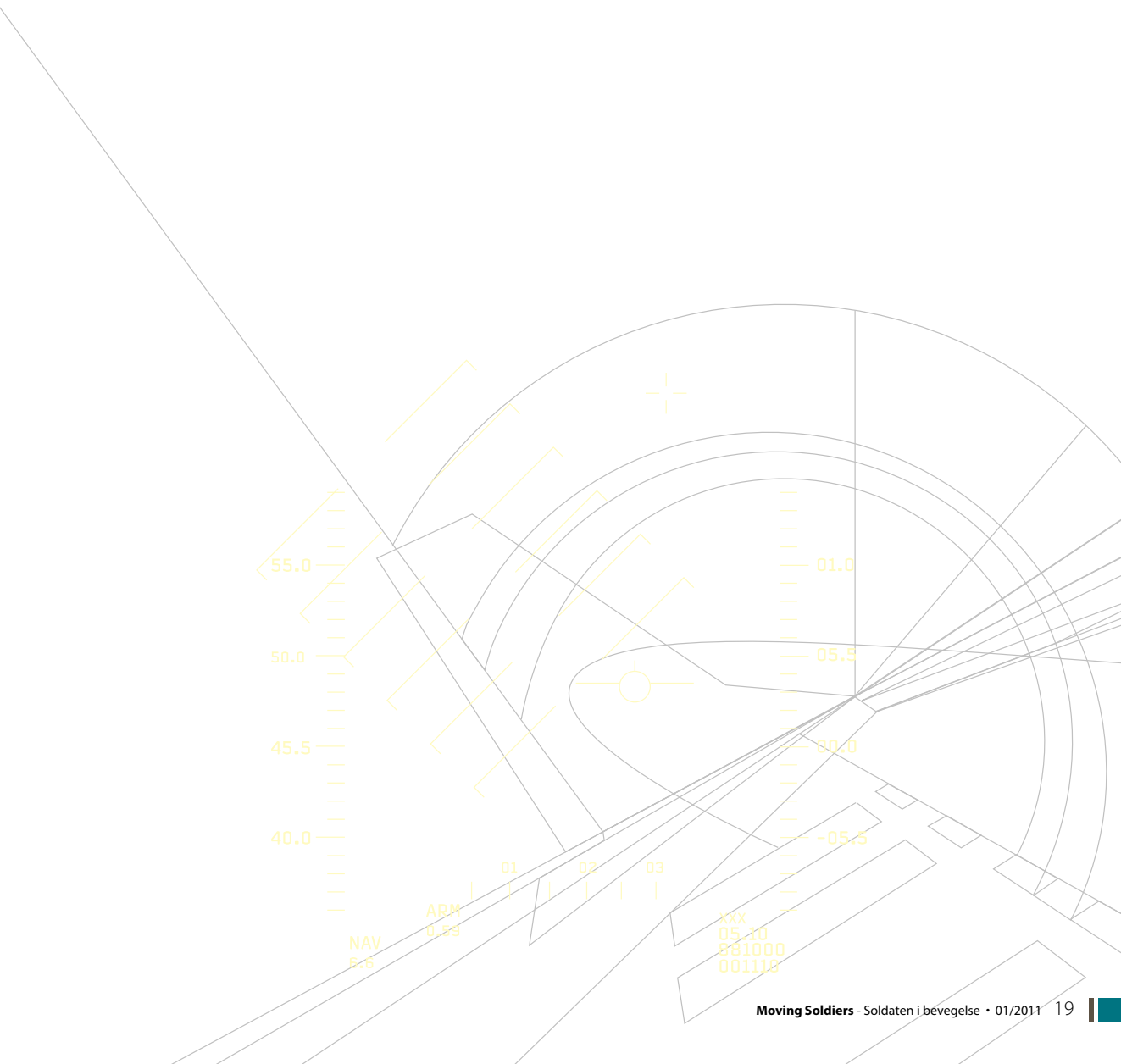
The continuous decline in the use of the proficiency badges of Test Groups B and C in the Norwegian Armed Forces test protocol may indicate a lack of interest in these tests, although the reason for this remains unknown. In contrast, the problems encountered with the standardization of test procedures in the Danish and Swedish sit-ups are in accordance with earlier findings by (Suni et al., 1996; Viljanen et al., 1991). The study by Suni et al. (1996) revealed only fair reliability and a large measurement error in the 90°Static Sit-up test among middle-aged men and women. The results of the study were explained by difficulties in the standardization of the test position and the effect of motivational factors. The problems with the standardization of test procedures reinforces the importance of using reliable assessment methods and the proper training of administrators to ensure reliable and valid test results.

The pending revision of the tasks in the operational units of the Swedish Armed Forces, including the potential revisions of the FM Physical Standards of the ground combat personnel, may be an indication of a shift towards more stringent physical requirements in the Swedish Armed Forces, particularly concerning tasks related to the operational units. Additionally, the current evaluation and revision of the Norwegian physical fitness test protocol, including the inclusion of the maximum treadmill running test for the assessment of aerobic fitness and two maximum isometric tests for the assessment of muscular strength for drafted personnel, may illustrate a shift in emphasis of the test protocol from the assessment of aerobic fitness to the assessment of overall physical fitness.

Conclusions

The present overview provides some input for a discussion on how to adjust and improve the strategies and methods for assessing physical fitness in the Nordic Armed Forces so that they may better serve the demands that soldiers meet in their military environment. In addition to the overall aim of promoting regular physical activity and training to ensure that military personnel remain physically fit, motivated and healthy for war, crisis and peacetime activities, there appears to be an apparent need to focus on more stringent physical requirements and more comprehensive physical fitness assessments among soldiers who encounter multiple stressors and risk of injuries related to demanding military working environments.

The present overview may also provide some input for the discussion of introducing common strategies and methods for the assessment of physical fitness within the Nordic Armed Forces. Despite differences observed in the physical fitness test protocols of the Nordic Armed Forces, the present overview may prove particularly useful when it comes to sharing experiences and information for the pending evaluations and revisions of the physical fitness test protocols for the Swedish and Norwegian Armed Forces.


55.0
50.0
45.5
40.0
01.0
05.5
80.0
-05.5
01
02
03
ARM
0.59
NAV
6.6
XXX
05.10
001000
001110

2

Description of the Basic Physical Fitness Test Protocols in the Nordic Armed Forces


0742
FOS BS

Denmark

Danish Concept of Military Physical Training

Denmark

Danish Concept of Military Physical Training

Klaus Gabriel Sørensen

Background

In 2009, The Danish Armed Forces, Center for Physical Training, carried out an investigation to clarify the physical work demands of its soldiers in Afghanistan – one of the toughest military campaigns Danish soldiers have ever taken part in. The observations and experiences from commanders, soldiers and investigative teams resulted in a new Danish Concept of Military Physical Training. This concept not only works to promote good physical performance capabilities and good health, it also assisted in lowering the risk of the soldiers becomming injured.

A soldier's assignment is influenced by a series of outside factors such as climate, task frequency, patrol speed and duration, equipment load, fluid and nutrition intake - or the lack of it - terrain and the enemy. In order to meet these demands, it is essential that the soldier possesses a good all-around physical performance capability. A high level of fitness is considered essential because it acts as resistance to the physical and mental demands that soldiers face in the battlefield. Physically capable soldiers are referred to as military athletes – due to the comparison with physical performance capabilities which exert a positive influence on their functional movement, as well as their psychological, social, technical and tactical skills.

Aim of Military Physical Training

A soldier is considered to be the most important "weapons system" in an army, based on the fact that no equipment can replace a well-trained soldier. A high all-around fitness level lowers physical stress in critical-/ extreme situations, e.g. when working in hot climates at high intensities or when carrying heavy equipment. A high level of fitness and a well-trained body also increase the body's ability to handle intense work loads and lower the risk of injuries.

The aim of the Danish Armed Force's Military Physical Training is to improve the overall physical fitness level of their soldiers in order to help them feel less strain during their operational tasks. The Danish Military Physical Training Concept consists of core muscular strength, muscular strength, as well as aerobic and anaerobic capacity. The concept is designed to increase the maximum physical performance capability, thereby increasing energy levels while reducing fatigue and the risk of injuries in physical work to improve the ability of the individual soldier to move faster.

A soldiers fitness can be increased by circuit training, which improves the heart's and

the circuit's function. An increase in fitness will result in striking improvements in the body's ability to carry out continuously, intense work, in addition to a faster and improved restoration between intense working periods and a better ability to adapt to tolerate hot climates. It can, however, take the body one-two months to build up aerobic and anaerobic capacity, two months or more to build up muscular strength, up to five months to build up the bone structure and seven months or more to build up the ligaments, joints and connective tissue. The physiological adaptations to physical training are key considerations when planning physical training for soldiers, especially before a deployment.

Physical Fitness Tests

All military and civil personnel in the Danish Armed Forces are subject to physical fitness tests. The recommended physical demands for each person are defined by the military assignment of the person. The highest demands are recommended for the Special Forces, followed by infantry soldiers and soldiers carrying out foot patrols, such as engineers, combat medics, interpreters and forward air controllers. The military assignment is regarded as the soldier's final test or "competition." After the soldier's return from a deployment, the physical work load of the soldier is lowered to avoid injuries. There are two different sets of physical fitness tests used in the Danish Military Physical Training Concept:

1. Core Test: Used to access the over all core fitness level for the Army, the Navy and the Air Force. The recommended fitness level in this test is 3.

2. The Danish Armed Forces Physical Test includes test blocks A, B, C and D for the Army and test blocks A, B and C for both the Navy and the Air Force. The soldiers are graded based on a grading scale of 0-5 in the three or four test blocks. Each unit commander is responsible and able to carry out the tests in his unit at any time in order to assess his unit's fitness level. However, in order to avoid getting injured, it is considered important that soldiers familiarize themselves with each test before even attempting the 4th or 5th level, particularly when using test block C.

Core Test
The Core Test rates the soldiers in their core muscular strength.

THE ARMED FORCES
PHYSICAL TEST/CORETEST

BACK

90° STATIC SIT-UP

SIDEBRIDGE RIGHT/LEFT

BACKBRIDGE RIGHT/LEFT

LUNGES

FORSVARET

THE ARMED FORCES
PHYSICAL TEST/CORETEST

NIVEAU	1. BACK	2. 90° STATIC SIT-UP	3. SIDEBRIDGE LEFT	4. SIDEBRIDGE RIGHT	5. BACKBRIDGE LEFT	6. BACKBRIDGE RIGHT	7. LUNGES 20 KG
5	165 sec.	135 sec.	120 sec.	120 sec.	90 sec.	90 sec.	60 reps.
4	150 sec.	120 sec.	105 sec.	105 sec.	75 sec.	75 sec.	50 reps.
3	135 sec.	105 sec.	90 sec.	90 sec.	60 sec.	60 sec.	40 reps.
2	120 sec.	90 sec.	75 sec.	75 sec.	45 sec.	45 sec.	40 reps.
1	105 sec.	75 sec.	60 sec.	60 sec.	30 sec.	30 sec.	20 reps.

FORSVARET

Back

The hip is placed two finger widths over the edge of a box while the hands are folded on the chest. The test position is correct when the body is in or above a horizontal position. This body position is maintained to exhaustion or for a maximum of 165sec.

90°Static Sit-up

The knees and hip are placed at a 90 degree angle with the hands folded on the chest. The back is straight and the chest is expanded during the test. This body position is maintained to exhaustion or for a maximum of 135sec.

Sidebridge Left/Right

The elbow and forearm are placed on the floor. The position of the elbow is directly below the armpit, the feet are placed on top of each other and the body is raised to the test position. This body position is tested on both the left and right side to exhaustion or for a maximum of 120sec.

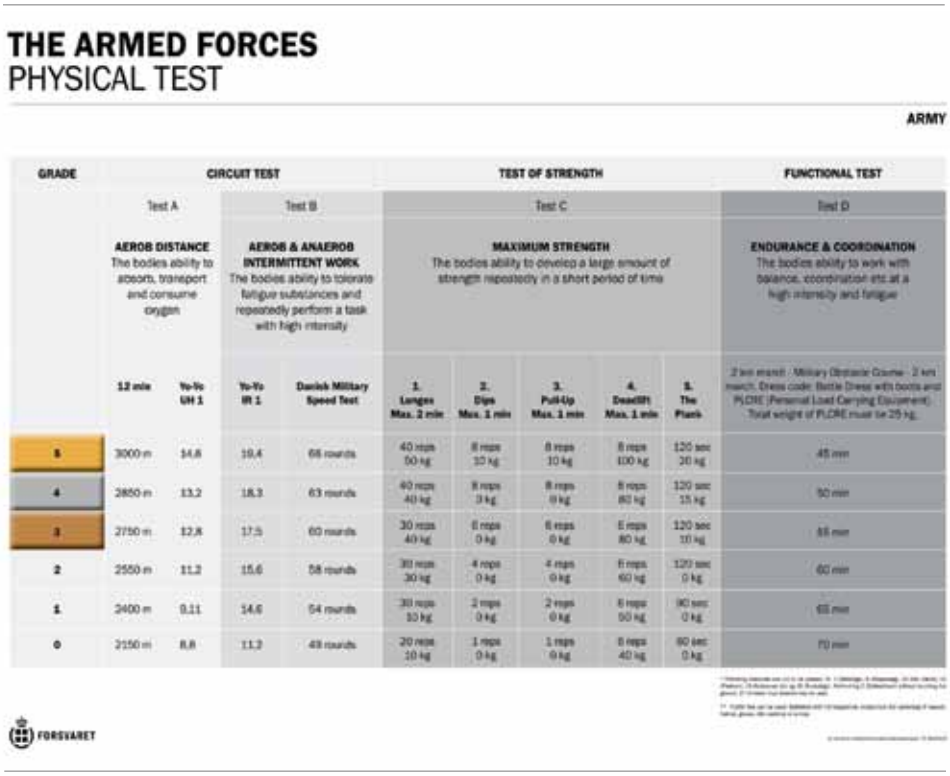
Backbridge Left/Right

The foot is placed in contact with the floor and hands are folded on the chest. The test position is correct when the hip is pressed up towards the ceiling, while the opposite leg and knee are straightened to the same level. This position is tested on both the left and right side to exhaustion or for a maximum of 90sec.

Lunges

This test is carried out as a fall out with an alternating right and left leg, so that the heel of the front leg is a minimum 10cm in front of the knee of the back leg. The kneeling down is performed, with a 20kg weight, and the knee of the back leg must reach a distance of at least 10cm from the floor. The back and knee remain stable during the test. The test is repeated continuously to exhaustion or for a maximum of 60 times.

The Danish Armed Forces Physical Test
The Danish Armed Forces Physical Test rates the soldiers in their aerobic and anaerobic fitness as well as muscular fitness.



THE ARMED FORCES
PHYSICAL TEST

ARMY

GRADE	CIRCUIT TEST				TEST OF STRENGTH					FUNCTIONAL TEST
	Test A		Test B		Test C					Test D
	AEROB DISTANCE The bodies ability to absorb, transport and consume oxygen		AEROB & ANAEROB INTERMITTENT WORK The bodies ability to tolerate fatigue substances and repeatedly perform a task with high intensity		MAXIMUM STRENGTH The bodies ability to develop a large amount of strength repeatedly in a short period of time					ENDURANCE & COORDINATION The bodies ability to work with balance, coordination etc at a high intensity and fatigue
	12 min	Yo-Yo UH 1	Yo-Yo IR 1	Danish Military Speed Test	1. Lunges Max. 2 min	2. Dips Max. 1 min	3. Pull-Up Max. 1 min	4. Deadlift Max. 1 min	5. The Plank	2 km march - Military Obstacle Course - 2 km march. Dress code: Battle Dress with boots and PLCRE (Personal Load Carrying Equipment). Total weight of PLCRE must be 25 kg.
5	3000 m	14.6	19.4	66 rounds	40 reps 50 kg	8 reps 10 kg	8 reps 10 kg	8 reps 100 kg	120 sec 20 kg	45 min
4	2850 m	13.2	18.3	63 rounds	40 reps 40 kg	8 reps 3 kg	8 reps 0 kg	8 reps 80 kg	120 sec 15 kg	50 min
3	2750 m	12.8	17.5	60 rounds	30 reps 40 kg	6 reps 0 kg	6 reps 0 kg	6 reps 80 kg	120 sec 10 kg	55 min
2	2550 m	11.2	15.6	58 rounds	30 reps 30 kg	4 reps 0 kg	4 reps 0 kg	6 reps 60 kg	120 sec 0 kg	60 min
1	2400 m	9.11	14.6	54 rounds	30 reps 10 kg	2 reps 0 kg	2 reps 0 kg	6 reps 50 kg	90 sec 0 kg	65 min
0	2150 m	8.8	11.2	48 rounds	20 reps 10 kg	1 reps 0 kg	1 reps 0 kg	6 reps 40 kg	60 sec 0 kg	70 min

FORSVARET

Aerobic Fitness Tests
Block A tests the soldiers in aerobic distance – the body's ability to absorb, transport and consume oxygen. The soldiers can choose one of the following two tests:

12 Minute Run

The soldiers are tested based on how many meters they can run in 12 minutes. In order to achieve the most repeatable test result, the test must be conducted outdoors on a 400m running course. The test course can be marked at every 50 or 100m.

Yo-Yo UH 1 (20m Shuttle-Run)

The soldiers run in a gymnasium between two marked lines which are 20m apart. It is required that they touch the lines with their feet upon hearing the sound of a beep from a Yo-Yo UH 1 test CD. The intervals between the beeps get progressively shorter, which results in the soldiers having to run increasingly faster to reach the line before the beep. The test score is the level that the soldier last initiated, before he/she was unable to keep up with the recording.

Aerobic and Anaerobic Fitness Tests
Block B rates the soldiers in aerobic and anaerobic distance, i.e. the body's ability to tolerate fatigue and repeatedly perform a task with high intensity. The soldiers can choose one of the following two tests:

YO-YO IR 1 (20m Shuttle-Run with Pauses)

This test is almost identical to Yo-Yo UH 1, but instead it incorporates pauses of 10sec. between each running interval. The intervals between the starting and finishing beep become progressively shorter, which results in the soldiers having to run increasingly faster to reach the line before the beep. The test score is the level that the soldier last recorded, before the soldier was unable to keep up with the recording.

The Danish Military Speed Test

The Danish Military Speed Test was invented by the Center for Physical Training. The simplicity of the test is considered to be its essence: The test can be taken by soldiers themselves anywhere and at any time with no extensive preparation or planning. Two lines are marked and drawn 20m apart. The soldiers run between the two lines as many times as possible in 30 seconds, followed by 30 seconds of rest. The cycle is repeated 10 times. The completed number of rounds is added up and the result is soldier's test score.

Muscular Fitness Tests
Block C rates the muscular strength of the soldiers, i.e. the body's ability to repeatedly generate a large amount of strength over a short period of time. The block contains the following five tests to help assess the overall muscular fitness level in relation to movements typical of soldiers patrolling with heavy carriage:

Lunges

This test is carried out as a fall out with an alternating right and left leg, so that the heel of the front leg is a minimum of 10cm in front of the knee of the back leg. The kneeling down is performed with weights of 10 to 50kg, and the knee of the back leg must reach a distance at least 10cm from the floor. The back and knee must remain stable during the test., and the exercise is repeated continuously or to exhaustion.

Dips

This test is carried out with the hands and legs in an optional position, though it is not allowed to change their position during the test. The upper part of the body is lowered until there is at least a 90 degree flexion in the elbows, after which the body is returned to its starting position. The test is repeated from one to eight times with no weight or with a weight of 10kg, depending on the test score.

Pull-Ups

This test is carried out with the hands in an overhand grip and with the legs in an optional position, and it is not allowed to change this position during the test. The body is pulled up to a position where the chin goes over the beam and then, the body is lowered to the starting position. The test is repeated from one to eight times with no weight or with a weight of 10kg, depending on the test score.

Dead-lifts

This test is carried out with hands in an optional position. The feet are positioned no more than 10cm wider than the width of the shoulders. A leg press is performed until a straight body posture is achieved with the chest slightly expanded. Thereafter, the body is lowered back to the starting position. The weight must touch the floor prior to each lift, although resting the weight on the floor between the lifts is not allowed. The test is repeated from 6 to 8 times with no weight or a weight of 40-100kg, depending on the test score.

The Plank

This test is carried out with the elbows a shoulder width apart, with the hands folded and the feet slightly widened to a maximum of a shoulders width apart. A 0-20kg weight is placed over the loin. The body is raised in a straight position so that only the toes and forearms touch the floor and the head forms a natural extension of the body. This body position is maintained for 60-120sec, depending on the test score. It is not allowed for the test subject to rock or change position during the test.

Functional Tests

Block D rates the soldiers in their aerobic and functional motor skills. The soldiers perform a 2km march (running is not allowed) followed by a 500m military obstacle course, in which six out of 20 obstacles are not to be negotiated, and finish with another 2km march. The total weight of each load of equipment is 25kg (without uniform and boots). The non-negotiable obstacles are: number 1 (rope ladder), number 8 (sloping wall with rope), number 10 (Irish table), number 12 (four steps of beam), number 15 (pit) and number 16 (vertical ladder).

Reliability and Validity of the Physical Fitness Test Protocol

A limited amount of data is available on the reliability and validity of our tests. However, the Yo-Yo IR 1 test (20m shuttle run with pauses) has been found to have a high reproducibility among athletes of intermittent sports. In addition, the test has been found to be a valid measure of fitness performance in intermittent sports (Krustrup et al., 2003; Bangsbo et al., 2008).

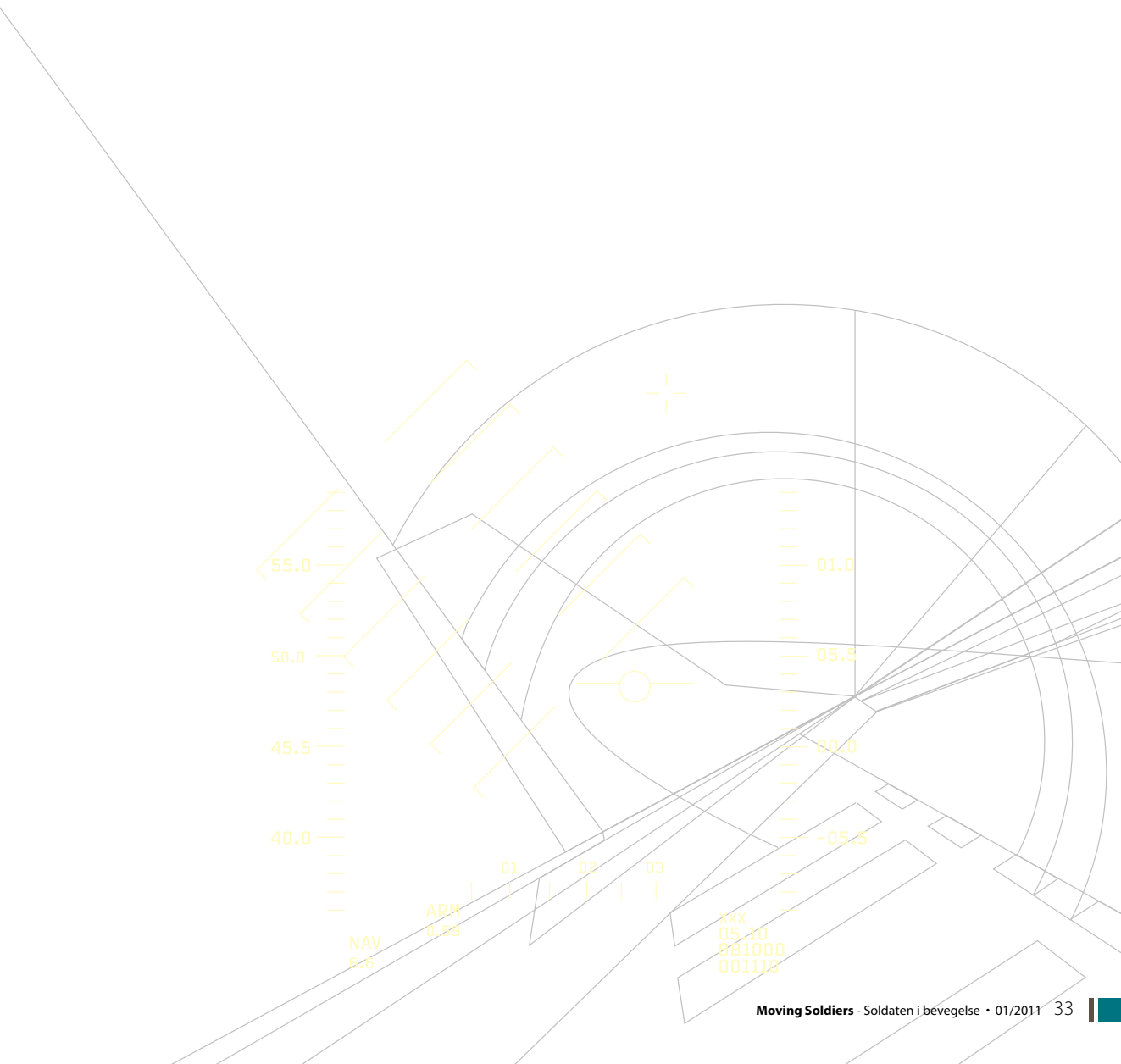
Application of the Physical Fitness Test Protocol

The Yo-Yo IR 1 is frequently applied since it gives soldiers a valid test result. Similarly, the Danish Military Speed Test, the alternative to the Yo-Yo IR 1 test, is also often used because it is easy to administer and requires no CD player or gymnastic hall. The test can be used for both testing and training purposes. Still, The Danish Military Speed Test has some unfortunate flaws, as soldiers can carry out tactical runs and benefit from this. A soldier who is reaching the starting or finishing line with four seconds remaining in an arbitrary interval can choose to save energy by not attempting to reach the half-way mark of the next interval. Instead, the soldier may decide to save energy by stopping at the line and getting an additional four seconds of rest, which will then be of benefit for him/her in the next interval.

Our experience have shown that many soldiers score higher in the 12min Run than in the Yo-Yo IR 1 test, despite the fact that both tests assess the body's ability to absorb, transport and consume oxygen. This can be explained by repeated shifts in direction followed by acceleration in the Yo-Yo UH 1 test. Soldiers with a great deal of experience with intermittent sports that require the same type of running demands demonstrate a higher readiness in adapting to the test, and score higher than soldiers who are unfamiliar with intermittent sports type of running.

Both the Muscular Fitness Tests (Block C) and the Core Test require well-trained personnel to control the various tests in order to give as valid test results as possible. In particular, if the angle in the 90 degree Static Sit-up is slightly off, it can result in the test being very easy and therefore yield an invalid test result. We recommend that soldiers train their core muscular strength on a daily basis by using dynamic, not static exercises, though many of them still train statically, as this is what is being tested in the Core Test. A positive outcome of this is that the Danish Armed Forces see a new emerging focus on the training of core muscular fitness.
A general tendency is for the soldiers to be highly focused on the test result in regard to their assignment. Thus, when they see the Danish Armed Forces Physical Test Schedule, they tend to use training models specific to the given tests. Furthermore, when initiating their training, soldiers aim for the highest fitness level without taking into account their current fitness level and their bodies' need to progressively build up strength. This often creates a problem, as we want our soldiers to train in various functional ways in order to improve their overall physical fitness level.

Future Prospective of the Physical Fitness Test Protocol
The Danish Concept of Military Physical Training is still very new and in the middle of its implementation and evaluation phase. Hence, we have only made minor adjustments to Block D of the test protocol by, for example, adjusting the grading of the test results from Block D and by allowing a stool as an aid for the assault wall. We try not to make too many small revisions to the test protocol since, our primary goal is for the tests to be easily implemented and used by the soldiers. Constant revisions will only confuse and frustrate the soldiers, resulting in a wrong focus for their physical training.


55.0
50.0
45.5
40.0
01.0
05.5
-05.5
01
02
03
ARM
0.59
NAV
6.6
XXX
05.10
001000
001110

Finland

Basic Physical Fitness Tests in the Finnish Defence Forces

Finland

Basic Physical Fitness Tests in the Finnish Defence Forces

Matti Santtila, Heikki Kyröläinen, Kai Pihlainen

Background

An increase in being overweight and a decline in physical fitness, especially in terms of cardiovascular fitness, of young men entering or recruited for military service (e.g. Dyrstad et al., 2005; Leyk et al., 2005; Santtila et al., 2006; Staub et al., 2010) has become a big challenge for the armed forces. The armed forces must accomplish their tasks of training skilled troops with a high performance capacity for deployment in peacekeeping and crisis management operations, and even for war. It seems that the current, more technical nature of warfare has not reduced the physical requirements for soldiers. Despite advances in technological developments, military operations and crisis management are still very demanding and challenging for both individual soldiers and their leaders. Consequently, good physical and mental preparedness are required for success in tasks undertaken in various environments as well as demanding physical training. In addition, soldiers are often exposed to various stressors in military operations, not only prolonged and strenuous physical exercises, but also in relation to energy and fluid deficiency, extreme ambient temperatures and sleep deprivation (Opstad, 1995; Nindl et al., 2002).

During operations, the physical performance of soldiers can decline fairly rapidly (Sharp et al., 2008; Lester et al., 2010), and there is not enough time for maintaining or improving physical performance during periods of increased operational stress. For this reason, soldiers should be at a high level of physical fitness prior to the beginning of operations. Additionally, good physical fitness resulting from regular physical activity plays an important role in promoting an individual's health. Previously, it has been emphasized that endurance training is the most important factor for developing a successful soldier, although the important role of strength training has also currently been recognized. In other words, a modern soldier needs both good aerobic and muscle strength capacity, thereby enabling them to work at a lower relative submaximal level during operations. In order to simultaneously improve aerobic fitness and muscle strength, the periodization of training should be used in order to avoid any interference in strength development induced by concurrent endurance and strength training as originally demonstrated by Hickson (1980).

Predictive field test models related to operative physical performance and requirements may be beneficial when preparing soldiers for demanding military operations. Nevertheless, limited information is available about the reliability of military field performance tests. Loaded running and marching have typically been

used as examples of military tasks, together with digging or shoveling activities and carrying various types of loads or materials (Sharp et al., 1998). The loaded running and marching tests are widely used and are valid performance tests. There are also typical task-related military field tests, by which a soldier's endurance and strength capacity can be evaluated (Kraemer et al., 2004).

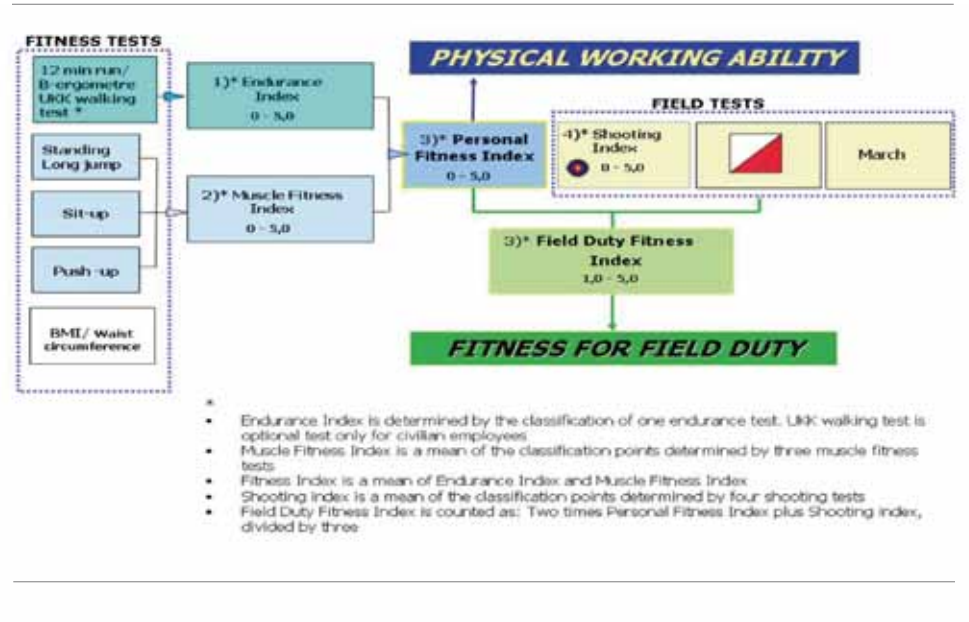
The Finnish Defence Forces (FDF) aim to ensure that it has physically fit, regularly active and motivated personnel who are prepared for war, crisis and peacetime activities. Therefore, the aim of physical education in FDF is to positively influence the personnel's physical activity and health behavior in addition to improving their attitudes towards physical exercise. The FDF encourages conscripts, reservists and FDF personnel to develop and maintain a physically active lifestyle, which further promotes physical health while seeking to inspire or strengthen peoples' willingness to be physically active throughout their lives. Physical activity and fitness both exert a great influence on an individual's health status and working ability. Thus, adequate levels of endurance and muscular fitness are essential, particularly for physically demanding field duties such as marching, and carrying heavy loads and materials.

Fitness testing in the Finnish Defence Forces is compulsory on an annual basis for all professional soldiers. This duty is based on the act on the Finnish Defence Forces (§43/2008), which states that a professional soldier must foster the professional skills and fitness level needed to perform his/her duties. The basic skills and fitness level needed by a soldier in different commissions, as well as the tests needed to evaluate these levels can be prescribed through a Ministry of Defence decree.

Therefore, the development of optimal training programs and reliable fitness testing protocols related to changes in society, or in requirements of warfare, is an essential and daily issue in the armed forces. In addition, a good level of physical fitness is not only essential for soldiers' performance, but also for the prevention of injuries, the maintenance of a good work ability and good public health (Jones et al., 1993; Knapik et al., 2001; Mattila et al., 2007).

Fitness Testing in the Finnish Defence Forces

The fitness level for field duty and physical working capacity of all personnel groups, professional soldiers, civilians, reservists and conscripts is monitored by the FDF, using a system comprised of fitness tests, measuring equipment, testing methods, personnel resources and a database program known as PVSAP HCM MilFit. Physical working capacity is determined by aerobic capacity and muscle fitness tests, whereas body composition is evaluated by measuring body height, weight and waist circumference. Professional soldiers must also pass field duty fitness tests, which include shooting, marching, and orienteering tests (see picture below). Physical fitness tests and body composition measurements of the conscripts and reservists are nearly the same as those previously described. All fitness tests and field duty tests are standardized according to administrative norm authorized by the Personnel Division of the Defence Command. Educated and licensed instructors lead all fitness tests.



The evaluation of the tests is based on age-class -defined classification tables designed for professional male and female soldiers, as well as male and female civilian personnel. The conscripts and reservists are evaluated according to their civilian classification (age group 20-24 years). The classification tables are presented in Appendix 1.

Health Screening to Ensure Safety of Testing

A health screening is conducted before all fitness tests in order to ensure that the subject has no acute medical problems that can prevent the safe execution of the tests. Fitness testing of conscripts is always determined by a medical examination, and the subjects are informed of general safety regulations (ACSM, 2000) prior to the fitness tests.

The participants in aerobic fitness tests (excluding the UKK Walk Test) fill out a health risk stratification questionnaire (ACSM, 2000) before the tests. Thereafter, subjects with two or more risk factors are referred to a health examination by a physician. The physician will then determine the appropriate fitness testing protocol or give him/her a fixed-period exemption from the tests. The same procedure is carried out if the subject has received a poor result in a previous aerobic fitness test. The subject can also be referred for an extended medical examination to ensure his/her working ability in his/her current duties. Reservists with two or more health risk factors are relieved from taking aerobic fitness tests, and are guided to a doctor for medical evaluation.

The instructors are advised to supervise the reactions of the test subjects during the fitness tests. If the supervisor or the subject notice any symptom mentioned in the general safety regulations, the test is interrupted and the subject is given the required

medical treatment. A poor test result, or a significant decline in the fitness test result with no reported change in physical activity behavior following a previous test, serve as screening methods and a reference for a medical re-evaluation for professional soldiers and civilian personnel.

The described health screening methods are agreed upon in co-operation with the Medical Sector of the Defence Command. In combination with a health screening, annual fitness tests act as a form of preventive occupational health care service. The physicians will make the final decision as to further medical treatments or rehabilitation activities for high-risk subjects.

Assessment of Body Composition

Body mass (BM) is measured using a commercial scale to an accuracy of 100g wearing only shorts. Body height is recorded by tape measure in a standing position to an accuracy of 5 mm without shoes. Body mass index (BMI) is calculated using weight over height squared. Waist circumference (WC) is measured using a cloth tape measure at a point between the lowest rib and iliac crest following a normal exhale. Two measurements were taken and then averaged for use in further analyses (Fogelholm et al., 2006).

Aerobic Fitness Tests

12 Minute Run

Aerobic capacity is measured by a 12min running test (Cooper, 1968), which is mainly performed outdoors. In the winter, however, some garrisons have the possibility to arrange indoor tests as needed. The test timing and circumstances are standardized according to an expert supervisor, and the personnel are instructed to perform the 12min run with a maximal effort, but at a progressively increasing running speed. Subjects are allowed to stop the test at any time for safety purposes. The accuracy of the measurements is ±10 meters.

Bicycle Ergometer Test

The maximal oxygen uptake (VO2peak) for soldiers and civilians over 45 years of age is measured using a bicycle ergometer (Ergoline GmbH, Ergoline, Germany). The initial work-load of the test is 50 W, which is increased by 25 W every second minute until exhaustion (MILFIT/FitWare, Fitware Oy, Mikkeli, Finland). Heart rate is continuously recorded using a heart rate monitor (Polar Electro, Kempele, Finland). Volitional exhaustion is the main criterion indicating that VO2peak has been achieved, and the highest mean VO2 over one minute is accepted as the VO2peak. Maximal oxygen uptake is estimated from HR and power output data (Åstrand & Rhyming, 1954) by using Fitware software (Fitware Oy, Mikkeli, Finland) for maximal test. The reliability and accuracy of this particular protocol has been studied by Keskinen, Keskinen, Takalo and Häkkinen (2002). Compared with indirect calorimetry, the Fitware protocol underestimated VO2peak by 7.0% (SD 5.7) in men, and the correlation between these two methods was r = 0.94. The test–retest repeatability of the VO2peak was r = 0.96.


POWERADE
300
069
176

The UKK Walk Test

The UKK Walk Test (Oja et al., 1991) is used as an optional aerobic fitness test for civilians and reservists over 45 years of age. The purpose of using the test is to create a low initial threshold for fitness testing. The UKK Walk Test is performed by walking two kilometers as fast as possible on a flat surface. The result is recorded as estimated VO2max, which is calculated based on the person's age, gender, height, weight, time taken to walk two kilometers and heart rate at the end of the test. The fitness classification scale is the same as in the bicycle ergometer test.

Muscle Fitness Tests

Muscle fitness tests consist of sit-ups, push-ups and the standing long jump. The sit-up test (Viljanen et al., 1991) is used to test the muscle endurance of the abdominals and hip flexors. The push-up test (ACSM, 2000) is used to test the physical performance of the upper extremities. The standing long jump test (Bosco et al., 1983) is used to test the explosive force production of the leg extensor muscles.

Sit-Ups

To measure performance of abdominal and hip flexor muscles, Sit-ups are performed so that in the starting position, subjects are lying on their back on the floor with their hands behind their neck and their elbows pointing forward. The knees are flexed at a 90 degree, the legs are slightly abducted and the ankles are supported by an assistant. The subjects lift their upper bodies and bring their elbows to their knees. The result of the test is expressed as the number of sit-ups completed during 60 sec (Viljanen et al., 1991). The test-retest reliability of the measurement has been reported to be high among young (ICC=0.83–0.93) (Tsigilis et al., 2002; Augustsson et al., 2009) and middle-aged adults (r=0.91) (Alaranta, Hurri, Heliövaara, Soukka and Harju, 1994).

Push-Ups

To measure performance of arm and shoulder extensor muscles, Push-ups are performed so that subjects start from a position with fully extended arms and a straight torso, hands shoulder-width apart, fingers pointing forward and legs in a parallel push-up position. The torso is then lowered until the elbow angle reaches 90 degrees. The result of this test is expressed as the number of push-ups completed during 60 sec (ACSM, 2000). An ICC between 0.93 and 0.95, which indicates a high test-retest reliability, has been reported for young adults (Augustsson et al., 2009).

Standing Long Jump

A standing long jump is used to measure the explosive force production of the lower limbs. The jump (performed three times) starts on the ground with the legs side-by-side. A powerful swinging of the upper body and arms assists with an explosive bilateral take off, and the landing of each jump is performed bilaterally as well. The result of the best jump is expressed in meters as the shortest distance from the landing to the starting line (Bosco et al., 1983).

Fitness Tests for Field Duty

In order to annually estimate soldiers' fitness for field duty, basic field tests including marching, orienteering and shooting are used. The fitness for field duty index is determined based on these tests. In addition, almost all branches of the armed forces have their own specific task-related field fitness tests, which are not described in this report.

Marching

Marching tests are used to evaluate a person's ability to maintain his/her performance both during and after prolonged physical strain. The test can be performed in cross-country terrain by completing a 25 km walk, 30 km of skiing or 80 km of cycling while carrying combat gear and a rifle. The test must be completed in six hours.

Orienteering

Orienteering skills are estimated by an orienteering run of at least five kilometers in demanding forest and cross-country terrain. In the winter, the test can be performed by the use of ski orienteering. The orienteering test must be completed in 90 min during daylight or in two hours in the dark.

Shooting

Shooting tests include two service rifle shooting tests and two pistol shooting tests. The rifle shooting is performed on a 150 m shooting range and pistol shooting on a 25 m range. Both rifle and pistol shooting consist of standard and rapid-fire tests. The classification tables and shooting index are presented in Appendix 2.

Swimming

Voluntary swimming tests can be performed to evaluate the swimming and life saving skills of the soldiers. Swimming tests are recommended for the units with a nautical working environment. Swimming tests can be performed by completing the Nordic 200 m, 12 min or life saving swim.

Reliability and Validity of the Physical Fitness Test Protocol

Direct bicycle ergometer or treadmill running tests are the "gold standard" measurement for maximal aerobic capacity (peakVO2 or VO2max), while predicted VO2max measurements are based on the assumption that there is a linear relationship between heart rate and VO2 (Åstrand et al., 1954). On the other hand, muscle strength and endurance are also important factors in many of the soldiers'activities. In FDF, VO2max studies using a bicycle ergometer use an initial work-load of 50 W. The load is increased by 25W every second minute until exhaustion (MILFIT/FitWare, AinoActive Oy, Helsinki, Finland). VO2 is continuously measured using a gas analyzer (SensorMedics, Yorba Linda, California, USA). The heart rate is continuously recorded by a heart rate monitor (Polar Electro, Kempele, Finland). In neuromuscular tests, the bilateral isometric maximal strength of the arm and leg extensors, grip strength and

muscle endurance (recording of the number of repetitions in one min of push-ups, sit-ups and squats) are utilized.

The VO2max is measured indirectly and directly and correlated significantly (r=0.80-0.84, p<0.001) with each other. The absolute and relative differences between the methods varied from -0.4 to 1.3 ml-1•kg-1•min-1 and from 0.9 to 2.7%, respectively. Significant correlations were also found between maximal strength of the arm extensors and repeated push-ups ($r = 0.58$, $p < 0.001$), as well as between repeated squats and VO2max ($r = 0.55$, $p < 0.001$). No significant relationships were observed between maximal isometric strength of the arm or leg extensors and that of VO2max. The present predicted VO2max measurements are only slightly over or under the VO2max values of the direct measurements. Thus, it can be concluded that our protocol is fairly accurate and valid in the prediction of VO2max values in male subjects. Nevertheless, in a large group of subjects with great inter-individual variation in physical fitness, muscle endurance tests such as push-ups, sit-ups and repeated squats seem to measure not only the level of muscle endurance, but also to some extent that of maximal strength. The relationship between maximal strength and muscle endurance was found in push-ups, but not in repeated squats. Nonetheless, the performance in repeated squats was related to VO2max, whereas that of push-ups was not.

The predictive field test models related to battlefield physical performance and requirements may be beneficial when preparing for demanding operations that are sometimes in harsh environments. However, limited information is available about reliable military field performance tests. Loaded running and marching have typically been used as two military tasks, together with digging or shoveling activities and carrying different types of loads or materials (Sharp et al., 1998). The loaded running and marching tests are widely used and are valid performance tests. There are also typical task-related military field tests by which soldiers' endurance and strength capacity can be concurrently evaluated (Kraemer et al., 2004).

In addition to the above-mentioned field tests, Nindl et al. (2007) have suggested that vertical jump height can predict operational capabilities in situations with limited testing resources, including equipment, time or environmental conditions. The data available support its utilization as an effective military field test. Using this method of testing, Nindl et al. (2007) have also found that the lower body power output declined linearly, with significant losses in lean body mass. Harman et al. (2008) later supported these findings. Nindl et al. also have found that a greater body mass was positively associated with a better casualty recovery performance.

In a study by Sharp et al. (2008), the authors examined a wide array of tests, including body composition measurements, lifting strength measured by an incremental lifting machine, lower and upper body explosive power measurements (vertical jump, medicine ball put) and aerobic capacity measurements. Yet, only two tests demonstrated a detraining effect, thereby indicating that aerobic capacity and a novel upper body power skill test were the only abilities not maintained by typical unit physical training and combat operations.

One field test that taxes both the aerobic and strength capabilities of a soldier is the loaded running or marching tests (Kraemer et al., 2004; Nindl et al., 2007). Usually, load tests reflect heavier demands and lighter combat-loaded running tests have not been used to evaluate physical training programs in the military, though such tests would reflect some of the operational demands in combat situations. Santtila et al. (2010) revealed that the initial VO2peak level, as measured by a bicycle ergometer test, was the main determinant of improvements in 3 K field running performance with combat gear. There was also a high correlation between measured VO2max values and field running times ($r=0.66$, $p<0.001$).

Based on the previously mentioned justifications, we are convinced that our tests fully measure physical fitness with its various aspects, though of course several military tasks require additional measurements to determine whether or not a person is able to complete his/her duties in terms of physical and mental performance. Therefore, several other special tests are utilized in the Finnish Defence Forces.

Application of the Physical Fitness Test Protocol

Our physical fitness testing system has recently been renewed, so we have only limited information on practical considerations related to the test system. The most challenging part so far has been to synchronize the new PVSAP HCM MilFit data system to work as planned.

Future Prospective of the Physical Fitness Test Protocol

Because of the recent renewal of our physical fitness testing system, we have no concrete plans related to the future of our testing system.


CRAFT
238

Norway

Physical Fitness Tests in the Norwegian Armed Forces

Norway

Physical Fitness Tests in the Norwegian Armed Forces

Jarmo Malmberg, Rune Hageberg, Anders Aandstad

Background

In the Norwegian Armed Forces, all entrants for and cadets in basic officer training, all compulsory military personnel in basic training, and all permanently employed officers and non-commissioned officers and enlisted personnel are subject to physical fitness testing. However, officers, non-commissioned officers and enlisted personnel have the choice of testing themselves on multiple occasions using multiple tests, and in tests which the best test result counts. Personnel over 50 years of age take the tests on an equal footing with other military personnel, although with no regard to the time requirements of the tests. Such test programs are meant to emphasize the health-enhancing effect of being physically active.

Physical fitness tests provide military personnel with concrete, attainable goals for physical training. A satisfactory aerobic performance is considered to be important and is of great significance for soldiers' abilities to endure physical and psychological stress. The Norwegian Armed Forces has therefore chosen aerobic fitness as a fundamental component of their physical fitness testing program. Physical fitness tests also provide unit commanders with an opportunity to assess the status of their personnel in terms of health, emergency preparedness and role model for subordinate personnel.

Minimum Military Physical Standard

Norway's Chief of Defence sets the minimum military physical standard for all military personnel in the Norwegian Armed Forces. The test scores for personnel and departments are classified on a scale from 0-6, with six being the highest. The minimum military physical standard is set at 2. This grade is defined as "acceptable physical fitness," and is considered sufficient for military duties with a minimum demands on physical capability. If needed, the Chiefs of Staff defines more stringent requirements for those categories for personnel with greater demands on physical capability than that mentioned above.

Physical Fitness Tests for Drafted Personnel

Today, drafted personnel take no physical fitness tests. However, a maximal treadmill running test to assess aerobic fitness and two maximum isometric tests to assess arm and leg muscle fitness, respectively, will be added to the testing program in August 2011. The test protocols for these tests are under construction and will be finished in June 2011.

Physical Fitness Tests for Compulsory Military Personnel

The physical fitness tests for compulsory military personnel consist of a 3000m run to assess aerobic fitness, and pull-ups, sit-ups and push-ups to assess muscle fitness. According to the guidelines, the tests are performed three times: within three weeks of entering, before transferring from training to different parts of military service, and within the final quarter before leaving military service. The required test scores for passing the tests are a 2 for the 3000m run and an average of 2 for the three tests of muscle fitness.

3000m Run

This test is performed with reasonably good footing on a track, road or constructed trail. The maximum rise of the test course is 10m. When a road or constructed trail is used, the test course is marked with signs at intervals of 500m. The classifications of test scores for compulsory military personnel are shown in Appendix 3.

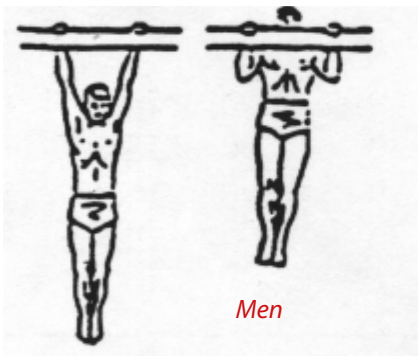
Pull-Ups

Men

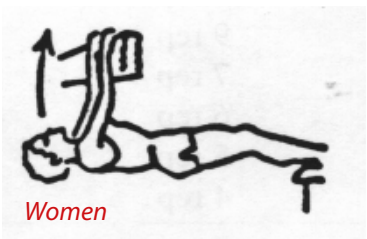
The body is hanging vertically from a gymnastics beam with the hands in an overhand grip and the feet off the floor, as depicted below. The extended body is then raised until the chin is above the upper part of the beam and lowered until the arms are fully extended. The test is performed repeatedly with calm, controlled movements. The classifications of test scores for compulsory military personnel of men are shown in Appendix 4.

Women

The body is hanging horizontally from a gymnastics beam with the hands in an overhand grip and the arms and legs extended, as depicted below. The heels are placed on a bench or something similar to achieve a horizontal starting position. The extended body is then raised until the chest touches the beam and lowered until the arms are fully extended (with no flexion of the hip or knees or pushing off with the heels). The test is performed repeatedly with calm, controlled movements. The classifications of test scores for compulsory military personnel of women are shown in Appendix 4.



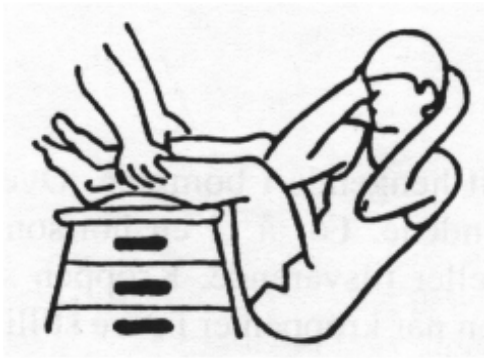
Men



Women

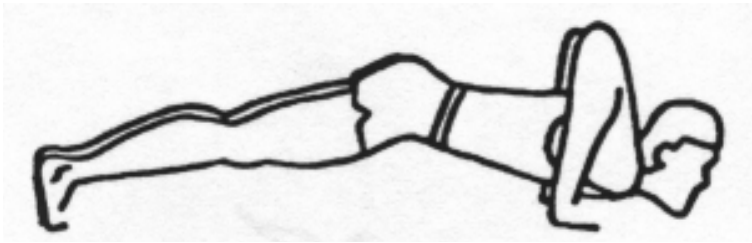
Sit-Ups

The body is positioned supine on the floor with the hands folded behind the head, as depicted below. The lower legs and buttocks rest against a box, respectively, and the legs are supported by a partner. The trunk is then alternatively raised so that the right and left elbow touches the opposite knee in the upper position and the back of the head touches the floor in the lower position. The test is performed repeatedly with controlled movements and no external encouragement. The classifications of test scores for compulsory military personnel are shown in Appendix 5.



Push-Ups

The body is positioned face down on the floor with the forefingers in line with the outer edges of the shoulders and the fingers pointing straight ahead, as depicted below. The body is then raised so that the arms fully extend in the upper position, and the chest and chin touches the floor in the lower position. The trunk is slightly flexed throughout the movement to avoid having it touching the floor. The test is repeatedly performed with calm movements and no external encouragement. The classifications of test scores for compulsory military personnel are shown in Appendix 6.



Physical Fitness Tests for Officers, Non-Commissioned Officers and Enlisted Personnel

Officers, non-commissioned officers and enlisted personnel are obligated to take a physical fitness test of their own choosing anytime between January 1st and December 15th. The test program is divided into three groups, as shown in Table 1. Test Group A consists of individual tests with grading scales from 0-6 to indirectly assess aerobic fitness. Test Group B is a selection of physically demanding proficiency badges, in which a passed proficiency test corresponds to a score of 4 and a passed proficiency test in two or more badges to a score of 6. Test Group C is a selection of proficiency badges and a 15km walking test, in which a passed proficiency test corresponds to the minimum military physical standard, which is a score of 2.

TABLE 1. Physical Fitness Tests and Proficiency Tests for Officers, Non-Commissioned Officers and Enlisted Personnel

Test Group A	Test Group B	Test Group C
Tests for aerobic fitness 3000m run 500m swim 10km cross-country skiing 20km bicycling Grading: Tests with classification scores 0-6, see Appendix 7-11.	Proficiency badges The Military Pentathlon Badge The Military Skiing Badge The Military Marching Badge The Infantry Badge The Field Sport Badge The Biathlon Badge The Nijmegen Medal Grading: A passed proficiency test corresponds to a score of 4 and a passed proficiency test in two or more badges to a score of 6.	Proficiency badges The Sports Badge The Swimming Proficiency Badge The 15km Walk* Grading: A passed proficiency test corresponds to the minimum military physical standard of 2. *Test with a classification score between 0-6, see Appendix 12

Test Group A

3000m Run

The description of this test is provided in the section on "Physical Fitness Tests for Compulsory Military Personnel" on page 49. The classifications of test scores in the 3000m run for officers, non-commissioned officers and enlisted personnel are shown in Appendix 7.

500m Swim

The swimming distance of 500m is measured as accurately as possible in a swimming pool no less than 12.5m long. The swim can be performed by use of the free stroke or breast stroke. The classifications of test scores in the 500m swim by free stroke and breast stroke for officers, non-commissioned officers and enlisted personnel are shown in Appendix 8 and Appendix 9, respectively.

10km Classic Cross-Country Skiing

The 10km Classic Cross-Country Skiing test course is set up so that the start and finish are placed at the same location. The course profile ranges between slightly and moderately hilly. The principle is that the test is performed in good and reasonable conditions in terms of hills, skiing track, weather conditions, etc. The test course is marked at a minimum of 5km. The classifications of test scores for officers, non-commissioned officers and enlisted personnel are shown in Appendix 10.

20km Bicycling

The 20km bicycling test course is set up so that the start and finish are placed at the same location. The profile of the test course ranges between slightly and moderately hilly. The distance between two cyclists must be kept at a minimum of 50m (with a large number of participants, the starting interval between two cyclists must be a minimum of 1 min). A passed cyclist must position himself/herself 50m behind the overtaking cyclist. The test course is marked with a sign at a minimum of 10km. The classifications of test scores for officers, non-commissioned officers and enlisted personnel are shown in Appendix 11.

Test Group B

Test group B consists of a selection of physically demanding proficiency badges. These are: (a) The Military Pentathlon Badge (shooting, track obstacle course, swim obstacle course, hand grenade throw and cross-country running); (b) The Military Skiing Badge (30km cross-country skiing with back-pack and weapon); (c) The Military Marching Badge (30km march with back-pack and weapon); (d) The Infantry Badge (12-15km cross-country running with shooting, communication, distance evaluation and goal setting); (e) The Field Sport Badge (shooting, map reading and orienteering); (f) The Biathlon Badge (10-20km cross-country skiing with rifle shooting), and (g) The Nijmegen Medal (a four-day march with daily distances of 30-50km). A passed

proficiency test corresponds to a score of 4, and a passed proficiency test in two or more badges to a score of 6.

Test Group C

Test group C consists of proficiency badges and a walking test. These are: (a) The Sports Badge (track and field, swimming, bicycling, cross-country skiing, skating, walking, orienteering, throwing or weight lifting); (b) The Swimming Proficiency Badge (swimming, underwater swimming, floating, diving and undressing in water), and (c) The 15km walk. A passed proficiency test corresponds to the minimum military physical standard, which is a score of 2.

15km Walk

The 15km test course is measured as accurately as possible. The distance is covered by walking, in which one foot is in contact with the ground at all times. The course is marked with signs at intervals of 5 and 10km, preferably with intervals of 1km. The correct walking technique is controlled by observing the walker twice during the course of the test. The classifications of test scores for officers, non-commissioned officers and enlisted personnel are shown in Appendix 12.

Physical Fitness Tests for Basic Officer Training

Physical fitness tests for basic officer training include a personal skills assessment based on performance in the 3000m run, pull-ups, sit-ups and push-ups (see section "Physical Fitness Tests for Compulsory Military Personnel" for the test descriptions). The assessment also requires the completion of a 200m swim before and two orienteering runs after admission to basic officer training.

3000m Run, Pull-Ups, Sit-Ups, Push-Ups and 200m Swim

The minimum requirement for admission to basic officer training for an officer cadet in the 3000m run is 14:30min for men and 15:30min for women, an average score of 4 in the three muscular fitness tests and completion of a 200m swim. The corresponding requirements for a non-commissioned officer cadet in the 3000m run is 14min for men and 15min for women, an average score of 4 in the three muscle fitness tests and completion of a 200m swim. The classification of test scores in the 3000m run and in the three muscle fitness tests for basic officer training are presented in Appendix 13 and Appendix 14, respectively.

In addition to theory, the personal skills assessment forms the basis for a grade in physical education after admission to basic officer training. The latter of two test results during the school year is used with respect to progress in physical education training. The grade in physical education can be further improved by 0.5 points by completing three of the following proficiency badges: (a) The Marching Badge; (b) The Infantry Badge; (c) The Pentathlon Badge; (d) The Skiing Badge; (e) The Field Sport Badge; (f) The Biathlon Badge, and (g) The Swimming Proficiency Badge.

Orienteering

The better of two runs in orienteering during the school year counts for a grade in physical education. The requirement is that the winning time in the orienteering run is approximately 30min, and that the orienteering run is performed using a map with a scale of 1:15 000 or 1:10 000. The difficulty of the orienteering trail is set as C (A for difficult and C and N for easiest). The C trail is considered to be varied, but requires no technically demanding orienteering skills to complete, as the trail is partly connected to easily followed lines on a map and is in terrain such as roads, trails, rivers, etc.

The basis for grading in orienteering is the basic time. The basic time corresponds to the average time of 60% of the test results located in the middle of the list of test results for men and women, after the adjustment of orienteering time for the women. The women receive a 20% deduction from the winning time. Tables for calculation of grade for a basic time of 45 minutes are presented below.

Tabel for Calculation of Grade

Basic Time 00:45:00	
Grade	**Time**
A	00:31:30
B	00:38:15
C	00:40:30
D	00:56:15
E	01:03:00
F	>01:03:00

Grade	**Basic Time**
A	-30,0 %
B	-15,0 %
C	10,0 %
D	25,0 %
E	40,0 %
F	>40,0 %

Reliability and Validity of the Physical Fitness Test Protocol

The physical fitness test arrangement in the Norwegian Armed Forces is based on recommendations from reports by two working groups, "test committee from 1979" (Testutvalget, 1979 (T79)) and "test committee from 1994" (Testutvalget, 1994 (T94)). According to the first report, the main targetof physical fitness testing in the Norwegian Armed Forces is to evaluate to what extentvarious groups of military personnel fulfil the demands faced in different military tasks. As a consequence, it has been a goal to know that demands and conduct tests are as specific as possible to military operations. As the demands are only partially known, T79 recommended that the demands be further investigated by research projects. This means that the physical fitness tests and scores that were recommended by T79 were based on what was believed to be real-life demands in different military operations. To be able to deliver recommendations on physical fitness tests and scores, T79 conducted research projects for both endurance capacity and muscular strength. T79 studied the interrelationships of three indirect tests (the 3000m run, step test, sub maximal cycle test) and one indirect test with particular relevance to military operations (the 8km cross-country race). The times in the 3000m run correlated weakly with the submaximal bicycle ergometer test ($r = -0.38$) and step test ($r = 0.50$) results, but correlated more strongly with the times from the 8km race ($r = 0.79$) and the 30km march ($r = 0.59$). Based on these results, T79 concluded that military personnel should be tested by maximum endurance capacity tests in regard to basic endurance-based military skills and capabilities. Officers, non-commissioned officers and enlisted personnel should also have the alternative to conduct a selection of physically demanding proficiency badges. For muscular strength, T79 compared the relationships of static and repeated dynamic muscle strength tests with military tasks such as walking uphill with a heavy backpack and carrying ammunition boxes. The conclusion was that repeated dynamic muscle strength tests best illustrated what was needed in military service.

The second report from the T94 gave an account of the evaluations of physical fitness tests in the Norwegian Armed Forces and the suggested adjustments. The evaluation was based on research from both academia and the Norwegian Armed Forces. The discussion about conducting a complete overview of physical demands in the various parts of the military system was once again brought up. The conclusion was that it was an insurmountable task for the working group, and that the job should be done by the different military sections themselves. As a consequence, the physical fitness demands still used today are based on what was previously believed to be real-life demands in different military operations. Nevertheless, there were some conclusions to be drawn from the work done in 1994. First, there was a clear comprehension that there should be a distinct aim for physical fitness testing in the Norwegian Armed Forces. Moreover, it was stressed that there should be an annual test for all officers, non-commissioned officers and enlisted personnel under the age of 50, and if the test was not conducted then, the reason for it not being conducted should be documented. As a third point, it was emphasized that the validity of the tests should be the main target, meaning that there should be an evident connection between the demand of a test and what it is meant to measure. Hence, some tests were recommended to be modified and some were left out. Despite these recommendations, the physical fitness test arrangement in

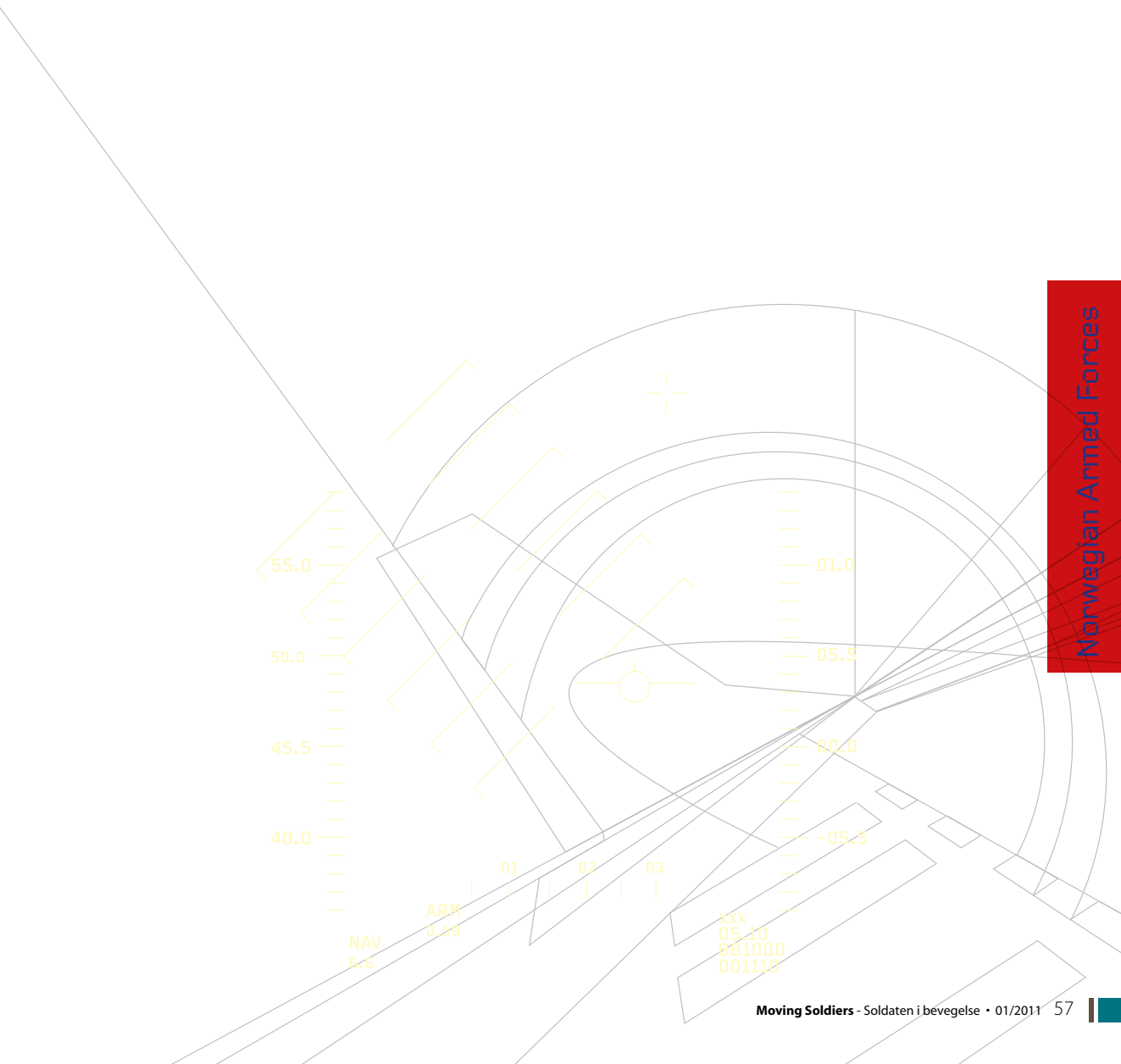
the Norwegian Armed Forces remained mostly unchanged after the T94 had finished its report.

Application of the Physical Fitness Test Protocol

Physical fitness tests taken by military personnel in the Norwegian Armed Forces are reported to P3, which is the database for physical fitness tests in the Norwegian Armed Forces. According to the current test system, compulsory military personnel are to be tested three times within their military service period of 12 months - within three weeks of entering training, before transferring from training to various parts of military service, and within the final quarter before leaving military service. The data from P3 indicates that most of the compulsory military personnel carry out the first and the final test, including the 3000meter run and the strength tests. The second test is mostly neglected due to a heavy training schedule at school. The data from P3 also indicate that between 80 to 85% of the officers, non-commissioned officers and enlisted personnel who are required to conduct an annual test are in fact doing so. Most of them choose tests from Test Group A, while only a few from Test Groups B and C. Some questions might be asked to the extent to which physical fitness tests are conducted on military personnel. Are all test results reported to P3? What are the control routines that make sure that the system works as planned? Does the test system account for approved absences? Such questions might affect the conclusions based on the registration numbers from P3. Even so, it seems that the majority of military personnel in the Norwegian Armed Forces perform physical fitness tests according to the current guidelines.

Future Prospective of the Physical Fitness Test Protocol

The trade-off between what is seen as an ideal physical fitness test protocol and what is seen as feasible is an ongoing discussion. As a part of this discussion, the Chief of Norwegian Armed Forces has given The Norwegian Defence University College a mandate to evaluate the current test system sometime within 2011. The task will be performed by The Norwegian School of Sport Science Defence Institute.


55.0
50.0
45.5
40.0
01.0
05.5
00.0
-05.5
01
02
03
ARM
0.59
NAV
6.6
XXX
05.10
001000
001110

Sweden

Physical Standards in the Swedish Armed Forces

Sweden

Physical Standards in the Swedish Armed Forces

Mikael Mineur, Johan Salén

Background

Since 2005, the FM (Swedish Armed Forces) Physical Standards has been the model for quality assurance of the physical performance capability within the Swedish Armed Forces. The FM Physical Standards apply to all personnel in the Swedish Armed Forces, and consists of a basic level and additional requirements above the basic level in the form of special physical fitness tests for certain positions.

The basic level consists of regular physical training with at least two training sessions per week aimed at promoting physical fitness, strength and mobility. It includes: (a) individual training goals (possibly interim goals); (b) training planning; (c) physical training, and d) follow-up/evaluation. Three hours out of every 40-hour work week should be used to achieve the basic level. The additional requirements of physical fitness tests must be fulfilled once a year to assure the continuing quality of the required physical fitness for particular positions and units within the operations organization. The test results form part of the unit's evaluation. The additional requirements are developed gradually when the tasks change for the operation units.

The aim of physical training in the Swedish Armed Forces is: (a) that the personnel have sufficient physical capability to fulfill the tasks assigned by the state, and (b) that physical training also contributes to better health, well-being and quality of life.

Physical Fitness Tests for Ground Combat Personnel

A description of the divisions for ground combat personnel/units is provided in Table 1. The additional requirement of a Field Test 2000m and Multitest Strength apply for personnel placed in ground combat positions with a deployment stand-by period of a 360 days at the most (not including the home guard unit). The tests are carried out before the readiness stage starts and at least once a year after that between July 1st and June 30th (the reporting period). Personnel in ground combat positions with a deployment stand-by period that exceeds 360 days (not including home guard units), carry out the tests as training checks of their physical performance. The training checks are conducted annually, and form the basis for planning and executing a realistic recovery of the FM Physical Standards.

The head of the organization that manages the units included in the operations organization is responsible for implementing and following-up the tests for the personnel. The tests, which are verified and/or reported, are administered by a test leader certified by the Swedish Armed Forces Sport Centre.

TABLE 1. Divisions of Ground Combat Personnel/units.

Group	Personnel/units
A	Personnel in staff positions for directing ground operations Examples: BnHQ
B	Personnel and ground combat units with other than main front-line roles Examples: AD units, ENGR platoon
C	Personnel and ground combat units with main front-line roles Examples: ARMD platoon, rifle platoon
D	Personnel and units with ranger roles (or similar) Examples: Recce platoon, ranger platoon

Field Test 2000m

The test course should be control measured to be 2000m. The test is performed under suitable weather conditions by running in fighting equipment on level ground. The surface of the test course is hard-packed gravel (or similar). The participants wear fighting equipment in accordance with the Manual for Soldiers Clothing and Equipment (Sold R Mtrl P). The weapon is carried slung or in the basic position. The requirements for Field Test 2000m are provided in Appendix 15.

Multitest Strength

The Multitest Strength is carried out as a set of tests in the following order: Push-ups, Sit-ups, Vertical Jump, Back Suspension and Arm Suspension. The maximum time for completion of the tests is 45 minutes. The entire Multitest Strength is repeated when re-testing.

It is required that at least the minimum level is achieved for each test. The number of repetitions, height or time exceeding the minimum level is multiplied by a coefficient, which results in a given amount of points for each subtest according to the following:

Points Table

Test	Unit	Min	Max	Points = over min. leve
Push-ups	number	8	28	5 points/repetition
Sit-ups	number	10	60	2 points/repetition
Vertical jump	cm	30	50	5 points/cm
Back Suspension	sec	60	160	1 point/sec
Arm Suspension	sec	15	65	2 points/sec

A maximum of 100 points per sub-test can be achieved. The requirement for passing the Multitest Strength is the achievement of the minimum level in all subtests and at least a total"Points = over min. level" as presented in Appendix 16.

Push-Ups

This test is carried out from a procumbent standing position with the toes (hip width) on the ground. The hands are placed at a chosen distance apart, with the arms and body straightened and the gaze slightly forward. The arms are then flexed until the upper arms are parallel to the ground. The test cycle is completed by extending the arms back to the starting position. The test is performed with as many consecutive repetitions as possible between the minimum and maximum level stated for each subtest. The working speed, which is set using a metronome, is 50 beats/min (25 repetitions/min).

Sit-Ups

This test is carried out from a sitting position with the arms linked and resting on the knees. The knees are flexed at 90°, the feet are partly in contact with the floor and the gaze is forward. The trunk is then lowered until the loins reach the ground. The trunk is then raised back to the starting position to complete the test cycle. The arms are linked throughout the test movement and in contact with the chest in the lower position. The parts of the feet and buttocks also remain in contact with the ground throughout the movement, with the knees in at least 90° and the gaze forward. The test is performed rhythmically without jerks and with as many consecutive repetitions as possible between the minimum and maximum level stated for each subtest. The working speed, which is set using a metronome, is 50 beats/min (25 repetitions/min).

Vertical Jump

This test is performed from an upright position with the legs straight and the feet even at shoulder width apart. A flexible measuring tape is firmly attached to the waist so that it hangs down from the back towards the ground. The ruler (or similar) is taped flat to the floor. After assuming the starting position with flexed legs and hips, the free end of the measuring tape is fed in under the ruler. The pendulum effect of the arms is then used to jump straight up as high as possible with the body in a vertical position in the upper part of the position. A maximum divergence of +/- 10cm from the jumping position is allowed. Upon landing, the centimeter marking is read on the measuring tape at the edge of the ruler. The highest jump out of three approved jumps is recorded and used for calculating points for the test.

Back Suspension

This test is performed lying on the stomach with the edge of the hip bone level with the edge of the bench (or similar). The lower legs are anchored onto the bench immediately below the knee joint. The body is horizontal and the hands are linked behind the ears with the elbows away from the body. A lightweight length measure is fixed around the participant's neck – the measure hangs straight down and ends exactly 3cm above the floor. The horizontal body position (the starting position) is maintained for as long as possible, and must be between the minimum and maximum suspension time. The timing starts when the starting position is assumed and stops when the measure touches the floor. The number of seconds the person remains suspended is recorded.

Arm Suspension

This test is performed suspended with bent arms and hands in an underhand grip at shoulder width apart. The chin is above the bar (or similar) with the gaze forwards and the head in a natural position. The body is suspended vertically and still, without the chin touching the bar. Help in assuming the starting position is allowed. The timing starts when the starting position is assumed and stops when the person's chin dips below the bar. The number of seconds the person remains suspended is recorded, and must be between the minimum and maximum suspension time.

Physical Fitness Tests for Admission to the Officers Program

All of the following tests are to be carried out and passed within six months before final admission to the Officers Program (OP). The execution of these tests is used as the basis for admission to OP. The tests are administered by test leaders certified by the Swedish Armed Forces Sport Centre. The test requirements for admission to OP are presented in Appendix 17.

Beep Test (20m Shuttle-Run)

The Beep Test depicted below is a progressive (increasing) running test to calculate stamina. The running distance between the outer limits (taped line, row of cones or similar) of the test is 20m. The participants line up at one of the outer limits. The test starts when the CD player (tape recorder) is turned on. Participants are required to place one foot on or behind the outer limit at the end of each running distance (at the beep (signal)), adjusting their speed so that turning occur at the beep. A warning is issued if a participant is unable to maintain the correct speed. The participant has another two running lengths to try to regain the correct speed. If unsuccessful, the test is terminated and the achieved level and shuttle is recorded as the test score, as illustrated in Table 2.

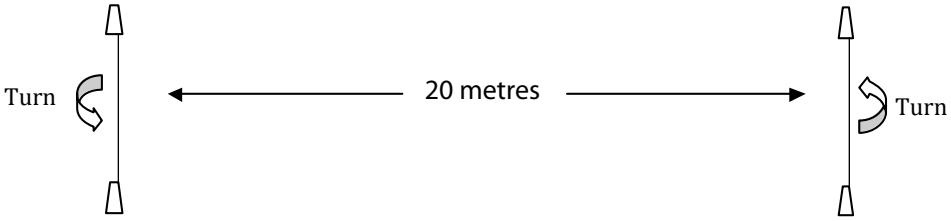


TABLE 2. Extract of the Beep Test (20m shuttle-run)

Level	Shuttle	Predicted VO2 max
8	4	41.1
8	6	41.8
8	8	42.4
8	11	43.3
9	2	43.9

Multitest Strength
A description of these tests is provided in section "Multitest Strength."

Swimming 400m

This test is started by diving or jumping (the head must go under the surface of the water) into a 25m or 50m swimming pool with a water temperature of at least 20o C and a pool depth of at least 1.75m at the starting point. The swimming test is carried out as a distance swim of 400m without rest. The test subject is not allowed to touch the pool floor or the pool edge at the long sides or the track lines in the pool. The pool edge at the short sides can only be touched with the hands and feet during the turning movement. Hanging on the edge is not permitted. Any swimming style may be used, and may be changed during the test.

Reliability and Validity of the Physical Fitness Test Protocol

We have no reliability or validity studies on the Field Test 2000m. However, we have measured the oxygen uptake for different military tasks and studied the correlation between the Cooper-Test 2000m and Field Test 2000m. The result was a correlation of 0.77. We postulate that the reliability of the Field Test is at the same level as the reliability of the Cooper-Test. The test-retest reliability of the subtests in the Multitest Strength has been studied in 20 subjects. The inter-correlation coefficient (ICC) was highest for the Vertical Jump (0.93) and lowest for the Back Suspension (0.72). The

weighted ICC for all the tests equaled 0.86 (Bergh et al., 2008). In addition, the test results for the Multitest Strength correlated with the soldiers' capacity to dig, lift and carry (Sing et al., 1991).

Application of the Physical Fitness Test Protocol

Our tests are easy to administer in large groups corresponding to the size of a platoon. We have trained 300 test-leaders for this purpose. Nevertheless, our biggest challenge is the sit-up. In general, sit-up tests are not easy to standardize. Based on our experience, we have chosen a type of sit-up test that has been the easiest to standardize. Still, people who are stiff in the back experience some difficulties in doing the test in a standardized manner.

Future Prospective of the Physical Fitness Test Protocol

During the pending year, the Swedish Armed Forces headquarters will revise the tasks of all the operational units within the organization. In connection to this revision, the additional physical requirements that the ground combat personnel must meet will also be revised. For the moment, there is no indication that the FM Physical Standards for ground combat personnel will be anything other than the Field Test 2000m and the Multitest Strength. However, in time, the requirement level of the tests may have to be adjusted to adapt to the new tasks of the operational units within the organization.


55.0
50.0
45.5
40.0
01.0
05.5
00.0
-05.5
01
02
03
ARM
0.59
NAV
6.6
XXX
05.10
001000
001110

References

ACSM (American College of Sports Medicine) 1995. ACMS's guidelines for exercise testing and prescription. Fifth edition. Pennsylvania: Williams and Wilkins.

ACSM (American College of Sports Medicine) 2000. ACMS's guidelines for exercise testing and prescription. Philadelphia: Lippincott Williams and Wilkins.

Alaranta, H., Hurri, H., Heliövaara, M., Soukka, A., Harju, R. 1994. Non-dynamometric trunk performance tests: reliability and normative data. Scandinavian Journal of Rehabilitation Medicine 26, 211-215.

Augustsson, S., Bersas, E., Magnusson-Thomas, E., Sahlberg, M., Augustsson, J., Svantesson, U. 2009. Gender differences and reliability of selected physical performance tests in young women and men. Advances in Physiotherapy 11, 64-70.

Bangsbo, J., Marcello Iaia, F., Krustrup, P. 2008. The Yo-Yo Intermittent Recovery Test. A useful tool for evaluation of physical performance in intermittent sports (review). Sports Medicine 38, 37-51.

Bergh, U., Danilsson, U., Ekblom, Ö., Olsson, M., Salén J. 2008. Fysiska prov för officerare. FOI-R—2421—SE, ISSN 1650-1942.

Bosco, C., Luhtanen, P., Komi, P.V. 1983. A simple method for measurement of mechanical power in jumping. European Journal of Applied Physiology 50, 273-282.

Bouchard, C. & Shephard, R.J. 1994. Physical activity, fitness, and health: the model and key concepts. In: C. Bouchard, R.J. Shephard & T. Stephens (Eds.) Physical activity, fitness, and health. Champaign, IL: Human Kinetics Books, 77-88.

Caspersen, C.J., Powell, K.E., Christenson, G.M. 1985. Physical activity, exercise and physical fitness: definitions and distinctions for health-related research. Public Health Reports 100, 126-130.

Cooper, K.H. 1968. A means of assessing maximal oxygen intake. Correlation between field and treadmill testing. Journal of American Medical Association 203, 201-204.

Dyrstad, S.,M., Aandstad, A., Hallén, J. 2005. Aerobic fitness in young Norwegian men: a comparison between 1980 and 2002. Scandinavian Journal of Medicine and Science in Sports 15, 298-303.

Dyrstad, S.M., Soltvedt, R., Halle, J. 2006. Physical fitness and physical training during Norwegian military service. Military Medicine 171, 736-741.

Fogelholm, M., Malmberg, J., Suni, J., Santtila, M., Kyröläinen, M. Mäntysaari, M. 2006. Waist circumference and BMI are independently associated with the variation of cardiorespiratory and neuromuscular fitness in young adult men. International Journal of Obesity 30, 962-969.

Hickson, R.C. 1980. Interference of strength development by simultaneously training for strength and endurance. European Journal of Applied Physiology and Occupational Physiology 45, 255-263.

Jette, M., Quenneville, J., Sidney, K. 1992. Fitness testing and counseling in health promotion. Canadian Journal of Sports Sciences 17, 193-198.

Jones, B.H., Cowan, D.N., Tomlinson, J.P., Robinson, J.R., Polly, D.W., Frykman, P.N. 1993. Epidemiology of injuries associated with physical training among young men in the army. Medicine and Science in Sports and Exercise 25, 197-203.

Keskinen, K.L., Keskinen, O.P, Takalo, T., Häkkinen, K. 2002. Comparison between straight measurement and two concurrent protocols to predict maximal oxygen uptake. Medicine and Science in Sports and Exercise 34, S271.

Knapik, J.J., Sharp, M.A., Canham-Chervak, M., Hauret, K., Patton, J.F., Jones, P.H. 2001. Risk factors for training-related injuries among men and women in basic combat training. Medicine and Science in Sports and Exercise 33, 946-954.

Kraemer, W.J., Vescovi, J.D., Volek, J.S., Nindl, B.C., Newton, R.U., Patton, J.F., Dziados, J.E., French, D.N., Häkkinen, K. 2004. Effects of concurrent resistance and aerobic training on load bearing performance and the Army Fitness Test. Military Medicine 169, 994.

Krustrup, P., Mohr, M., Amstrup, T., Rysgaard, T., Johansen, J., Steensberg, A., Pedersen, P.K., Bangsbo, J. 2003. The Yo-Yo intermittent Recovery Test: physiological response, reliability, and validity. Medicine and Science in Sports and Exercise 35, 697-705.

Lester, M.E., Knapik, J.J., Catrambone, D., Antczak, A., Sharp, M.A., Burrell, L., Darakjy, S. 2010. Effect of a 13-month deployment to Iraq on physical fitness and body composition. Military Medicine 175, 417-423.

Léger, L., Mercier, D., Gadoury, C., Lambert, J. 1998. The multistage 20 metre shuttle run test for aerobic fitness. Journal of Sports Science 6, 93-101.

Leyk, D., Rohde, U., Gorges, W., Ridder, D., Wunderlich, M., Dinklage, C., Sievert, A., Rüther, T., Essfeld, D. 2005. Physical performance, body weight and BMI of young adults in Germany 2000-2004: results of the physical-fitness-test study. International Journal of Sports Medicine 27, 642-647.

Mattila, V.M., Niva, M., Kiuru, M., Pihlajamäki, H. 2007. Risk factors for bone stress injuries: a follow-up study of 102, 515 person-years. Medicine and Science in Sports and Exercise 39, 1061-1066.

Nindl, B.C., Leone, C.D., Tharion, W., Johnson, R.F., Castellani, J., Patton, J.F., Montain, S.J. 2002. Physical performance responses during 72 h of military operational stress. Medicine and Science in Sports and Exercise 34, 1814-1822.

Nindl, B.C., Barnes, B.R., Alemany, J.A., Frykman, P.N., Shippee, R.L., Friedl, K.E. 2007. Physiological consequences of U.S. Army Ranger Training. Medicine and Science in Sports and Exercise 39, 1380-1387.

Oja, P., Laukkanen, R., Pasanen, M., Tyry, T., Vuori, I. 1991. A 2-km walking test for assessing the cardiorespiratory fitness of healthy adults. International Journal of Sports Medicine 12, 356-362.

Opstad, P. 1995. Medical consequences in young men of prolonged physical stress with sleep and energy deficiency. NDRE/PUBLICATION-95/05586, Forsvarets Forskningsinstitut.

Santtila, M., Kyröläinen, M., Vasankari, T., Tiainen, S., Palvalin, K., Häkkinen, A., Häkkinen, K. 2006. Physical fitness profiles in young Finnish men during the years 1975-2004. Medicine and Science in Sports and Exercise 38, 1990-1994.

Santtila, M. 2010. Effects of added endurance or strength training on cardiovascular and neuromuscular performance of conscripts during the 8-week basic training period. Academic Dissertation. Faculty of Sport and Health Sciences, University of Jyväskylä. Studies in Sport, Physical Education and Health 146, 9.

Santtila, M., Häkkinen K., Kraemer, W.J., Kyröläinen H. 2010. Effects of basic training on acute physiological responses to a combat loaded run test. Military Medicine 175, 273-279.

Sharp, M.A., Patton, J.F., Vogel, J.A. 1998. A database of physically demanding tasks performed by U.S. Army soldiers. T98-12, 1-42. Natick, M.A., USA Army Research Institute of Environmental Medicine Technical Report 3-10-0098.

Sharp, M.A., Knapik, J.J., Walker, L.A., Burrell, L., Frykman P.N., Darakjy, S.S., Lester, M.E., Martin, R.E. 2008. Physical fitness and body composition after a 9-month deployment to Afghanistan. Medicine and Science in Sports and Exercise 40, 1687-1692.

Sing, M., Lee, D. W., Wheeler, G.D., Chahal, P., Oseen, M., Countore, R.T. 1991. Development of Forces Nobile Command Army Physical Fitness Evaluation and Standards of Field Units, Final Report. Faculty of Physical Education and Recreation, University of Alabama, Canada.

Staub, K., Ruhli, F.J., Woitek, U., Pfister, C. 2010. BMI distribution/social stratification in Swiss conscripts from 1875 to present. European Journal of Clinical Nutrition 64, 335-340.

Suni, J.H., Oja, P., Laukkanen, R.T., Miilunpalo, S.I., Pasanen, M.E., Vuori, I.M., Vartiainen, T-M., Bös, K. 1996. Health-related fitness test battery for adults: aspects of reliability. Archives of Physical Medicine and Rehabilitation 77, 399-405.

Testutvalget 1979. (Test Committee from 1979). Fysisk testing i forsvaret. Testutvalget, 1-88.

Testutvalget 1994. (Test Committee from 1994). Vurdering av fysisk test, trening I arbeidstiden, fysisk aktivitet og helse. Testutvalget, 1-9.

Tomkinsson, G.R., Léger, L., Olds, T.S., Cazorla, G. 2003. Secular trends in performance of children and adolescents (1980-2000): Analyses of 55 studies of the 20 metre shuttle run in 11 countries. Sports Medicine 33:285-300.

Tsigilis, N., Douda, H., Tokmadidis, S.P. 2002. Test-retest reliability of the Eurofit test battery administered to university students. Perception and Motor Skills 95, 1295-1300.

Vaara, J.P., Kyröläinen, H., Niemi, J., Ohrankämmen, O., Häkkinen, A., Kocay, S., Häkkinen, K. 2011. Associations of maximal strength and muscular endurance tests scores with cardiorespiratory fitness and body composition. Submitted for publication.

Viljanen, T., Viitasalo, J.T., Kujala, U.M. 1991. Strength characteristics of a healthy urban adult population. European Journal of Applied Physiology and Occupational Physiology 63, 43-47.

Åstrand, P.-O., and Rhyming, I. 1954. Journal of Applied Physiology 7, 218.

Appendix 1

Finnish Classification Tables for Professional Male and Female Soldiers, as well as Male and Female Civilian Personnel. The conscripts and reservists are evaluated according to the civilian classification (age group 20-24 years).

Male soldiers (age-groups 20-64)

Push-Ups 60 sec, repetitions

		20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64
	5	48	46	44	42	40	38	36	34	32
Excellent	**4.75**	47	45	43	41	39	37	35	33	31
	4.5	46	44	42	40	38	36	34	32	30
	4.25	45	43	41	39	37	35	33	31	29
Very good	**4**	44	42	40	38	36	34	32	30	28
	3.75	43	41	39	37	35	33	31	29	27
	3.5	42	40	38	36	34	32	30	28	26
	3.25	41	39	37	35	33	31	29	27	25
Good	**3**	40	38	36	34	32	30	28	26	24
	2.75	39	37	35	33	31	29	27	25	23
	2.5	38	36	34	32	30	28	26	24	22
	2.25	37	35	33	31	29	27	25	23	21
Satisfactory	**2**	36	34	32	30	28	26	24	22	20
	1.75	35	33	31	29	27	25	23	21	19
	1.5	34	32	30	28	26	24	22	20	18
Fair	**1.25**	29	27	25	23	21	19	17	15	13
	1	24	22	20	18	16	14	12	10	8
	0.75	19	17	15	13	11	9	7	5	4
Poor	**0.5**	14	12	10	8	6	4	2	1	1
	0.25	9	7	5	3	1	1	1	1	1

Male soldiers (age-groups 20-64)

Sit-Ups 60 sec, repetitions

		20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64
	5	53	50	47	44	41	38	35	32	29
Excellent	**4.75**	52	49	46	43	40	37	34	31	28
	4.5	51	48	45	42	39	36	33	30	27
	4.25	50	47	44	41	38	35	32	29	26
Very good	**4**	49	46	43	40	37	34	31	28	25
	3.75	48	45	42	39	36	33	30	27	24
	3.5	47	44	41	38	35	32	29	26	23
	3.25	46	43	40	37	34	31	28	25	22
Good	**3**	45	42	39	36	33	30	27	24	21
	2.75	44	41	38	35	32	29	26	23	20
	2.5	43	40	37	34	31	28	25	22	19
	2.25	42	39	36	33	30	27	24	21	18
Satisfactory	**2**	41	38	35	32	29	26	23	20	17
	1.75	40	37	34	31	28	25	22	19	16
	1.5	39	36	33	30	27	24	21	18	15
Fair	**1.25**	34	31	28	25	22	19	16	13	10
	1	29	26	23	20	17	14	11	8	5
	0.75	24	21	18	15	12	9	6	3	1
Poor	**0.5**	19	16	13	10	7	4	1	1	1
	0,25	14	11	8	5	2	1	1	1	1

Standing Long Jump, meters

		20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64
	5	2.70	2.60	2.50	2.40	2.30	2.20	2.10	2.00	1.90
Excellent	**4.75**	2.65	2.55	2.45	2.35	2.25	2.15	2.05	1.95	1.85
	4.5	2.60	2.50	2.40	2.30	2.20	2.10	2.00	1.90	1.80
	4.25	2.55	2.45	2.35	2.25	2.15	2.05	1.95	1.85	1.75
Very good	**4**	2.50	2.40	2.30	2.20	2.10	2.00	1.90	1.80	1.70
	3.75	2.45	2.35	2.25	2.15	2.05	1.95	1.85	1.75	1.65
	3.5	2.40	2.30	2.20	2.10	2.00	1.90	1.80	1.70	1.60
	3.25	2.35	2.25	2.15	2.05	1.95	1.85	1.75	1.65	1.55
Good	**3**	2.30	2.20	2.10	2.00	1.90	1.80	1.70	1.60	1.50
	2.75	2.25	2.15	2.05	1.95	1.85	1.75	1.65	1.55	1.45
	2.5	2.20	2.10	2.00	1.90	1.80	1.70	1.60	1.50	1.40
	2.25	2.15	2.05	1.95	1.85	1.75	1.65	1.55	1.45	1.35
Satisfactory	**2**	2.10	2.00	1.90	1.80	1.70	1.60	1.50	1.40	1.30
	1.75	2.05	1.95	1.85	1.75	1.65	1.55	1.45	1.35	1.25
	1.5	2.00	1.90	1.80	1.70	1.60	1.50	1.40	1.30	1.20
Fair	**1.25**	1.95	1.85	1.75	1.65	1.55	1.45	1.35	1.25	1.15
	1	1.90	1.80	1.70	1.60	1.50	1.40	1.30	1.20	1.10
	0.75	1.85	1.75	1.65	1.55	1.45	1.35	1.25	1.15	1.05
Poor	**0.5**	1.80	1.70	1.60	1.50	1.40	1.30	1.20	1.10	1.00
	0.25	1.75	1.65	1.55	1.45	1.35	1.25	1.15	1.05	0.95

Male soldiers (age-groups 20-64)

12 Minute Run, meters

		20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64
	5	3300	3200	3100	3000	2900	2800	2700	2600	2500
Excellent	**4.75**	3250	3150	3050	2950	2850	2750	2650	2550	2450
	4.5	3200	3100	3000	2900	2800	2700	2600	2500	2400
	4.25	3150	3050	2950	2850	2750	2650	2550	2450	2350
Very good	**4**	3100	3000	2900	2800	2700	2600	2500	2400	2300
	3.75	3050	2950	2850	2750	2650	2550	2450	2350	2250
	3.5	3000	2900	2800	2700	2600	2500	2400	2300	2200
	3.25	2950	2850	2750	2650	2550	2450	2350	2250	2150
Good	**3**	2900	2800	2700	2600	2500	2400	2300	2200	2100
	2.75	2850	2750	2650	2550	2450	2350	2250	2150	2050
	2.5	2800	2700	2600	2500	2400	2300	2200	2100	2000
	2.25	2750	2650	2550	2450	2350	2250	2150	2050	1950
Satisfactory	**2**	2700	2600	2500	2400	2300	2200	2100	2000	1900
	1.75	2650	2550	2450	2350	2250	2150	2050	1950	1880
	1.5	2600	2500	2400	2300	2200	2100	2000	1900	1860
Fair	**1.25**	2400	2325	2250	2175	2100	2025	1950	1875	1840
	1	2200	2150	2100	2050	2000	1950	1900	1850	1820
	0.75	2000	1975	1950	1925	1900	1875	1850	1825	1800
Poor	**0.5**	1800	1800	1800	1800	1800	1800	1800	1800	1780
	0.25	1780	1780	1780	1780	1780	1780	1780	1780	1780

Bicycle Ergometer Test, UKK Walk Test, mL·kg-1·min-1

		20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64
	5	62.4	60.2	57.9	55.7	53.5	51.2	49.0	46.8	44.5
Excellent	**4.75**	61.3	59.1	56.8	54.6	52.4	50.1	47.9	45.7	43.4
	4.5	60.2	57.9	55.7	53.5	51.2	49.0	46.8	44.5	42.3
	4.25	59.1	56.8	54.6	52.4	50.1	47.9	45.7	43.4	41.2
Very good	**4**	57.9	55.7	53.5	51.2	49.0	46.8	44.5	42.3	40.1
	3.75	56.8	54.6	52.4	50.1	47.9	45.7	43.4	41.2	39.0
	3.5	55.7	53.5	51.2	49.0	46.8	44.5	42.3	40.1	37.8
	3.25	54.6	52.4	50.1	47.9	45.7	43.4	41.2	39.0	36.7
Good	**3**	53.5	51.2	49.0	46.8	44.5	42.3	40.1	37.8	35.6
	2.75	52.4	50.1	47.9	45.7	43.4	41.2	39.0	36.7	34.5
	2.5	51.2	49.0	46.8	44.5	42.3	40.1	37.8	35.6	33.4
	2.25	50.1	47.9	45.7	43.4	41.2	39.0	36.7	34.5	32.3
Satisfactory	**2**	49.0	46.8	44.5	42.3	40.1	37.8	35.6	33.4	31.1
	1.75	47.9	45.7	43.4	41.2	39.0	36.7	34.5	32.3	30.7
	1.5	46.8	44.5	42.3	40.1	37.8	35.6	33.4	31.1	30.3
Fair	**1.25**	42.3	40.6	39.0	37.3	35.6	33.9	32.3	30.6	29.8
	1	37.8	36.7	35.6	34.5	33.4	32.3	31.1	30.0	29.4
	0.75	33.4	32.8	32.3	31.7	31.1	30.6	30.0	29.5	28.9
Poor	**0.5**	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.5
	0.25	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5

Appendix 2

The Finnish Classification Table for the Calculation of Shooting Index

Classification points	Rifle shooting 1	Rifle shooting 2	Pistol shooting 1	Pistol shooting 2	Shooting index
5	93-100 points	17-18 hits	89-100 points	9-10 hits	The sum of classification points of four shooting tests is divided by four. Total shooting index can be 0–5 points.
4	86-92 points	14-16 hits	77-88 points	7-8 hits	
3	79-85 points	11-13 hits	65-76 points	5-6 hits	
2	72-78 points	8-10 hits	53-64 points	3-4 hits	
1	65 -71 points	5-7 hits	41-52 points	1-2 hits	
0	0 - 64 points	0 - 4 hits	0 - 40 points	0 hits	

Appendix 3

Norwegian Classification of Test Scores in the 3000m Run for Compulsory Military Personnel, min:s

Men

Grade	M I/II - 34 yrs
6	11:00
5	12:00
4	13:00
3	14:00
2	15:00
1	16:00
0	> 16:00

Women

Grade	K I/II - 34 yrs
6	12:00
5	13:00
4	14:30
3	15:30
2	16:30
1	17:30
0	> 17:30

Appendix 4

Norwegian Classification of Test Scores in Pull-Ups for Compulsory Military Personnel

Grade	Men	Women
6	14 reps	20 reps
5	12 reps	16 reps
4	9 reps	12 reps
3	6 reps	8 reps
2	4 reps	5 reps
1	2 reps	3 reps
0	< 2 reps	< 3 reps

Appendix 5

Norwegian Classification of Test Scores in Sit-Ups for Compulsory Military Personnel

Grade	Men / Women
6	70 reps
5	58 reps
4	46 reps
3	34 reps
2	20 reps
1	10 reps
0	< 10 reps

Appendix 6

Norwegian Classification of Test Scores in Push-Ups for Compulsory Military Personnel

Grade	Men	Women
6	45 reps	26 reps
5	39 reps	22 reps
4	32 reps	18 reps
3	24 reps	14 reps
2	16 reps	10 reps
1	9 reps	6 reps
0	< 9 reps	< 6 reps

Appendix 7

Test Group A: Norwegian Classification of Test Scores in 3000m Run for Officers, Non-Commissioned Officers and Enlisted Personnel, min:s

Men

Grade	M I/II - 34 yrs	M III 35-42 yrs	M IV 43-49 yrs	M V 50-54 yrs	M VI 55- yrs
6	11:00	11:30	12:00	13:00	14:00
5	12:00	12:30	13:00	14:00	15:00
4	13:00	13:30	14:00	15:00	16:00
3	14:00	14:30	15:30	16:30	17:00
2	15:00	15:30	16:30	17:30	18:00
1	16:00	16:30	17:30	18:30	19:00
0	> 16:00	> 16:30	> 17:30	> 18:30	> 19:00

Women

Grade	K I/II - 34 yrs	K III 35-42 yrs	K IV 43-49 yrs	K V 50-54 yrs	K VI 55- yrs
6	12:00	13:00	14:00	15:00	16:00
5	13:00	14:00	15:00	16:00	17:00
4	14:30	15:30	16:30	17:30	18:30
3	15:30	16:30	17:30	18:30	19:30
2	16:30	17:30	18:30	19:30	20:30
1	17:30	18:30	19:30	20:30	21:30
0	> 17:30	> 18:30	> 19:30	> 20:30	> 21:30

Appendix 8

Test Group A: Norwegian Classification of Test Scores in 500m Swim Free Stroke for Officers. Non-Commissioned Officers and Enlisted Personnel, min:s

Men

Grade	M I/II - 34 yrs	M III 35-42 yrs	M IV 43-49 yrs	M V 50-54 yrs	M VI 55- yrs
6	7:10	7:30	7:50	8:10	8:30
5	8:00	8:20	8:50	9:10	9:30
4	8:50	9:20	9:40	10:10	10:30
3	9:40	10:10	10:40	11:00	11:30
2	10:30	11:00	11:30	12:00	12:30
1	11:20	11:50	12:30	13:00	13:30
0	> 11:20	> 11:50	> 12:30	> 13:00	> 16:30

Women

Grade	K I/II - 34 yrs	K III 35-42 yrs	K IV 43-49 yrs	K V 50-54 yrs	K VI 55- yrs
6	8:00	8:25	9:00	9:20	9:50
5	8:50	9:25	10:00	10:20	11:00
4	9:50	10:25	11:00	11:30	12:00
3	10:40	11:25	12.00	12:30	13:10
2	11:40	12:25	13:00	13:40	14:20
1	12:30	13:25	14:00	14:40	15:20
0	> 12:30	> 13:25	> 14:00	> 14:40	> 15:20

Appendix 9

Test Group A: Norwegian Classification of Test Scores in 500m Swim Breast Stroke for Officers, Non-Commissioned Officers and Enlisted Personnel, min:s

Men

Grade	M I/II - 34 yrs	M III 35-42 yrs	M IV 43-49 yrs	M V 50-54 yrs	M VI 55- yrs
6	8:40	9:00	9:30	10:00	10:30
5	9.30	10:00	10:25	11:00	11:30
4	10:20	10:50	11:20	12:00	12:30
3	11:10	11:40	12:15	12:50	13:30
2	12:00	12:30	13:10	13:50	14:30
1	12:50	13:20	14:05	14:50	15:30
0	> 12:50	> 13:20	> 14:05	> 14:50	> 15:30

Women

Grade	K I/II - 34 yrs	K III 35-42 yrs	K IV 43-49 yrs	K V 50-54 yrs	K VI 55- yrs
6	9:40	10:00	10:50	11:20	12:00
5	10:30	11:00	11:50	12:30	13:00
4	11:30	12:00	12:50	13:30	14:10
3	12:20	13:00	14:00	14:30	15:20
2	13:20	14:00	15:00	15:40	16:30
1	14:10	15:00	16:00	16:40	17:40
0	> 14:10	> 15:00	> 16:00	> 16:40	> 17:40

Appendix 10

Test Group A: Norwegian Classification of Test Scores in 10km Classic Cross-Country Skiing for Officers, Non-Commissioned Officers and Enlisted Personnel, min:s

Men

Grade	M I/II - 34 yrs	M III 35-42 yrs	M IV 43-49 yrs	M V 50-54 yrs	M VI 55- yrs
6	35:00	36:00	37:00	38:00	40:00
5	38:00	39:00	40:30	41:30	43:30
4	41:00	42:00	43:30	45:00	47:00
3	44:00	45:30	47:00	48:30	50:00
2	47:00	48:30	50:00	52:00	54:00
1	50:00	51:30	53:00	55:30	57:30
0	> 50:00	> 51:30	> 53:00	> 55:30	> 57:30

Women

Grade	K I/II - 34 yrs	K III 35-42 yrs	K IV 43-49 yrs	K V 50-54 yrs	K VI 55- yrs
6	37:00	39:00	40:00	42:00	44:00
5	40:00	42:00	43:00	45:00	47:00
4	43:00	45:30	47:30	49:00	51:00
3	46:00	49:00	51:00	53:00	55:00
2	50:00	52:30	54:30	57:00	59:00
1	54:00	56:30	58:30	61:00	63:00
0	> 54:00	> 56:30	> 58:30	> 61:00	> 63:00

Appendix 11

Test Group A: Norwegian Classification of Test Scores in 20km Bicycling for Officers, Non-Commissioned Officers and Enlisted Personnel, min:s

Men

Grade	M I/II - 34 yrs	M III 35-42 yrs	M IV 43-49 yrs	M V 50-54 yrs	M VI 55- yrs
6	34:00	35:00	36:00	37:30	39:00
5	37:00	38:00	39:30	40:30	42:00
4	40:00	41:00	42:30	43:30	45:00
3	43:00	44:30	46:00	47:30	48:30
2	46:00	47:30	49:00	51:30	52:00
1	49:00	50:30	52:00	54:00	55:30
0	> 49:00	> 50:30	> 52:00	> 54:00	> 55:30

Women

Grade	K I/II - 34 yrs	K III 35-42 yrs	K IV 43-49 yrs	K V 50-54 yrs	K VI 55- yrs
6	37:00	38:00	40:00	41:00	44:00
5	40:00	41:00	43:00	44:30	47:00
4	43:00	44:30	46:30	48:00	50:00
3	46:00	48:00	50:00	51:30	53:30
2	49:00	51:30	53:30	55:00	58:00
1	52:00	54:30	57:00	58:30	61:30
0	> 52:00	> 54:30	> 57:00	> 58:30	> 61:30

Appendix 12

Test Group C: Norwegian Classification of Test Scores in 15km Walk for Officers, Non-Commissioned Officers and Enlisted Personnel, min:s

Men

Grade	II - 34 yrs	III 35-42 yrs	IV 43-49 yrs	V 50-54 yrs	VI 55- yrs
Men	1:45	1:50	1:55	2:00	2:05
Women	2:00	2:05	2:10	2:15	2:20

Appendix 13

Norwegian Personal Skills Assessment for Basic Officer Training: 3000m Run, min:s

Grade	Men	Women
A	10:10	11:20
B	10:55	12:05
C	11:45	12:50
D	12:35	13:40
E	13:30	14:30
F	> 13:30	> 14:30

Appendix 14

Norwegian Personal Skills Assessment for Basic Officer Training: Sit-Ups, Push-Ups, Pull-Ups, repetitions

Grade	Sit-ups Men/Women	Push-ups Men	Push-ups Women	Pull-ups Men	Pull-ups Women
A	63	40	23	12	18
B	53	34	20	10	15
C	42	28	17	8	12
D	31	23	14	6	9
E	20	16	10	4	5
F	< 20	< 16	< 10	< 4	< 5

Appendix 15

Swedish Requirements for Field Test 2000m

Group	Officer Individual Requirement	Soldier Individual Requirement	Approved Average Time/Unit
A	13 min 30 sec	13 min 30 sec	-----
B	12 min 30 sec	13 min 30 sec	12 min 30 sec
C	11 min 30 sec	12 min 30 sec	11 min 30 sec
D	10 min 15 sec	11 min 30 sec	10 min 15 sec

Appendix 16

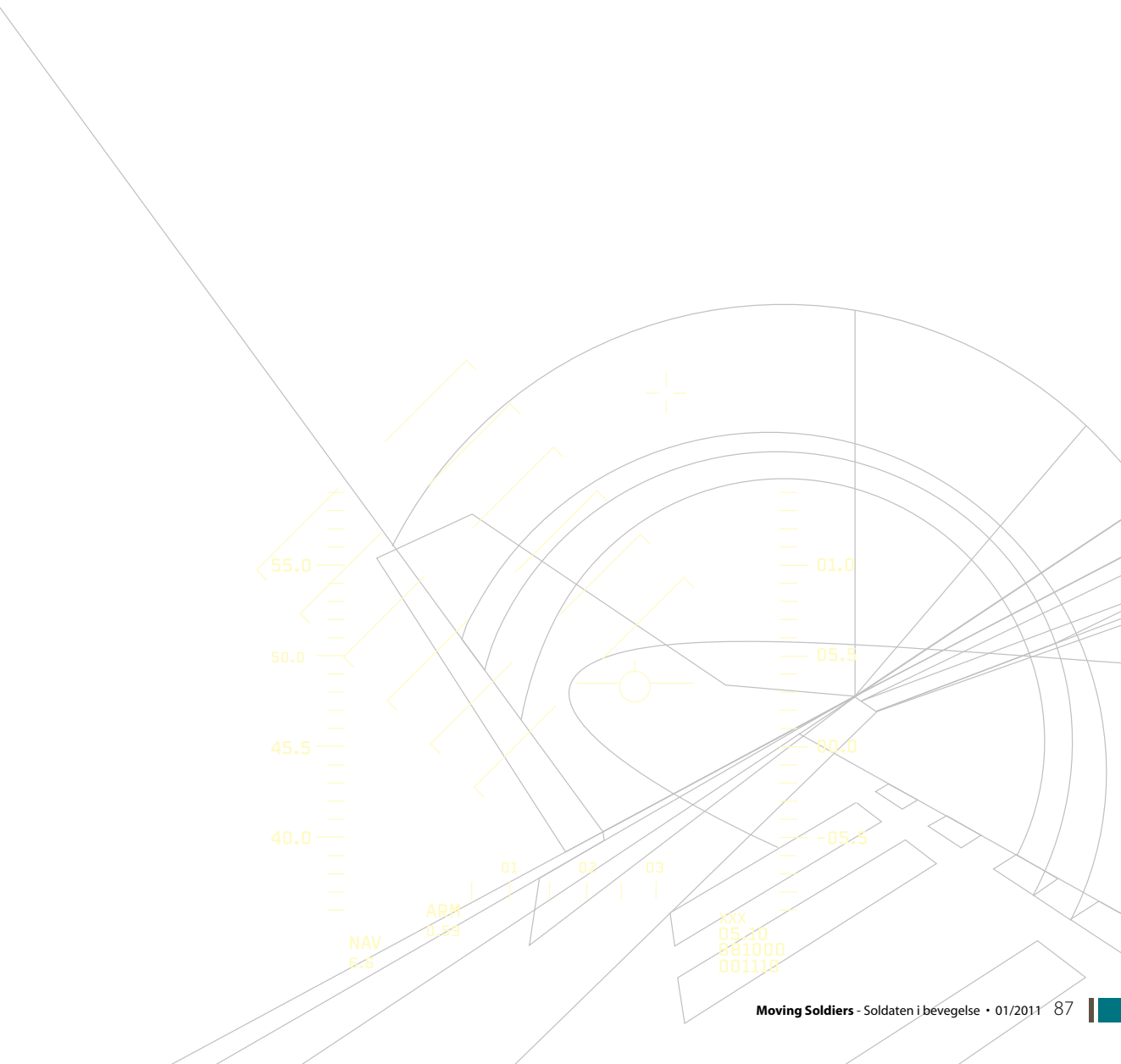
Swedish Requirements for Multitest Strength

Group	Officer Individual Requirement	Soldier Individual Requirement
A	125 points	125 points
B	175 points	175 points
C	175 points	175 points
D	300 points	300 points

Appendix 17

Swedish Test Requirements for Admission to Officers Program

Test	Requirement
Stamina; Beep Test (Shuttle-run)	Up to and including level 8:8
Strength; Multitest	125 points
Swimming; Swimming test 400m	Carried out consecutively


55.0
50.0
45.5
40.0
01.0
05.5
-05.5
01
02
03
ARM
0.59
NAV
6.6
XXX
05.10
001000
001110

Aknowledgements

This overview was completed at The Norwegian School of Sport Sciences Defence Institute in close collaboration with its Nordic partners in the Project Group on Physical Fitness Tests in the Nordic Armed Forces. I would like to express my deepest gratitude to the Head of the Department of Military Skill Acquisition, Anders McDonald Sookermany, for providing me the possibility and support for completing this overview. In addition, I would like to express my sincere gratitude to our Nordic partners, Mikael Mineur and Johan Salén from the Swedish Armed Forces, Matti Santtila, Heikki Kyröläinen and Kai Pihlainen from the Finnish Armed Forces, and Sabine Pedersen and Klaus Gabriel Sørensen from the Danish Armed Forces, for their invaluable contribution and support for the preparation and writings of their manuscripts for this overview. Finally, I gratefully acknowledge my colleagues. Lene Røe, Anders Aandstad and Rune Hageberg, for their review, constructive criticism and valuable advice for finishing this overview.

Jarmo Malmberg
Project leader
Oslo 15.04.2011

The Norwegian School of Sport Sciences/ Defence intitute (NSSS/DI)

The Norwegian School of Sport Sciences Defence Institute has been a subdivision of the Norwegian Defence University College (NDUC) since 2001, but is located at the Norwegian School of Sport Sciences (NSSS) where it has been an integrated partner since its (NSSS) origin in 1968. Being situated within the university college society, the Defence Institute conducts its professional activities in accordance with recognized scientific, pedagogical and ethical principles (pursuant to the Act pertaining to Universities and University Colleges, Section 1-5). Its main field of interest is in connection to the training, performance and cultural aspects within military contexts in which the aim is to develop applicable soldiers and military units.

Director: Lieutenant Colonel Steinar Høgseth

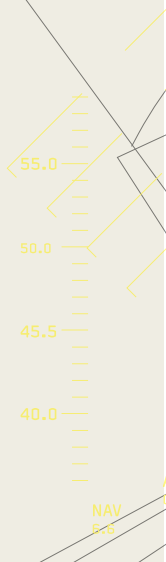
Moving Soldiers – Soldaten i bevegelse is an institute series that aims to provide an arena for interdisciplinary thinking and debate within the fields of interest of the Norwegian School of Sport Sciences Defence Institute. As such, target groups of the series are primarily military leaders and civilian scholars interested in the development of military capability and the performance of soldiers and their units in an ever changing world. Moving Soldiers will be published three to six times a year. The series is primarily based on Norwegian contributions, but will be published in English whenever the topic being addressed is of interest to a more international audience. The series is also open to contributions from authors other than those affiliated with the Defence Institute. All views expressed in Moving Soldiers are those of the authors, thus the content may not necessarily coincide with the views of the Norwegian School of Sport Sciences Defence Institute.

Editor: Major Anders McD Sookermany

Moving Soldiers is an institute series that aims to provide an arena for interdisciplinary thinking and debate on relevant issues related to the development of soldiers and their military units. The series is published by the Norwegian School of Sport Sciences Defence Institute.

01
2011

This report gives an overview of the basic physical fitness test protocols used in the Nordic armed forces. It covers descriptions and comparative information on background, aim, content, validity and reliability, application and future prospective of the basic physical fitness test protocols used in the Danish, Finnish, Norwegian and Swedish armed forces. The report represents an important tool for discussing common strategies and methods for assessing physical fitness in the armed forces.



THE NORWEGIAN DEFENCE UNIVERSITY COLLEGE
Norwegian School of Sport Sciences/Defence intitute
Sognsvn. 220 • Postboks 4014 Ullevål stadion • 0806 Oslo
www.mil.no/idrett