**Supplementary Material.**

**Stress resilience assessment at the Swedish military conscription**

The purpose of assessing stress-resilience was to estimate the conscript’s ability to cope with psychological requirements of the military service, war-time stress and suitability for military training.(1)

Although the actual test manuals are classified as military secrets and are not publicly available, more detailed information can be obtained from reports and literature by the Swedish Armed Forces(2-4) and from previously published articles. (5, 6) Additional information is found in an article by Lindqvist & Vestman, 2011, who performed interviews with Johan Lothigius, chief psychologist at the Swedish National Service Administration and Berit Carlstedt at the Swedish National Defense College.(1)

Assessment of stress resilience at military enlistment started in the early 1940s by Professor T. Husén.(2) It consisted of a 25-30 minute semi-structured interview by a licenced psychologist. Apart from regular psychologist education, they also had to take a four-week course at the Swedish National Service Administration. Psychologists may differ in their evaluation of conscripts. Although the psychologist had to follow a manual stating that certain topics had to be discussed, the specific formulation of the questions were not specified in advance. However, when psychologists listen to tape recordings of enlistment interviews by other psychologists, interrater-reliability was estimated high (0.85).(3)

Guidelines for the interview state that it was conducted in a separate room and was executed as a conversation in neutral language without leading questions. Prior to the interview, the psychologist had information on school grades, civil status, job experience, results from a questionnaire with open-ended answers, results from a multiple-choice questionnaire and the result from the test of cognitive performance. The psychologist was instructed to disregard cognitive performance as well as motivation to join the armed service, and to only focus on relevant personal factors.

Emotional stability was regarded highly important and it was deemed that men who had difficulties adjusting to their civilian environment would only see these difficulties magnify while in military service. Therefore, the interview concerned situations relevant for general everyday life and five areas of the subject’s personal life was covered. The first area was experiences at school and included academic achievements, adaptation to the school environment, own perception of school, school drop-out or repeated classes. The second area was work experience where the subject’s ability to function in a workplace was assessed. Noteworthy events were repeated conflicts or abrupt terminations. The third area was leisure time, hobbies and to what degree he has shown interest in certain activities including team sports and leadership roles. It was noted if the activities indicated introversion or extroversion, if the interests were plentiful and if the subject was able to adopt to given circumstances. The fourth area was home environment and upbringing including contacts with parents and siblings. The subjective experience of the conditions was noted to investigate for example how the subject may have adopted to difficult circumstances and the extent of dependence on his parents. The fifth area was emotional stability including the subject’s maturity and self-knowledge. To summarize, topics assessed included willingness to assume responsibility, independence, extraversion/introversion, persistence, emotional stability, power of initiative, ability to adjust, social skills, adjustment problems, conflicts and social maturity. Instead of measuring a specific trait, this measure captures a specific function, i.e. the ability to function in a demanding and stressful environment.

Characteristics that indicated higher stress resilience included emotional stability, willingness to assume responsibility, independence, persistence, high power of initiative, good social skills and social maturity whereas neurotic tendencies, adjustment problems, introversion, undemocratic values, obsessive interest in the military and violent or aggressive behaviour gave a low score on the stress resilience test. (1) It has also been argued that a high rating on stress resilience measure corresponds to low neuroticism, high conscientiousness, and high extraversion, thus similar to the ‘general factor of personality’.(7)

**Measurement of cardiovascular fitness at the Swedish military conscription**

Cardiovascular fitness was assessed using the cycle ergometric test. Although the protocol for the ergometer test has changed over the years, average cardiovascular fitness scores have remained stable (<1% change) and the test has been shown to have good reliability and validity (8) and has been used in studies previously.(9)

After a normal resting electrocardiogram, the test started with 5 min of submaximal exercise at work rates of 75–175W, depending on body mass. The work rate was then continuously increased by 25 W/min until volitional exhaustion. The individual was instructed to maintain pedal cadence between 60–70 rpm and heart rate was continuously measured. The final work rate (Wmax) was recorded and divided by body mass. Wmax/kg was employed, because of better correlation with measured maximum oxygen consumption (VO2max) (correlation coefficient ~0.9) than predicted VO2max (correlation coefficient ~0.6–0.7).(10, 11) The resulting value (Wmax/kg) was transformed into stanine scores, with 1 as the lowest and 9 as the maximal performance. We have previously observed that the frequency distribution of cardiovascular fitness in the data set is right-skewed and not normally distributed. Therefore, as in other studies,(12) cardiovascular fitness categories were trichotomized as low (score 1–4), medium (score 5–7) and high (score 8–9).

**References**

1. Lindqvist E, Vestman R. The Labor Market Returns to Cognitive and Noncognitive Ability: Evidence from the Swedish Enlistment. American Economic Journal: Applied Economics. 2011;3(1):101-28.

2. Husén T. Militär psykologi. Ny militär tidskrift. 1941;14(3-4):48-52.

3. Liljeblad B, Ståhlberg B. Reliabilitet hos psykologiska bedömningar vid inskrivningsprövning. FOA rapport C 55011-H7 Stockholm, Sweden. 1977.

4. Carlstedt B. Cognitive abilities - aspects of structure, process and measurement. University of Gothenburg. Thesis. Gothenburg. 2000.

5. Hiyoshi A, Udumyan R, Osika W, Bihagen E, Fall K, Montgomery S. Stress resilience in adolescence and subsequent antidepressant and anxiolytic medication in middle aged men: Swedish cohort study. Soc Sci Med. 2015;134:43-9.

6. Udumyan R, Montgomery S, Fang F, Valdimarsdottir U, Fall K. Stress resilience in late adolescence and survival among cancer patients: a Swedish register-based cohort study. Cancer Epidemiol Biomarkers Prev. 2018.

7. Falkstedt D, Sorjonen K, Hemmingsson T, Deary IJ, Melin B. Psychosocial functioning and intelligence both partly explain socioeconomic inequalities in premature death. A population-based male cohort study. PLoS One. 2013;8(12):e82031.

8. Nordesjö LO, Schéle R. Validity of an ergometer cycle test and measures of isometric muscle strength when prediction some aspects of military performance. Swedish Journal of Defence Medicine. 1974;10(1):11-23.

9. Aberg MA, Waern M, Nyberg J, Pedersen NL, Bergh Y, Aberg ND, et al. Cardiovascular fitness in males at age 18 and risk of serious depression in adulthood: Swedish prospective population-based study. Br J Psychiatry. 2012;201(5):352-9.

10. Glassford RG, Baycroft GH, Sedgwick AW, Macnab RB. Comparison of maximal oxygen uptake values determined by predicted and actual methods. J Appl Physiol. 1965;20(3):509-13.

11. Nordesjö LO. A comparison between the Thornvall maximal ergometer test, submaximal ergometer tests and maximal oxygen uptake. . Swedish Journal of Defence Medicine. 1974;10(1):3-10.

12. Aberg MA, Nyberg J, Toren K, Sorberg A, Kuhn HG, Waern M. Cardiovascular fitness in early adulthood and future suicidal behaviour in men followed for up to 42 years. Psychol Med. 2014;44(4):779-88.

**Supplementary Table 1. Diagnostic codes\* in accordance with the 8th, 9th & 10th revisions of the ICD.**

|  |  |
| --- | --- |
| Variable | ICD-codes |
| Depressive disorder | ICD-8: 296.0, 296.2, 298.0, 300.4; ICD-9: 298.0, 300.4, 311; ICD- 10: F32-34, F38-39 |
| Anxiety/Neurotic disorder | ICD-8: 300.0-3, 300.5-9, 305, 307; ICD-9: 300.0-3, 3005-9, 306, 308-9; ICD-10: F40-48 |
| Personality disorder | ICD-8: 301; ICD-9: 301; ICD-10: F60-69 |
| Alcohol-related disorder | ICD-8: 291, 303; ICD-9: 291, 303, 305.0; ICD-10: F10 |
| Drug-related disorder | ICD-8: 294.3, 304; ICD-9: 292, 304, 305.1-8; ICD-10: F11-19 |
| Suicide death/ self-harm | ICD-8/9: E950-E959; ICD-10: X60-X84 |

\* Most ICD diagnoses in the Swedish National Hospital Register have been validated with positive predictive values of 85%–95% (Ludvigsson JF, Andersson E, Ekbom A, Feychting M, Kim JL, Reuterwall C, et al. External review and validation of the Swedish national inpatient register. BMC Public Health. 2011;11:450).

**Supplementary Table 2. Characteristics of 987 583 Swedish male conscripts, for whole sample and for those with suicide or self-harm in middle age (45-64 years).**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | | | **All** | **Suicide** | **Death by other causes** | **Self-harm** |
| Total number | | | 987 583 | 3 400 | 29 059 | 7 045 |
| General cognitive performance | | |  |  |  |  |
|  | Low | | 201 132 (20.4%) | 943 (27.7%) | 8 284 (28.5%) | 2 541 (36.1%) |
|  | Medium | | 528 097 (53.5%) | 1 788 (52.6%) | 14 021 (48.3%) | 3 376 (47.9%) |
|  | High | | 239 653 (24.3%) | 564 (16.6%) | 5 036 (17.3%) | 838 (11.9%) |
|  | Missing | | 18 701 (1.9%) | 105 (3.1%) | 1 718 (5.9%) | 290 (4.1%) |
| Stress resilience | | |  |  |  |  |
|  | Low | | 175 104 (17.7%) | 1 034 (30.4%) | 9 023 (31.1%) | 2 641 (37.5%) |
|  | Medium | | 573 424 (58.1%) | 1 725 (50.7%) | 13 562 (46.7%) | 3 197 (45.4%) |
|  | High | | 203 753 (20.6%) | 488 (14.4%) | 4 347 (15.0%) | 784 (11.1%) |
|  | Missing | | 35 302 (3.6%) | 153 (4.5%) | 2 127 (7.3%) | 423 (6.0%) |
| Psychiatric disorders | | |  |  |  |  |
|  | Depressive/neurotic/adjustment | | 57 147 (5.8%) | 466 (13.1%) | 3 937 (13.5%) | 1 201 (17.0%) |
|  |  | Depressive | 2 892 (0.3%) | 27 (0.8%) | 230 (0.8%) | 87 (1.2%) |
|  |  | Anxiety/Neurotic | 45 384 (4.6%) | 317 (9.3%) | 2 656 (9.1%) | 885 (12.6%) |
|  | Personality | | 10 408 (1.1%) | 122 (3.6%) | 1 185 (4.1%) | 304 (4.3%) |
|  | Alcohol/drug-related | | 7 764 (0.8%) | 104 (3.1%) | 1070 (3.7%) | 333 (4.7%) |
| BMI | | |  |  |  |  |
|  | Underweight | | 88 836 (9.0%) | 380 (11.2%) | 3 002 (10.3%) | 767 (10.9%) |
|  | Normal | | 783 349 (79.3%) | 2 600 (76.5%) | 20 566 (70.8%) | 5 301 (75.2%) |
|  | Overweight | | 93 536 (9.5%) | 299 (8.8%) | 3 647 (12.6%) | 643 (9.1%) |
|  | Missing | | 21 862 (2.2%) | 121 (3.6%) | 1 844 (6.3%) | 334 (4.7%) |
| Cardiovascular fitness | | |  |  |  |  |
|  | Low | | 134 063 (13.6%) | 565 (16.6%) | 4 883 (16.8%) | 1 394 (19.8%) |
|  | Medium | | 464 699 (47.1%) | 1 535 (45.1%) | 12 469 (42.9%) | 3 077 (43.7%) |
|  | High | | 233 824 (23.7%) | 648 (19.1%) | 5 298 (18.2%) | 1 106 (15.7%) |
|  | Missing | | 154 997 (15.7%) | 652 (19.2%) | 6 409 (22.1%) | 1 468 (20.8%) |
| Muscle strength | | |  |  |  |  |
|  | Low | | 77 643 (7.9%) | 383 (11.3%) | 3 738 (12.9%) | 804 (11.4%) |
|  | Medium | | 402 051 (40.7%) | 1 820 (53.5%) | 15 517 (53.4%) | 3 493 (49.6%) |
|  | High | | 166 087 (16.8%) | 694 (20.4%) | 5 958 (20.5%) | 1 335 (18.9%) |
|  | Missing | | 341 802 (34.6%) | 503 (14.8%) | 3 846 (13.2%) | 1 413 (20.1%) |

**Supplementary Table 3. Cause-specific hazard ratios for suicides or self-harm in middle age (age 45-64) in relation to stress resilience, adjusted for cognitive performance, at conscription.**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **Suicide** | | | | | |  | **Self-harm** | |
|  |  | **Unadjusted** | | **Model 1** | | **Model 2** | |  | **Model 1** | |
|  |  | **CHR (95%CI)** | **Padj.** | **CHR (95%CI)** | **Padj.** | **CHR (95%CI)** | **Padj.** |  | **CHR (95%CI)** | **Padj.** |
| Stress resilience | |  |  |  |  |  |  |  |  |  |
|  | Low | 2.05 (1.93 - 2.18) | <0.001 | 2.03 (1.71 - 2.42) | <0.001 | 1.78 (1.51 - 2.11) | <0.001 |  | 2.05 (1.98 - 2.13) | <0.001 |
|  | Medium | 1.15 (1.10 - 1.23) | <0.001 | 1.24 (1.07 - 1.46) | <0.001 | 1.22 (1.05 - 1.42) | <0.001 |  | 1.16 (1.13 - 1.20) | <0.001 |
|  | High (Ref.) | 1.0 |  | 1.0 |  | 1.0 |  |  | 1.0 |  |

Model 1: adjusted for age, conscription calendar year and region, parental education and cognitive performance at conscription.

Model 2: adjusted for age, conscription calendar year and region, parental education, self-harm between baseline and age 45 and cognitive performance at conscription.

**Supplementary Table 4. Cause-specific hazard ratios for suicides in middle age (age 45-64) in relation to performance on cognitive domains at conscription.**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  | **Model 1** | |  | **Model 2** | |
|  |  | **Suicide/Total No.** | **CHR (95% CI)** | **Padj.** |  | **CHR (95% CI)** | **Padj.** |
| Logical cognitive performance | |  |  |  |  |  |  |
|  | Low | 906 / 934 484 | 1.89 (1.61 - 2.22) | <0.001 |  | 1.65 (1.41 - 1.93) | <0.001 |
|  | Medium | 1 784 / 934 484 | 1.38 (1.20 - 1.60) | <0.001 |  | 1.32 (1.15 - 1.52) | <0.001 |
|  | High (Ref.) | 541 / 934 484 | 1.0 |  |  | 1.0 |  |
| Verbal cognitive performance | |  |  |  |  |  |  |
|  | Low | 854 / 933 597 | 1.68 (1.43 - 1.98) | <0.001 |  | 1.50 (1.28 - 1.76) | <0.001 |
|  | Medium | 1 857 / 933 597 | 1.36 (1.19 - 1.58) | <0.001 |  | 1.31 (1.15 - 1.51) | <0.001 |
|  | High (Ref.) | 516 / 933 597 | 1.0 |  |  | 1.0 |  |
| Spatial cognitive performance | |  |  |  |  |  |  |
|  | Low | 732 / 933 597 | 1.66 (1.42 - 1.94) | <0.001 |  | 1.48 (1.27 - 1.73) | <0.001 |
|  | Medium | 1 829 / 933 597 | 1.29 (1.14 - 1.48) | <0.001 |  | 1.26 (1.11 - 1.43) | <0.001 |
|  | High (Ref.) | 666 / 933 597 | 1.0 |  |  | 1.0 |  |
| Technical cognitive performance | |  |  |  |  |  |  |
|  | Low | 1 066 / 933 272 | 1.70 (1.45 - 2.00) | <0.001 |  | 1.50 (1.28 - 1.76) | <0.001 |
|  | Medium | 1 696 / 933 272 | 1.32 (1.14 - 1.54) | <0.001 |  | 1.26 (1.09 - 1.46) | <0.001 |
|  | High (Ref.) | 465 / 933 272 | 1.0 |  |  | 1.0 |  |

Model 1: adjusted for age, conscription calendar year and region and parental education.

Model 2: adjusted for age, conscription calendar year and region, parental education and self-harm between baseline and age 45.

**Supplementary Table 5. Baseline performance on cognitive domains in 987 583 Swedish male conscripts, for whole sample and for those with suicide or self-harm in middle age (age 45-64).**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | | **All** | **Suicide** | **Death by other causes** | **Self-harm** |
| Logical cognitive performance | |  |  |  |  |
|  | Low | 199 586 (20.2%) | 906 (26.6%) | 7 822 (26.9%) | 2 362 (33.5%) |
|  | Medium | 516 318 (52.3%) | 1 784 (52.5%) | 14 515 (50.0%) | 3 396 (48.2%) |
|  | High | 218 580 (22.1%) | 541 (15.9%) | 4 718 (16.2%) | 812 (11.5%) |
|  | Missing | 53 099 (5.4%) | 169 (5.0%) | 2 004 (6.9%) | 475 (6.7%) |
| Verbal cognitive performance | |  |  |  |  |
|  | Low | 198 362 (20.1%) | 854 (25.1%) | 7 869 (27.1%) | 2 160 (30.7%) |
|  | Medium | 544 730 (55.2%) | 1 857 (54.6%) | 14 571 (50.1%) | 3 567 (50.6%) |
|  | High | 190 505 (19.3%) | 516 (15.2%) | 4 609 (15.9%) | 844 (12.0%) |
|  | Missing | 53 986 (5.5%) | 173 (5.1%) | 2 100 (6.9%) | 474 (6.7%) |
| Spatial cognitive performance | |  |  |  |  |
|  | Low | 177 172 (17.9%) | 732 (21.5%) | 6 141 (21.1%) | 1 961 (27.8%) |
|  | Medium | 515 463 (52.2%) | 1 829 (53.8%) | 14 975 (51.1%) | 3 443 (48.9%) |
|  | High | 240 962 (24.2%) | 666 (19.6%) | 5 932 (20.4%) | 1 167 (16.6%) |
|  | Missing | 53 986 (5.5%) | 173 (5.1%) | 2 011 (6.9%) | 474 (6.7%) |
| Technical cognitive performance | |  |  |  |  |
|  | Low | 228 264 (23.1%) | 1 066 (31.4%) | 9 442 (32.5%) | 2 597 (36.9%) |
|  | Medium | 514 300 (52.1%) | 1 696 (49.9%) | 13 739 (47.3%) | 3 314 (47.0%) |
|  | High | 190 708 (19.3%) | 465 (13.7%) | 3 864 (13.3%) | 658 (9.3%) |
|  | Missing | 54 311 (5.5%) | 173 (5.1%) | 2 014 (6.9%) | 476 (6.8%) |

**Supplementary Table 6. Cause-specific hazard ratios for self-harm in middle-aged men (age 45-64) in relation to risk factors in late adolescence for a sub-group with no self-harm before age 45.**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  | **Unadjusted** | |  | **Model 1** | |
|  |  | **Self-harm/Total No.** | **CHR (95%CI)** | **Padj.** |  | **CHR (95%CI)** | **Padj.** |
| General cognitive performance | |  |  |  |  |  |  |
|  | Low | 1414 / 963 515 | 2.27 (2.14-2.41) | <0.001 |  | 2.18 (2.06-2.31) | <0.001 |
|  | Medium | 2 173 / 963 515 | 1.42 (1.34-1.50) | <0.001 |  | 1.38 (1.31-1.46) | <0.001 |
|  | High (Ref.) | 601 / 963 515 | 1.0 |  |  | 1.0 |  |
| Stress resilience | |  |  |  |  |  |  |
|  | Low | 1 540 / 947 097 | 2.48 (2.32-2.65) | <0.001 |  | 2.37 (2.22-2.53) | <0.001 |
|  | Medium | 2 072 / 947 097 | 1.27 (1.19-1.35) | <0.001 |  | 1.24 (1.17-1.32) | <0.001 |
|  | High (Ref.) | 577 / 947 097 | 1.0 |  |  | 1.0 |  |
| Psychiatric disorders | |  |  |  |  |  |  |
|  | Depressive/neurotic/adjustment | 1 040 / 981 894 | 1.99 (1.89-2.09) | <0.001 |  | 1.92 (1.82-2.02) | <0.001 |
|  | Personality | 265 / 981 894 | 2.37 (2.16-2.59) | <0.001 |  | 2.27 (2.07-2.48) | <0.001 |
|  | Alcohol/drug-related | 295 / 981 894 | 3.85 (3.49-4.24) | <0.001 |  | 3.75 (3.40-4.12) | <0.001 |
| BMI | |  |  |  |  |  |  |
|  | Underweight | 483 / 960 437 | 1.10 (1.04-1.17) | <0.001 |  | 1.10 (1.04-1.16) | <0.001 |
|  | Normal (Ref.) | 3 363 / 960 437 | 1.0 |  |  | 1.0 |  |
|  | Overweight | 343 / 960 437 | 1.63 (1.54-1.71) | <0.001 |  | 1.60 (1.52-1.69) | <0.001 |
| Cardiovascular fitness | |  |  |  |  |  |  |
|  | Low | 1 038 / 828 247 | 1.70 (1.61-1.81) | <0.001 |  | 1.69 (1.59-1.79) | <0.001 |
|  | Medium | 2 248 / 828 247 | 1.33 (1.27-1.40) | <0.001 |  | 1.31 (1.25-1.38) | <0.001 |
|  | High (Ref.) | 903 / 828 247 | 1.0 |  |  | 1.0 |  |
| Muscle strength | |  |  |  |  |  |  |
|  | Low | 561 / 643 375 | 1.19 (1.12-1.26) | <0.001 |  | 1.18 (1.11-1.25) | <0.001 |
|  | Medium | 2 615 / 643 375 | 0.99 (0.95-1.04) | 1.00 |  | 0.99 (0.95-1.03) | 1.00 |
|  | High (Ref.) | 561 / 643 375 | 1.0 |  |  | 1.0 |  |

Model 1: Adjusted for age, conscription calendar year and region and parental education.