

ADVERSE EFFECTS OF TOBACCO USE IN DEPLOYED MILITARY UNITS

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ABSTRACT

Although research reveals that the prevalence of smoking has in general stabilized or is even decreasing among military personnel, this trend does not ultimately apply. Being young, being deployed, or being a member of Army personnel, for instance, is proven to increase the risk of being or beginning to be a tobacco user. Usually there are no immediate links emphasised between tobacco habits and their serious health-related consequences during the service period because of the long time lag between tobacco use and its consequences. With some exceptions, the impact of smoking on military performance is defined indirectly rather than directly. However, findings in the Estonian military sample (n=135) indicate that an increase in smoking behaviour while on deployment not only corresponds with poorer psychological wellbeing and general health, but also with absence from duty because of physical aches. These results can be taken as indicators that smoking behaviour decreases fitness for military operations and should be targeted by performance enhancement activities. The role of the military culture of smoking behaviour and the arguments for an effective strategy for tobacco use cessation among military personnel are discussed.

TRENDS IN TOBACCO USE

Considering the direct and indirect costs related to the consequences of tobacco habits, a high importance has been attributed to this behaviour in health policies. Tobacco use is known as the single largest cause of preventable death in the world today, killing a third to a half of all users. Projecting into the future, the total number of tobacco-attributable deaths will account for almost 10% of all deaths worldwide in 2030¹. In the WHO

¹ **World Health Statistics** 2008. Part 1. Ten highlights in health statistics. Reducing deaths from tobacco. <http://www.who.int/whosis/whostat/EN_WHS08_Part1.pdf>, (10.08.2009)

European Region, smoking is blamed for about 18.6 million years of life lost².

The financial costs caused by tobacco-related illnesses and medical care are remarkable. The direct and indirect costs of smoking in the EU, for instance, were estimated to range from 1.04% to 1.39% of the EU Gross Domestic Product, exceeding even 3% of it in some new member countries³.

Some pessimistic prognoses show that the worldwide number of smokers continues to increase⁴ and that the deaths caused by tobacco will double over the next few decades⁵. However, the trends of tobacco-related habits in the Western world are constantly decreasing. According to the latest health surveys in the US and in Europe, smoking prevalence among men and women has in general stabilized or is even decreasing. For example, in the US, the use of tobacco products was 29.4 % in 2005, while it was 30.4% in 2002⁶; in the WHO European Region, smoking prevalence was estimated around 28.6% in 2005 but 28.8% in 2002. Falling death rates due to tobacco-related illnesses imply that trends in smoking prevalence have been curbed at least since the early eighties.⁷

Findings from Western military surveys show similar trends and indicate overall declines in smoking as well. For example, in the total military population, the prevalence of any smoking in the US declined from 51.0% in 1980 to 32.2% in 2005⁸. In the Canadian Forces, everyday smoking has decreased from 24% in 2000 to 20% in 2004; the latter figure is declared to be even lower than in the civil population⁹. However, low smoking rates in the armed forces are not the case in every country, and cannot be generalized

² **WHO The World Health Report** 2002. Reducing Risks, Promoting Healthy Life. <<http://www.who.int/whr>>, (10.08.2009).

³ **WHO Regional Office for Europe** 2007. The European Tobacco Control Report. <<http://www.euro.who.int>>, (10.08.2009).

⁴ **Guindon, G. E., & Boisclair, D.** 2003. Past, current and future trends in tobacco use. Washington, DC: World Bank. <<http://www1.worldbank.org>>, (10.08.2009).

⁵ **WHO Report on the Global Tobacco Epidemic** 2008: The MPOWER package, Geneva, World Health Organization. <<http://www.who.int>>, (10.08.2009).

⁶ **Substance Abuse and Mental Health Services Administration** 2006. Results from the 2005 National Survey on Drug Use and Health: National Findings [Office of Applied Studies, NSDUH Series H-30, DHHS Publication No. SMA 06-4194]. Rockville, MD. <<http://www.samhsa.gov>>, (10.08.2009).

⁷ **WHO Regional Office for Europe** 2007. The European Tobacco Control Report. <<http://www.euro.who.int>>, (10.08.2009)

⁸ **RTI International** 2006. 2005 Department of Defence Survey of Health Related Behaviours among Active Duty Military Personnel. RTI/7841/106-FR

⁹ **Directorate of Force Health Protection CF Health Services Group** 2005. Canadian Forces Health and Lifestyle Information Survey 2004. Regular Force Report A-MD-015-FHP/AF-002.

to all tobacco products or age groups. In Estonia, for instance, we can observe the same smoking prevalence as elsewhere in Europe (i.e. 27.8%) in the general population¹⁰, but the prevalence is as high as 41.1% in the military population¹¹. Recent findings also reveal that military personnel are more than twice as likely as civilians to use smokeless tobacco¹² and also indicate an increasing rate of tobacco use among young military members¹³.

Inside the military, tobacco use rates and initiation or cessation related aspects are widely explored, especially in relation to the extra stress or excessive boredom that military personnel might have experienced on duty. Being deployed has been found to be associated with higher rates of cigarette use¹⁴. There are an increasing number of regular smokers (including relapse and new initiation) of approximately 10% as well as an increase in daily consumption from an average of 15 cigarettes to 21 cigarettes¹⁵. The main reasons for increased smoking during deployments that have been cited are: (1) stress, boredom, anxiety, and sleep deprivation; (2) lack of alternate activities and privileges; (3) the perception that dangers in the field trump the negative health impact of smoking; and (4) a permissive military culture toward tobacco use¹⁶. With respect to managing stress, however, the research findings indicate that tobacco use is more likely to perpetuate a stress response rather than to suppress it, and that nicotine consumers are overall less effective in dealing with combat stress¹⁷.

¹⁰ **Estonian National Institute for Health Development** 2006. Health behaviour among the Estonian adult population. <<http://www2.tai.ee/uuringud>>, (10.08.2009).

¹¹ **Estonian National Institute for Health Development** 2008. Prevalence of smoking behaviour in Estonian Defence Forces. (preliminary data)

¹² **Peterson, A. L., Severson, H., H., Andrews, J. A., Gott, S. P., Cigrang, J. A., Gordon, J. S., Hunter, C. M., & Martin, G. C.** 2007. Smokeless tobacco use in military personnel. – *Military Medicine*, 172, pp. 1300–1305.

¹³ **Nelson, J. P., & Pederson, L. L.** 2008. Military tobacco use: A synthesis of the literature on prevalence, factors related to use and cessation interventions. – *Nicotine & Tobacco Research*, 10, pp. 775–790.

¹⁴ **Federman, B. E., Bray, M. B., & Kroutil, L. A.** 2000. Relationships between substance use and recent deployments among women and men in the military. – *Military Psychology*, 12, pp. 205–220.

¹⁵ **Boos, J. C., & Coft, A. F.** 2004. Smoking rates in the staff of a military field hospital before and after wartime deployment. – *Journal of the Royal Society of Medicine*, 97, pp. 20–22.

¹⁶ **Poston, W. S. C., Taylor, J. E., Hoffman, K. M., Peterson, A. L., Lando, H. A., Shelton, S., & Haddock, C. K.** 2008. Smoking and Deployment: Perspectives of Junior-Enlisted U.S. Air Force and U.S. Army Personnel and Their Supervisors. – *Military Medicine*, 173, pp. 441–447.

¹⁷ **Stein, R. J., Pyle, S. A., Haddock, C. K., Poston, W. S. C., Bray, R., & Williams, J.** 2008. Reported stress and its relationship to tobacco use among U.S. military personnel. – *Military Medicine*, 173, pp. 271–277.

Unfortunately, not much can be found about the lastingness of post-deployment changes in smoking behaviour. One survey where the persistence of this behaviour is described indicates noticeable differences among subgroups: a larger percentage of Army personnel began or increased their cigarette smoking one year after having deployed than stopped or reduced, whereas the opposite was reported for the other services⁹.

TOBACCO USE AND MILITARY FITNESS

Clinical studies have reported that cigarette use is associated with a lower functional status¹⁸ and a lower exercise tolerance among young adult people^{19, 20}. Smoking has also been found to be a consistent and strong predictor of the lack of fitness for military duty, operationalized e.g. in measures of physical health, mental health, substance abuse, and legal problems and of the occurrence of medical problems in training. It is even suggested that smoking be considered as a negative marker of readiness and be included in the services' fitness evaluations^{21, 22}. Considering the frequency of injury incidents in training²³ and in infantry duties²⁴ related to cigarette smoking, it has been cited as an independent risk factor for both

¹⁸ **Eriksen, W., Natwig, B., Rutle, O., & Bruusgard, D.** 1999. Smoking and functional status of young adults. – *Scandinavian Journal of Primary Health Care*, 17, pp. 174–179.

¹⁹ **Papathanasiou, G., Georgakopoulos, D., Georgoudis, G., Spyropoulos, P., Perrea, D., Evangelou, A.** 2007. Effects of chronic smoking on exercise tolerance and on heart rate-systolic blood pressure product in young healthy adults. – *European Journal of Cardiovascular Prevention and Rehabilitation*, 14, pp. 646–652.

²⁰ **Kimura, Y., Nakamoto, Y., Shitama, H., Ohmine, S., Ide M., & Hashisuka, K.** 2007. Influence of moderate smoking on physical fitness and local muscle oxygenation profile during incremental exercise. – *Journal of UOEH*, 29, pp. 149–158.

²¹ **Haddock, C.K., Pyle, S. A., Poston, W. S. C., Bray, R. M., & Stein, R. J.** 2007. Smoking and Body Weight as Markers of Fitness for Duty among U.S. Military Personnel. – *Military Medicine*, 172, pp. 527–532.

²² **Snoddy, R. O., & Henderson, J. M.** 1994. Predictors on basic infantry training success. – *Military Medicine*, 159, pp. 616–622.

²³ **Reynolds, K. L., Heckel, H. A., Witt, C. E., Martin, J. W., Polland, J. A., Knapik, J. J., & Jones, B. H.** 1994. Cigarette smoking, physical fitness, and injuries in infantry soldiers. – *American Journal of Preventive Medicine*, 10, pp. 145–150.

²⁴ **Reynolds, K. L., White, J. S., Knapik, J. J., Witt, C. E., & Amoroso, P. J.** 1999. Injuries and risk factors in a 100-mile (161-km) infantry road march. – *Preventive Medicine*, 28, pp. 167–173.

men and women²⁵. Similar findings about the harmful effect of cigarette smoking on physical fitness and readiness are described among U.S. Navy personnel²⁶.

It is shown that cigarette smoking adversely impacts troop readiness with increasing time off from duty²⁷, leading to poorer visual acuity²⁸, and together the exposure to fine dust being possibly related with the acute eosinophilic pneumonia²⁹. However, the decreased fitness during a military exercise, even in harsh environments and in combination with poor dietary habits³⁰, is not clearly and explicitly identified. Study results remain controversial about the harmful effects of smokeless tobacco as well. On the one hand, there are results showing that using smokeless tobacco is an independent risk factor for injury proneness³¹, that it has a detrimental effect on visuo-motor performance³², and that it is associated with hypercholesterolemia³³ and higher blood pressure³⁴. On the other hand, results

²⁵ Knapik, J. J., Sharp, M. A., Canham-Chervak, M., Hauret, K., Patton, J. F., & Jones, B. H. 2001. Risk factors for training-related injuries among men and women in basic combat training. – *Medicine and Science in Sports Exercise*, 33, pp. 946–954.

²⁶ Van Orden, K. F., & Nice, D. S. 2008. National security interests at the naval health research center. – Mangelsdorff, A. D. (Ed.). *Psychology in the service of national security*. Washington DC: American Psychological Association, pp. 55–70.

²⁷ Zadoo, V., Fengler, S., & Catteson, M. 1993. The effects of alcohol and tobacco use on troop readiness. – *Military Medicine*, 158, pp. 480–484.

²⁸ Sharma, R. R. 2009. Visual effect of long-term active smoking: Are air-crew flying NVG aided missions at a disadvantage? Paper presented at 57-th International Congress of Aviation and Space Medicine, Zagreb.

²⁹ Shorr, A. F., Scoville, S. L., Cersovsky, S. B., Shanks, G. D., Ockenhouse, C. F., Smoak, B. L., Carr, W. W., & Petrucci, B. P. 2004. Acute eosinophilic pneumonia among US Military personnel deployed in or near Iraq. – *The Journal Of The American Medical Association*, 292, pp. 2997–3005.

³⁰ Defence Science and Technology Organisation Victoria (Australia) Aeronautical and Maritime Research Lab 2002. The Effect of Consumption of Australian Combat Rations on Military Personnel after a Medium-Term Field Exercise. <<http://handle.dtic.mil/100.2/ADA399668>>, (10.08.2009).

³¹ Heir, T., & Eide, G. Injury proneness undergoing a physical training programme: smokeless tobacco use, higher age, and low levels of physical fitness are risk factors. – *Scandinavian Journal of Medicine & Science in Sports*, 7, pp. 304–311.

³² Contreras-Vidal, J. L., Van den Heuvel, C. E., Teulings, H. L., & Stelmach, G. E. 1999. Visuo-motor adaptation in smokeless tobacco users. – *Nicotine & Tobacco Research*, 1, pp. 219–227.

³³ Tucker, L. A. 1989. Use of smokeless tobacco, cigarette smoking, and hypercholesterolemia. – *American Journal of Public Health*, 79, pp. 1048–1050.

indicate that even the long-term use of smokeless tobacco does not significantly influence exercise capacity³⁵. However, even while physical performance may remain unaffected, there is an increased risk of all kinds of oral problems for users^{36,37} and a negative effect on performance caused by deprivation symptoms, such as increased reaction time, self-rated withdrawal and decreased heart rate³⁸.

Military fitness is not only about physical health and hardiness. Several studies have reported the association between cigarette smoking and psychiatric illnesses. For currently enlisted personnel, smoking is found to be one of the factors predictive of hospitalization for mental health disorders³⁹. Regarding psychiatric illness research, in the target group with posttraumatic stress disorder (PTSD) or major depression, there is a higher prevalence of smoking. It refers to possible self-medication caused by the alleviating effect of nicotine on some symptoms like arousal, numbness, or detachment, which are related to these disorders⁴⁰. The fact that poor mental health relates to failures in smoking cessation⁴¹ indicates that for those people, quitting is even more difficult than for healthy people. It has also been shown that the overall quality of life among veterans is affected by poor health behaviours, even after controlling for the impact of co-morbid

³⁴ **Bolinder, G., & De Faire, U.** 1998. Ambulatory 24-h blood pressure monitoring in healthy, middle-aged smokeless tobacco users, smokers and non-tobacco users. – *American Journal of Hypertension*, 11, pp. 1153–1163.

³⁵ **Bolinder, G., Noren, A., Wahren, J., & De Faire, U.** 1997. Long-term use of smokeless tobacco and physical performance in middle-aged men. – *European Journal of Clinical Investigation*, 27, pp. 427–433.

³⁶ **Robertson, P. B., De Rouen, T. A., Ernster, V., Grady, D., Greene, J., Mancl, L., McDonald, D., & Wash, M. M.** 1995. Smokeless tobacco use: how it affects the performance of major league baseball players. – *Journal of the American Dental Association*, 126, pp. 1115–1121.

³⁷ **Robertson, P. B., Walsh, M. M., & Greene, J. C.** 1997. Oral effects of smokeless tobacco use by professional baseball players. – *Advances in Dental Research*, 11, pp. 307–312.

³⁸ **Keenan, R. M., Hatsukami, D. K., & Anton, D. J.** 1989. The effects of short-term smokeless tobacco deprivation on performance. – *Psychopharmacology*, 98, pp. 126–130.

³⁹ **Booth-Kevley, S., & Larson, G. E.** 2005. Predictors of Psychiatric Hospitalization in the Navy. – *Military Medicine*, 170, pp. 87–93.

⁴⁰ **RAND Centre for Military Health Policy Research** 2008. Invisible Wounds of War. <<http://www.rand.org>>, (10.08.2009).

⁴¹ **Hemmingsson, Kriebel, Tynelius, Rasmussen and Lundberg** 2008. Adolescent mental health predicts quitting smoking in adulthood: a longitudinal analysis. – *European Journal of Public Health*, 18, pp. 66–70.

medical conditions⁴². Taking a closer look at the average level of self care among PTSD veterans, one can also observe quite low frequencies of preventive health behaviours and increased risks for non-fatal strokes and myocardial infarctions⁴³.

INTERVENTION OPPORTUNITIES

Often there is more than one health risk behaviour, or kind of substance in use, involved simultaneously^{44,45} and it is difficult to detect which of them is responsible for the given disease or harm. The fact that usually several risky behaviours are concurrently present is observable among teenagers in the civil population^{46,47} as well as among the adult population in a military environment (e.g. high-risk drinkers use seatbelts less frequently, are more likely to exceed speed limits while driving and smoke more than 20 cigarettes per day). Therefore, intervention programs should be implemented for all those behaviours (safe driving habits, smoking cessation, high-risk drinking) and to be tailored to the specific needs of the group at highest risk⁴⁸. However, when expecting a positive change, one should be aware that people do not alter several behaviours at the same time and efforts to modify

⁴² **Borzecki, A. M., & Lee, A.** 2005. Do poor health behaviours affect health-related quality of life and healthcare utilization among veterans? – *Journal of Ambulatory Care Management*, 28, pp. 141–156.

⁴³ **Buckley, T. C., Mozley, S. L., Bedard, M. A., Dewulf, A. C., & Greif, J.** 2004. Preventive health behaviours, physical morbidity, and health related role functioning impairment in veterans with post-traumatic stress disorder. – *Military Medicine*, 169, pp. 536–540.

⁴⁴ **Centres for Disease Control and Prevention** 2008. Youth Risk Behaviour Surveillance: United States. Surveillance Summaries, 2007. – *Morbidity and Mortality Weekly Report (MMWR)*, 57 (SS04). <<http://www.cdc.gov/mmwr>>, (10.08.2009).

⁴⁵ **The NHS Information Centre Lifestyles Statistics** 2008. The health survey for England 2006. <<http://www.ic.nhs.uk>>, (10.08.2009).

⁴⁶ **Pesa, J. A.** 1998. The association between smoking and unhealthy behaviours among national sample of Mexican-American adolescents. – *The Journal of School Health*, 68, pp. 376–380.

⁴⁷ **National Centre for Social Research** 2007. Smoking, drinking and drug use among young people in England in 2006. <<http://www.ic.nhs.uk>>, (10.08.2009).

⁴⁸ **Williams, J.O., Bell, N.S., & Amoroso, P. J.** 2002. Drinking and other risk taking behaviours of enlisted male soldiers in the US Army. – *Work*, 18, pp. 141–150.

one kind of unhealthy behaviour into a healthy one will not necessarily affect other risky behaviours⁴⁹.

The struggle for a healthy lifestyle in the military is far from hopeless as tobacco interventions aimed at smoking cessation have proven to be effective among veterans⁵⁰ as well as active duty military personnel⁵¹. Exhausting list of evidence-based practices of tobacco-control programs and activities are described in depth⁵², and clinical treatment approaches are provided⁵³. Still, more needs to be done to change the military culture, which has been invoked as a kind of excuse for tobacco consumption (i.e. a means for enhancing comfort or as a morale booster) in almost every article or health report dealing with this population. It has been proven that social influence encourages tobacco use⁵⁴, and role models of smoking behaviour in the military are strongly associated with the initiation and resumption of smoking, even after adjusting for other known risk factors⁵⁵. Consequently, intervening with empty slogans or vague efforts is ineffective. Without trying to modify the organisational culture, a persistent change in behaviour can hardly be reached.

As an additional hidden menace to the culture of the Armed Forces, military personnel form an attractive market segment for tobacco producers. Manufacturers' business interests are expressed in manipulative messages,

⁴⁹ **Naval Health Research Centre** 1998. Relationships Among Changes in Health Behaviours in a Six-Year U.S. Navy Cohort.

⁵⁰ **Beckham, J. C., Becker, M. E., Hamlett-Berry, K. W., Drury, P. D., Kang, H. K., Wiley, M. T., Calhoun, P. S., Moore, S. D., Bright, M. A., & McFail, M. E.** 2008. Preliminary Findings from a Clinical Demonstration Project for Veterans Returning from Iraq or Afghanistan. – *Military Medicine*, 173, pp. 448–453.

⁵¹ **Morgan, B. J.** 2001. Evaluation of an educational intervention for military tobacco users. – *Military Medicine*, 166, pp. 1094–2004.

⁵² **IOM (Institute of Medicine)** 2009. *Combating Tobacco Use in Military and Veteran Populations*. New York, NY: The Guilford Press.

⁵³ **Peterson, L. P.** 2006. Clinical health psychology and behavioural medicine in military healthcare settings. – Kennedy, C. H. & Zillmer, E. A. (Eds.). *Military psychology: Clinical and Operational Applications*. Washington, DC: American Psychological Association, pp. 74–104.

⁵⁴ **Bray, R. M., & Brown, J. M.** 2008. Influence of military leaders, units, and deployment on tobacco use. Paper presented at 50-th Annual conference of the International Military Testing Association, Amsterdam. <<http://www.imta.org>>, (10.08.2009).

⁵⁵ **Bray, R. M., Pemberton, M. R., Williams, J., Green, K. J., & Hunter, C. M.** 2008. Peer and role model influences on cigarette smoking. Paper presented at 50-th Annual conference of the International Military Testing Association, Amsterdam. <www.imta.org>, (10.08.2009).

openly directed to military members with high effectiveness⁵⁶. This should be taken into account when trying to protect military members from (re)starting tobacco use and when elaborating the strategy for tobacco use cessation. To reduce existing perverse incentives that lead to increased tobacco consumption, an effective tobacco control policy in the Armed Forces requires explicit implementation instructions and high-level organisational support⁵⁷. Extra attention should be paid to formulate segment-specific messages for military members that counteract effectively against industry messages.

RECENT FINDINGS

A survey was conducted among two rotations of Estonian soldiers deployed in Afghanistan to ascertain the change in their perceived general health and smoking behaviour during the first three months of deployment as well as to explore the relationship between declared changes in behaviour and the level of psychological well-being reported⁵⁸. The use of other tobacco products such as snuff was not explored in this research. All respondents were white males.

Soldiers (n=135) were asked if they had noticed a change in their (1) general health; (2) seeking help from a physician; (3) being forced to stay away from duty because of aches; (4) smoking behaviour; and (5) frequency of physical fitness training compared with the period before deployment. The questions of being a smoker versus non-smoker, and – if yes – the number of cigarettes smoked per day were not explicitly asked for. Nevertheless, the smokers could be distinguished from the non-smokers through item x shown below. Participants had three choices of answer to an item indicating a change: 1) negative change, 2) positive change, or 3) no changes in the health related aspect considered. Examples of items:

x. Compared with the period before deployment my smoking behaviour did ...

(1) Increase;

(2) Decrease;

(3) Not change (did not start if non-smoker)

xx. Compared with the period before deployment my general health is ...

(1) Worse;

⁵⁶ **Joseph, A. M., Muggli, M., Pearson, K. C., & Lando, H.** 2005. The Cigarette Manufacturers' Efforts to Promote Tobacco to the U.S. Military. – *Military Medicine*, 170, pp. 874–880.

⁵⁷ **Arvey, S. R., & Malone, R. E.** 2008. Advance and Retreat: Tobacco control policy in the U.S. military. – *Military Medicine*, 173, pp. 985–991.

⁵⁸ Unpublished survey.

(2) *Better;*

(3) *Unchanged*

To assess psychological well-being, we asked them to fill out the well-being questionnaire World Health Organization-Five Well-Being Index (WHO-5)⁵⁹. For both rotations, a survey was administered in the middle of their deployment (being May and August 2008 respectively) on their way to Rest & Recuperation⁶⁰ in Estonia.

Most participants declared no changes in assessed health related aspects in the middle of deployment (Fig. 1). Some negative trends were found in all health related aspects but the second highest was for Smoking behaviour (n=29) after frequency of Fitness training (n= 40). In terms of positive change, we observed the highest change was for General health which was evaluated more positively (better general health) at the mid deployment as compared with the period before deployment.

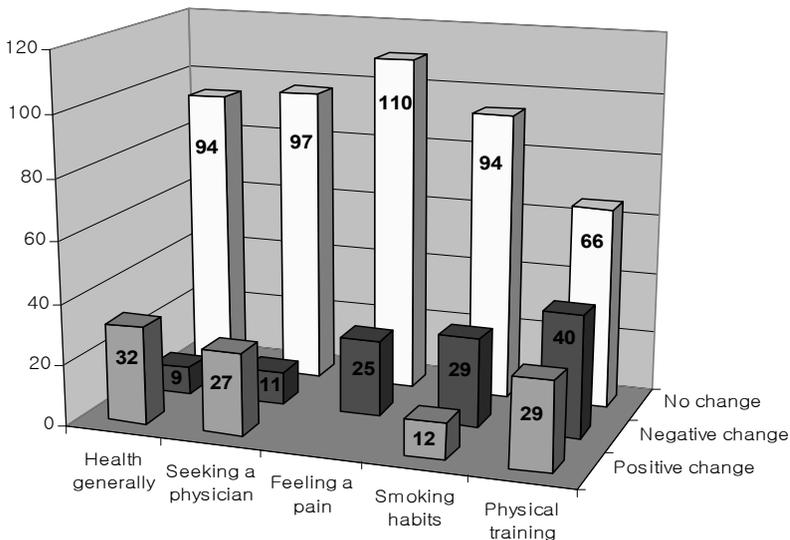


Figure 1. Dynamics of self-reported changes in health related aspects in the middle of deployment

⁵⁹ **Bech, P., Olsen, L. R., Kjoller, M., & Rasmussen, N. K.** 2003. Measuring well-being rather than the absence of distress symptoms: a comparison of the SF-36 Mental Health subscale and the WHO-Five Well-Being Scale. – *International Journal of Methods in Psychiatric Research*, 12, pp. 85–91.

⁶⁰ Rest & Recuperation stands for a short break in the middle of deployment, in which troops visit home or stay in a safe area near the theatre of operations.

The odds ratios in change (positive against negative changes) are also very informative. If the number is higher than 1 then there are proportionally more positive changes than negative ones; and if the number is lower than one, then there are more negative changes as compared to the positive ones. The odds ratio for General health is 3.55; this means that there are approximately 3.5 times more positive changes than negative ones. On the contrary, the odds ratio for Smoking behaviour is .30; in other words, there are about three times more negative changes than positive ones.

The matrix presented in Table 1 shows correlations between health-related aspects measured among all respondents (n=135). Higher scores on the scales indicate a positive change: better psychological well-being, better general health, fewer visits to a physician, less excessive aches, decreased smoking, and more physical fitness training. Hence, higher positive correlations have a positive connotation. Results reveal that the correlations between Smoking behaviour and Psychological well-being ($r=.31$), General health ($r=.36$), and Aches ($r=.28$) are positive and significant ($p < .01$). Notwithstanding the fact that correlations do not allow for any causal relationship between the variables, the results show that the observed negative changes in tobacco use (thus more smoking- see Figure 1) and in general health is correlated with poorer psychological well-being during the first three months of deployment.

Table 1. Correlations between psychological well-being and health aspects

	Psy.WB	Gen.Hlth	Seek.Phy	Ex. Aches	Smoking
Psychological WB	–				
General Health	.33*	–			
Seeking a Physician	.11	.38*	–		
Excessive Aches	.25	.31*	.14	–	
Smoking Behaviour	.31*	.36*	.05	.28*	–
Fitness Training	.04	.37*	.21	.14	.21

Note. Psy.WB – Psychological Wellbeing, Gen.Hlth – General Health, Seek.Phy – Seeking a Physician, Ex. Aches – Excessive Aches, Smoking – Smoking Behaviour
* $p < .01$

To have an understanding about the causal relationships, a regression analysis was performed at first with Psychological well being as a criterion and General Health related aspects as predictors. The solution reveals that Psychological Well- Being is significantly ($p=.00014$) predicted in the first place by General Health ($\beta = .263$) and in the second place by Smoking

Behaviour ($\beta = .200$) (see Table 2). The full model accounts for 18% of the total variance.

Table 2. Multiple regression results: predicting Psychological Well-being

	β	t (126)	p
General Health	.263	2.636	.009*
Seeking Physician	.005	0.056	.955
Excessive Aches	.131	1.507	.134
Smoking Behaviour	.200	2.243	.027*
Fitness Training	.121	-1.378	.171

*R= .422 R²= .178 F(5.126)=5.451 p = .00014

Another regression analysis was conducted with Smoking Behaviour as a criterion and Health related aspects as predictors. We found that Smoking Behaviour is significantly ($p = .00003$) predicted by the perceived state of General Health ($\beta = .312$) and being forced to stay away from duty because of Excessive Aches ($\beta = .212$) (see Table 3). The full model described 18% of total variance of Smoking Behaviour.

Table 3. Multiple Regression Results: Predicting Smoking Behaviour

	β	t(130)	p
General Health	.312	3.371	.001*
Seeking Physician	-.158	-1.850	.067
Excessive Aches	.212	2.564	.011*
Fitness Training	.077	0.894	.373

*R= .424 R²= .179 F(4.130)=7.108 p = .00003

DISCUSSION

Findings from the empirical part of the review concur with the line of previous research indicating that on deployments smoking behaviour is increased. Together with the perceived state of general health, smoking impacts a soldiers' psychological well-being. It is shown that soldiers who experience problems with their general health and whose smoking behaviour becomes more frequent are more vulnerable to mental distress. On the other hand smoking behaviour itself is predicted by the state of general health and

presence of aches. It seems to be a closed circle of the afore mentioned self medication where one problem is cured with the other and no easy solution is available. Military personnel on deployments are relatively young. Considering the remarkable time lag between tobacco use and its consequences, we might expect the harm to become more disturbing among older soldiers and among retired military members and veterans in terms of restricting their everyday activities, impairing quality of life, and reducing life expectancy.

There is a general decrease in the smoking behaviours of the Western population, however, elevated smoking in the military increases during deployment. As opposed to alcohol consumption or risky driving, there is no such immediate impact of tobacco habits and the harm caused by those bad habits like increased death, premature diseases, serious injury rates or severe diseases found during the active service period. On active duty, the impact of tobacco use on general health and specifically on military performance can be defined rather more indirectly. However, this indirect impact (e.g. injury proneness, deprivation symptoms, higher blood pressure, impaired visual acuity) of tobacco related behaviour may still decrease troops' fitness for military operations and should be the target of performance enhancement activities. Based on research recommended interventions include: (1) working out intervention programs tailored to the specific needs of the group at highest risk; (2) elaborating a strategy to modify the military culture which encourages tobacco use; (3) developing an effective tobacco control policy in the Armed Forces with explicit implementation instructions and high-level organisational support; (4) formulating segment-specific messages for military members that effectively counteract the messages from the tobacco industries. Research has shown that, instead of pointing to the manipulations of the tobacco industry or to the unhealthy effects of tobacco use, there are four promising themes for tobacco control efforts in the military. Messages to this population should emphasise that: (1) smoking decreases one's ability to positively influence others; (2) smoking increases the chance that a military member will be discharged from the military prematurely; (3) smoking lowers the readiness to fight and to win wars; and (4) smokers are not as productive as other military personnel⁶¹.

⁶¹ Hoffman, K. M., Haddock, C. K., Poston, W. S. C., Taylor, J. E., Lando, H. A., & Shelton, S. 2008. A formative examination of messages that discourage tobacco use among junior enlisted members of the United States military. – *Nicotine & Tobacco Research*, 10, pp. 653–661.

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BIBLIOGRAPHY

- Arvey, S. R., & Malone, R. E.** 2008. Advance and Retreat: Tobacco control policy in the U.S. military. – *Military Medicine*, 173, pp. 985–991.
- Bech, P., Olsen, L. R., Kjoller, M., & Rasmussen, N. K.** 2003. Measuring well-being rather than the absence of distress symptoms: a comparison of the SF-36 Mental Health subscale and the WHO-Five Well-Being Scale. – *International Journal of Methods in Psychiatric Research*, 12, pp. 85–91.
- Beckham, J. C., Becker, M. E., Hamlett-Berry, K. W., Drury, P. D., Kang, H. K., Wiley, M. T., Calhoun, P. S., Moore, S. D., Bright, M. A., & McFail, M. E.** 2008. Preliminary Findings from a Clinical Demonstration Project for Veterans Returning from Iraq or Afghanistan. – *Military Medicine*, 173, pp. 448–453.
- Bolinder, G., & De Faire, U.** 1998. Ambulatory 24-h blood pressure monitoring in healthy, middle-aged smokeless tobacco users, smokers and non-tobacco users. – *American Journal of Hypertension*, 11, pp. 1153–1163.
- Bolinder, G., Noren, A., Wahren, J., & De Faire, U.** 1997. Long-term use of smokeless tobacco and physical performance in middle-aged men. – *European Journal of Clinical Investigation*, 27, pp. 427–433.
- Boos, J. C., & Coft, A. F.** 2004. Smoking rates in the staff of a military field hospital before and after wartime deployment. – *Journal of the Royal Society of Medicine*, 97, pp. 20–22.
- Booth-Kevley, S., & Larson, G., E.** 2005. Predictors of Psychiatric Hospitalization in the Navy. – *Military Medicine*, 170, pp. 87–93.
- Borzecki, A. M., & Lee, A.** 2005. Do poor health behaviours affect health-related quality of life and healthcare utilization among veterans? – *Journal of Ambulatory Care Management*, 28, pp. 141–156.
- Bray, R. M., & Brown, J. M.** 2008. Influence of military leaders, units, and deployment on tobacco use. Paper presented at 50-th Annual conference of the International Military Testing Association, Amsterdam. <www.imta.org>, (10.08.2009).
- Bray, R. M., Pemberton, M. R., Williams, J., Green, K. J., & Hunter, C. M.** 2008. Peer and role model influences on cigarette smoking. Paper presented at 50-th Annual conference of the International Military Testing Association, Amsterdam. <www.imta.org>, (10.08.2009).
- Buckley, T. C., Mozley, S. L., Bedard, M. A., Dewulf, A. C., & Greif, J.** 2004. Preventive health behaviours, physical morbidity, and health related role functioning impairment in veterans with post-traumatic stress disorder. – *Military Medicine*, 169, pp. 536–540.

- Centres for Disease Control and Prevention** 2008. Youth Risk Behaviour Surveillance: United States. Surveillance Summaries, 2007. – Morbidity and Mortality Weekly Report (MMWR), 2008, 57 (SS04). <<http://www.cdc.gov/mmwr>>, (10.08.2009).
- Contreras-Vidal, J. L., Van den Heuvel, C. E., Teulings, H. L., & Stelmach, G. E.** 1999. Visuo-motor adaptation in smokeless tobacco users. – *Nicotine & Tobacco Research*, 1, pp. 219–227.
- Defence Science and Technology Organisation Victoria (Australia) Aeronautical and Maritime Research Lab** 2002. The Effect of Consumption of Australian Combat Rations on Military Personnel after a Medium-Term Field Exercise. <<http://handle.dtic.mil/100.2/ADA399668>>, (10.08.2009).
- Directorate of Force Health Protection CF Health Services Group** 2005. Canadian Forces Health and Lifestyle Information Survey 2004. Regular Force Report A-MD-015-FHP/AF-002.
- Eriksen, W., Natwig, B., Rutle, O., & Bruusgard, D.** 1999. Smoking and functional status of young adults. – *Scandinavian Journal of Primary Health Care*, 17, pp. 174–179.
- Estonian National Institute for Health Development** 2008. Prevalence of smoking behaviour in Estonian Defence Forces (preliminary data).
- Estonian National Institute for Health Development** 2006. Health behaviour among the Estonian adult population. <<http://www2.tai.ee/uuringud>>, (10.08.2009).
- Federman, B. E., Bray, M. B., & Kroutil, L. A.** 2000. Relationships between substance use and recent deployments among women and men in the military. – *Military Psychology*, 12, pp. 205–220.
- Guindon, G. E., & Boisclair, D.** 2003. Past, current and future trends in tobacco use. Washington, DC, World Bank. <<http://www1.worldbank.org>>, (10.08.2009).
- Haddock, C.K., Pyle, S. A., Poston, W. S. C., Bray, R. M., & Stein, R. J.** 2007. Smoking and Body Weight as Markers of Fitness for Duty among U.S. Military Personnel. – *Military Medicine*, 172, pp. 527–532.
- Heir, T., & Eide, G.** Injury proneness undergoing a physical training programme: smokeless tobacco use, higher age, and low levels of physical fitness are risk factors. – *Scandinavian Journal of Medicine & Science in Sports*, 7, pp. 304–311.
- Hemmingsson, Kriebel, Tynelius, Rasmussen and Lundberg** 2008. Adolescent mental health predicts quitting smoking in adulthood: a longitudinal analysis. – *European Journal of Public Health*, 18, pp. 66–70.
- Hoffman, K. M., Haddock, C. K., Poston, W. S. C., Taylor, J. E., Lando, H. A., & Shelton, S.** 2008. A formative examination of messages that discourage tobacco use among junior enlisted members of the United States military. – *Nicotine & Tobacco Research*, 10, pp. 653–661.
- IOM (Institute of Medicine)** 2009. Combating Tobacco Use in Military and Veteran Populations. New York, NY: The Guilford Press.
- Joseph, A. M., Muggli, M., Pearson, K. C., & Lando, H.** 2005. The Cigarette Manufacturers' Efforts to Promote Tobacco to the U.S. Military. – *Military Medicine*, 170, pp. 874–880.

- Keenan, R. M., Hatsukami, D. K., & Anton, D. J.** 1989. The effects of short-term smokeless tobacco deprivation on performance. – *Psychopharmacology*, 98, pp. 126–130.
- Kimura, Y., Nakamoto, Y., Shitama, H., Ohmine, S., Ide M., & Hashisuka, K.** 2007. Influence of moderate smoking on physical fitness and local muscle oxygenation profile during incremental exercise. – *Journal of UOEH*, 29, pp. 149–158.
- Knapik, J. J., Sharp, M. A., Canham-Chervak, M., Hauret, K., Patton, J. F., & Jones, B. H.** 2001. Risk factors for training-related injuries among men and women in basic combat training. – *Medicine and Science in Sports Exercise*, 33, pp. 946–954.
- Morgan, B. J.** 2001. Evaluation of an educational intervention for military tobacco users. – *Military Medicine*, 166, pp. 1094–2004.
- National Centre for Social Research** 2007. Smoking, drinking and drug use among young people in England in 2006. <<http://www.ic.nhs.uk>>, (10.08.2009).
- Naval Health Research Centre** 1998. Relationships Among Changes in Health Behaviours in a Six-Year U.S. Navy Cohort.
- Nelson, J. P., & Pederson, L. L.** 2008. Military tobacco use: A synthesis of the literature on prevalence, factors related to use and cessation interventions. – *Nicotine & Tobacco Research*, 10, pp. 775–790.
- Papathanasiou, G., Georgakopoulos, D., Georgoudis, G., Spyropoulos, P., Perrea, D., Evangelou, A.** 2007. Effects of chronic smoking on exercise tolerance and on heart rate-systolic blood pressure product in young healthy adults. – *European Journal of Cardiovascular Prevention and Rehabilitation*, 14, pp. 646–652.
- Pesa, J. A.** 1998. The association between smoking and unhealthy behaviours among national sample of Mexican-American adolescents. – *The Journal of School Health*, 68, pp. 376–380.
- Peterson, A. L., Severson, H., H., Andrews, J. A., Gott, S. P., Cigrang, J. A., Gordon, J. S., Hunter, C. M., & Martin, G. C.** 2007. Smokeless tobacco use in military personnel. – *Military Medicine*, 172, pp. 1300–1305.
- Peterson, L. P.** 2006. Clinical health psychology and behavioural medicine in military healthcare settings. – Kennedy, C. H. & Zillmer, E. A. (Eds.). *Military psychology: Clinical and Operational Applications*. Washington, DC: American Psychological Association, pp. 74–104.
- Poston, W. S. C., Taylor, J. E., Hoffman, K. M., Peterson, A. L., Lando, H. A., Shelton, S., & Haddock, C. K.** 2008. Smoking and Deployment: Perspectives of Junior-Enlisted U.S. Air Force and U.S. Army Personnel and Their Supervisors. – *Military Medicine*, 173, pp. 441–447.
- RAND Centre for Military Health Policy Research** 2008. Invisible Wounds of War. <<http://www.rand.org>>, (10.08.2009).
- Reynolds, K. L., Heckel, H. A., Witt, C. E., Martin, J. W., Polland, J. A., Knapik, J. J., & Jones, B. H.** 1994. Cigarette smoking, physical fitness, and injuries in infantry soldiers. – *American Journal of Preventive Medicine*, 10, pp. 145–150.

- Reynolds, K. L., White, J. S., Knapik, J. J., Witt, C. E., & Amoroso, P. J.** 1999. Injuries and risk factors in a 100-mile (161-km) infantry road march. – *Preventive Medicine*, 28, pp. 167–173.
- Robertson, P. B., De Rouen, T. A., Ernster, V., Grady, D., Greene, J., Mancl, L., McDonald, D., & Wash, M. M.** 1995. Smokeless tobacco use: how it affects the performance of major league baseball players. – *Journal of the American Dental Association*, 126, pp. 1115–1121.
- Robertson, P. B., Walsh, M. M., & Greene, J. C.** 1997. Oral effects of smokeless tobacco use by professional baseball players. – *Advances in Dental Research*, 11, pp. 307–312.
- RTI International** 2006. 2005 Department of Defence Survey of Health Related Behaviours among Active Duty Military Personnel. RTI/7841/106-FR.
- Sharma, R. R.** 2009. Visual effect of long-term active smoking: Are air-crew flying NVG aided missions at a disadvantage? Paper presented at 57-th International Congress of Aviation and Space Medicine, Zagreb.
- Shorr, A. F., Scoville, S. L., Cersovsky, S. B., Shanks, G. D., Ockenhouse, C. F., Smoak, B. L., Carr, W. W., & Petruccelli, B. P.** 2004. Acute eosinophilic pneumonia among US Military personnel deployed in or near Iraq. – *The Journal Of The American Medical Association*, 292, pp. 2997–3005.
- Snoddy, R. O., & Henderson, J. M.** 1994. Predictors on basic infantry training success. *Military Medicine*, 159, 616 – 622.
- Stein, R. J., Pyle, S. A., Haddock, C. K., Poston, W. S. C., Bray, R., & Williams, J.** 2008. Reported stress and its relationship to tobacco use among U.S. military personnel. – *Military Medicine*, 173, pp. 271–277.
- Substance Abuse and Mental Health Services Administration** 2006. Results from the 2005 National Survey on Drug Use and Health: National Findings [Office of Applied Studies, NSDUH Series H-30, DHHS Publication No. SMA 06-4194]. Rockville, MD. <<http://www.samhsa.gov>>, (10.08.2009).
- Zadoo, V., Fengler, S., & Catteson, M.** 1993. The effects of alcohol and tobacco use on troop readiness. – *Military Medicine*, 158, pp. 480–484.
- The Information NHS Centre Lifestyles Statistics** 2008. The health survey for England 2006. <<http://www.ic.nhs.uk>>, (10.08.2009).
- Tucker, L. A.** 1989. Use of smokeless tobacco, cigarette smoking, and hypercholesterolemia. – *American Journal of Public Health*, 79, pp. 1048–1050.
- Van Orden, K. F., & Nice, D. S.** 2008. National security interests at the naval health research center. – Mangelsdorff, A. D. (Ed.). *Psychology in the service of national security*. Washington DC: American Psychological Association, pp. 55–70.
- WHO Regional Office for Europe** 2007. The European Tobacco Control Report. <<http://www.euro.who.int>>, (10.08.2009).
- WHO Report on the Global Tobacco Epidemic** 2008. The MPOWER package, Geneva, World Health Organization. <<http://www.who.int>>, (10.08.2009).
- WHO The World Health Report** 2002. Reducing Risks, Promoting Healthy Life. <<http://www.who.int/whr>>, (10.08.2009).
- Williams, J. O., Bell, N. S., & Amoroso, P. J.** 2002. Drinking and other risk taking behaviours of enlisted male soldiers in the US Army. – *Work*, 18, pp. 141–150.

World Health Statistics 2008. Part 1. Ten highlights in health statistics. Reducing deaths from tobacco.

<http://www.who.int/whosis/whostat/EN_WHS08_Part1.pdf>, (10.08.2009)

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