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# HEALTH-RELATED QUALITY OF LIFE IN SOLDIERS IN CROATIA: RELATIONSHIP WITH COMBAT READINESS AND PSYCHOLOGICAL DIMENSIONS

Davorka Perić<sup>1</sup>, Darije Plančak<sup>2</sup>, Martina Bulj<sup>1</sup>, Vedrana Tudor<sup>3</sup>, Stjepan Špalj<sup>4</sup>

<sup>1</sup>Department of Military Medicine, Croatian Army, Zagreb, Croatia

<sup>2</sup>School of Dental Medicine, University of Zagreb, Zagreb, Croatia

<sup>3</sup>Jadran Galenski Laboratory, Rijeka, Croatia

<sup>4</sup>School of Medicine, University of Rijeka, Rijeka, Croatia

## SUMMARY

Health status of soldiers affects their quality of life and combat readiness. The aim of the research was to explore the differences in health-related quality of life (HRQoL) between combat ready and unready soldiers and to what extent are clinically assessed combat readiness and psychological dimensions related to self-reported HRQoL. The study included 402 consecutively selected soldiers aged 21 to 54 (mean age 35.3±6.0) who were classified on the basis of a regular health examination as combat ready (N=327) and unready (N=75). HRQoL was assessed using the Short Form-8 Questionnaire and psychological dimensions using the Brief Symptom Inventory. There were no significant differences in physical and mental components of HRQoL between combat ready and unready soldiers. Clinically assessed combat readiness and psychological symptomatic dimensions were weak predictors of HRQoL. Higher intensity of psychoticism and less years in military service were the only significant predictor of higher physical component of HRQoL ( $p=0.027$  and  $p=0.020$ , respectively) but accounted for low variability (each 1%). None variable was a predictor of mental component. In conclusion, clinically assessed combat readiness of soldiers and psychological symptomatic dimensions are poor predictors of HRQoL. HRQoL should be introduced in evaluation of combat readiness.

*Key words:* quality of life, general health, military, combat readiness, psychological dimensions

**Address for correspondence:** S. Špalj, School of Medicine, University of Rijeka, Braće Branchetta 20, 51 000 Rijeka, Croatia. E-mail: stjepan.spalj@medri.uniri.hr

## INTRODUCTION

The quality of life (QoL) of soldiers implies their ability to participate in professional activities required by the military environment in accordance with the intra-psychological abilities and health status (1). Health-related quality of life (HRQoL) may provide insight into the combat readiness of soldiers as it indicates a self-perceived health, functioning and well-being in the physical, mental and social domain (2–4). Only few researches of HRQoL in soldiers have been published so far (5–8). Heretofore, there has been no research that explored the relationship between psychological dimensions and normative assessed combat readiness with the self-perceived HRQoL. Variations in psychological dimensions in soldiers might affect the self-assessment of HRQoL and the reduction of their combat readiness due to stress during a mission. Therefore, adequately rated level of their combat readiness is what the efficiency of the unit and the success of the mission depend on.

Combat readiness is the capability to perform tasks in armed forces in conditions of war and peace and it is periodically systematically examined. This especially applies to candidates for peacekeeping missions who act in different conditions of warfare, different environments with limited support. It is determined by health status, physical, mental and intellectual characteristics (9). Although the armies of ancient Greece and Rome took care

about the physical and psychological characteristics of soldiers who composed the legions, it was not until the 18th and the 19th century that the systematic control in conscription of soldiers began to be applied (9). Since the beginning of the 20th century, more attention has been paid to the selection of soldiers due to the fast development of armed forces, and the assessment of military capability became a complex task. The criteria for the assessment of combat readiness vary from army to army and are defined in accordance with the concept of armed forces organization, the level of general and technical culture of the population and the health status. The contemporary methods of warfare require great psychophysical efforts from the soldier, so psychological preparation and good physical fitness are obligatory before military deployment (10–12). Physical exhaustion of soldiers disturbs their mental stability and causes frustrations, nervousness, anxiety, aggressiveness, low motivation, indecision, insecurity, fear, and panic (10, 13). Still, dimension of soldiers self-perceived HRQoL is not assessed in evaluation of combat readiness.

The aim of the research was to explore the differences in HRQoL between combat ready and unready soldiers, classified according to medical and fitness evaluation, controlling for age, educational level and military experience. Furthermore, it was aimed to explore to what extent are clinically assessed combat readiness and psychological dimensions related to self-reported HRQoL, controlling for the above-mentioned factors.

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The research hypothesis is that the self-assessed HRQoL is weakly related to the clinically assessed combat readiness of soldiers, but it is considerably under influence of psychological symptomatic dimensions.

## MATERIALS AND METHODS

The study was cross-sectional and a sample consisted of 402 consecutively selected male professional soldiers aged 21 to 54 (mean age 35.3±6.0) during their annual regular health examination at the Department of Military Medicine of Croatian Army in a period from October – November 2010. From the initial sample of 421 soldiers 19 were eliminated due to incomplete or irregularly completed questionnaires. The approval of the Ministry of Defence of the Republic of Croatia (No. 512M2-0301-10/3) was obtained for the research as well as the approval of the Ethics Committee of the University of Zagreb (No. 05-PA-35-XVII-11.1.3.2/11). The respondents signed an informed consent for participation in the research.

The research was performed with validated psychometric instruments and clinical medical examination. The recorded socio-demographic parameters included age, educational level, years in military service, and previous participation in international peacekeeping missions.

HRQoL was assessed using the Short Form-8 Health Survey Questionnaire (SF-8) (14), while psychological dimensions were assessed using the Brief Symptom Inventory (BSI) (15). SF-8 measures HRQoL in eight dimensions grouped in two profiles – the Physical Component Summary Measure (PCS) – dimensions: perception of general health (GH), physical functioning (PF), role-physical (RP) and bodily pain (BP), and the Mental Component Summary Measure (MCS) – dimensions: vitality (VT), social functioning (SF), mental health (MH), and role-emotional (RE) (14). Higher scores indicate higher levels of health.

BSI comprises 53 items for measurement of psychopathology that captures multidimensional measure of psychological symptoms in nine dimensions: somatisation, obsession-compulsion, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism (15). The respondent assesses his intensity of preoccupation or agitation with regard to each of the mentioned 53 problems on the five-level Likert-type scale with limit values of 0 = “not at all” and 4 = “to a great extent”. BSI showed good reliability in the general US and Croatian population (16). BSI enables calculation of three global psychopathology indices which indicates overall psychological distress level, intensity of symptoms and number of self-reported symptoms: the Global Severity Index (GSI), the Positive Symptom Distress Index (PSDI) and the Positive Symptom Total (PST).

The respondents also assessed their health by using the five-level Likert scale with limit values 1 = “excellent” and 5 = “poor” as well as how much care they dedicate to keeping themselves healthy on a scale with limit values 1 = “no care at all” and 5 = “a lot of care”. Psychometric testing was anonymous and self-administered.

The distribution of respondents into the combat ready and combat unready groups was carried out on the basis of a medical check-up defined by the Regulations on Determining Health Requirements for Military Service in the Croatian Army (17). The

medical examinations encompassed determining the status and functional capabilities of all organ systems, organs and sensory organs, central and peripheral nervous system, cognitive capabilities and mental status, and they were performed by specialists of internal medicine, ophthalmology, otorhinolaryngology, physical medicine, occupational medicine, epidemiology, neurology, and psychiatry as well as by a psychologist and intraoral examination without x-rays was performed by dentist. The summary dichotomous rating of the combat readiness (ready or unready) was made by the occupational medicine specialist, based on all examinations performed by all specialists on organ systems and sensory organs.

Mann-Whitney and Chi-square tests were used to test differences in demographic data, military experience, psychological dimensions, and HRQoL between combat ready and unready soldiers in univariate analysis. Multiple logistic regression was used to assess whether parameters of HRQoL can discriminate combat ready and unready soldiers, controlling for age, educational level and military experience. Multiple linear regression analysis was employed to explore the predictive value of clinical and fitness evaluation of combat readiness and psychological dimensions for HRQoL, controlling for the above-mentioned factors. Statistical analysis was performed in commercial software SPSS 10.0 (SPSS Inc., Chicago, Illinois, USA) at significance level  $p < 0.05$ .

## RESULTS

Out of 402 respondents, 19% were qualified as combat unready based on the medical check-up. There was no statistically relevant difference in age, years in military service and educational level between the combat ready and the combat unready soldiers, but the combat unready soldiers have statistically considerably less frequently previously participated in peacekeeping missions ( $p = 0.039$ ). The combat ready and the combat unready equally assess their general health and take equal care of it (Table 1). There were no statistically significant differences in physical and most mental components of HRQoL between combat ready and unready soldiers, and role emotional was the only component that was statistically significantly lower in unready soldiers in univariate analysis ( $p = 0.038$ ) (Fig. 1). Both groups of respondents gave relatively high marks to all general health components.

Combat unready soldiers had higher intensity of obsession-compulsion symptoms ( $p = 0.029$ ), interpersonal sensitivity ( $p = 0.030$ ), depression ( $p = 0.035$ ), and psychoticism ( $p = 0.034$ ) than unready soldiers in univariate analysis (Fig. 1). None of the psychological dimensions was a statistically significant predictor of combat readiness in the multiple logistic regression model (results not shown).

Self-reported health significantly correlated with physical and mental summary measures of SF-8 ( $r = -0.399$  and  $-0.221$ ;  $p < 0.001$ ), and all particular dimensions of SF-8 (in range from  $r = -0.148$  for role emotional to  $-0.485$  for general health). Multiple logistic regression presented in Table 2 was used to assess how well HRQoL can predict combat unreadiness in model with several variables. This approach allowed us to control for the effect of potentially confounding variables age, educational level and military experience. The parameters of physical and mental component of HRQoL are not significant predictors of

**Table 1.** The comparison of demographic and military variables as well as of the health self-assessment with regard to combat readiness

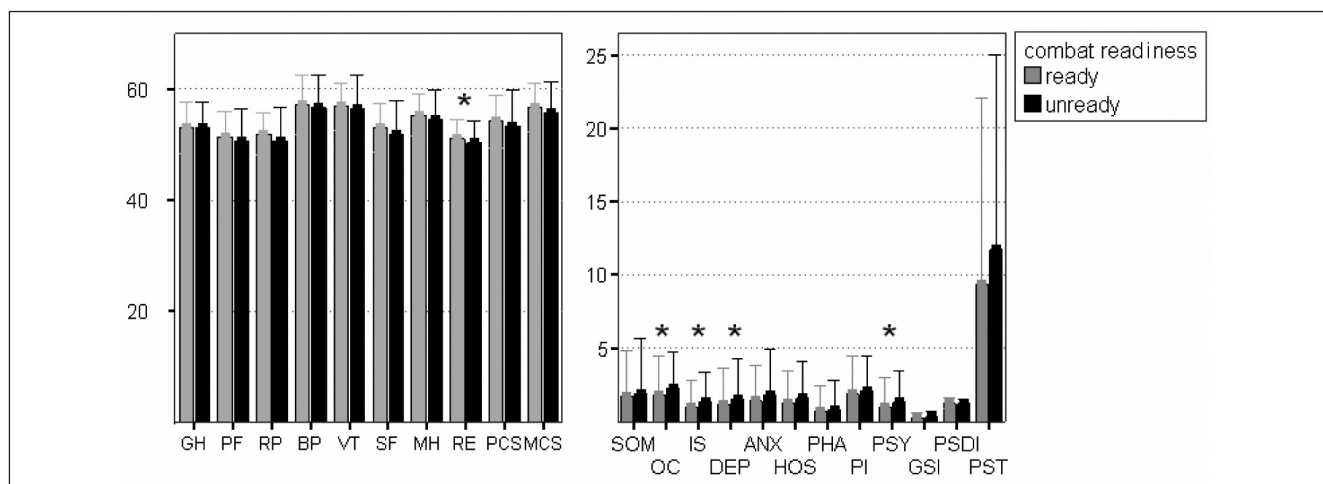
		Combat readiness			p
		Ready N=327	Unready N=75	Total N=402	
Age	Mean ± std. dev.	35.34±6.05	34.96±5.87	35.27±6.01	0.874*
	Median (quartile range)	36 (33–39)	36 (30–40)	36 (33–39)	
Educational level	Elementary school	12 (3.7%)	5 (6.7%)	17	0.436**
	Secondary school	247 (75.5%)	57 (76%)	304	
	College/university	68 (20.8%)	13 (17.3%)	81	
Years in military service	Mean ± std. dev.	13.95±6.29	13.24±5.79	13.82±6.20	0.440*
	Median (quartile range)	15 (10–18)	15 (6–18)	15 (10–18)	
Experience in international military missions	No	131 (40.1%)	40 (53.3%)	171	<b>0.039**</b>
	Yes	196 (59.9%)	35 (46.7%)	231	
Self-assessed health status	Mean ± std. dev.	1.76±0.61	1.84±0.66	1.78±0.62	0.341*
	Median (quartile range)	2 (1–2)	2 (1–2)	2 (1–2)	
Self-assessed health concern	Mean ± std. dev.	3.63±0.70	3.56±0.74	3.62±0.71	0.421*
	Median (quartile range)	4 (3–4)	4 (3–4)	4 (3–4)	

\*Mann-Whitney test, \*\*Chi square test

**Table 2.** Multiple logistic regression model for the prediction of combat unreadiness

Dependent variable	Predictor	B	Std. error	p	Odds ratio	95% confidence interval
Combat unreadiness	Constant	1.241	2.008	0.537		
	Age	0.04	0.047	0.357	1.044	0.952–1.145
	Years in military service	-0.05	0.046	0.261	0.950	0.868–1.039
	No experience in international military missions	0.541	0.267	<b>0.042</b>	1.719	1.019–2.899
	Secondary vs. elementary education	-0.626	0.571	0.273	0.535	0.175–1.637
	Higher vs. elementary education	-0.926	0.633	0.144	0.396	0.114–1.371
	Physical component HRQoL	-0.03	0.025	0.224	0.970	0.932–1.019
	Mental component HRQoL	-0.03	0.026	0.320	0.974	0.925–1.026

Nagelkerke pseudo R<sup>2</sup>=0.041; p=0.166, B – logistic coefficient



**Fig. 1.** Comparison of HRQoL and psychological dimensions between combat ready and unready soldiers.

**Table 3.** Multiple linear regression model for the prediction of physical component of HRQoL assessed by SF-8

Predictors	B	Std. error	$\beta$	p	Correlations		
					Zero-order	Partial	Semi partial
Constant	55.249	2.437		<0.001			
Chronological age	0.128	0.088	0.153	0.149	-0.068	0.073	0.070
Years in military service	-0.201	0.086	-0.248	<b>0.020</b>	-0.108	-0.118	-0.113
Experience in international military missions (1=no, 2=yes)	-0.632	0.515	-0.062	0.220	-0.057	-0.062	-0.060
Combat readiness	-0.960	0.636	-0.074	0.132	-0.064	-0.076	-0.073
Somatisation	-0.082	0.154	-0.052	0.596	-0.169	-0.027	-0.026
Obsession-compulsion	-0.340	0.206	-0.178	0.100	-0.191	-0.084	-0.080
Interpersonal sensitivity	0.362	0.264	0.137	0.172	-0.118	0.069	0.066
Depression	0.213	0.205	0.108	0.299	-0.136	0.053	0.050
Anxiety	-0.396	0.278	-0.201	0.155	-0.186	-0.072	-0.069
Hostility	-0.162	0.201	-0.074	0.421	-0.176	-0.041	-0.039
Phobic anxiety	-0.220	0.297	-0.079	0.460	-0.165	-0.038	-0.036
Paranoid ideation	-0.181	0.166	-0.092	0.275	-0.137	-0.055	-0.053
Psychoticism	0.573	0.258	0.232	<b>0.027</b>	-0.110	0.112	0.108

R=0.295, R<sup>2</sup>=0.087, F=2.853, p=0.001, B – unstandardized coefficient,  $\beta$  – standardized coefficient

combat readiness, and only absence of previous involvement in international peacekeeping military missions is significant predictor producing 1.7 times higher odds for combat unreadiness (p=0.042) (Table 2).

It can be seen from zero-order correlations in Table 3 that physical component of HRQoL significantly correlates with several psychological dimensions in univariate analysis, but the correlation is weak and negative in range from -0.110 for psychoticism to -0.191 for obsession-compulsion. Higher HRQoL was associated with lower intensity of psychological dimensions. The highest independent power in prediction of physical component of HRQoL has obsessive compulsion which accounted for 3.6% of variability, but in multivariate model the psychological symptomatic dimensions were mainly not significant predictors of HRQoL. Similarly, in multiple logistic regression, the approach of controlling for the effect of potentially confounding variables age, military experience and combat readiness in assessing how well psychological dimensions can predict HRQoL was used in multiple linear regressions presented in Tables 3 and 4. Higher intensity of psychoticism and less years in military service, controlling for all other variables, were the only significant predictor of better physical component of HRQoL (p=0.027 and p=0.020, respectively), but they accounted for low variability (each 1%). Whole model accounted for 8.7% of variability in physical component HRQoL (p=0.001) leaving a large portion of variability unexplained.

Zero-order correlations in Table 4 demonstrate that mental component of HRQoL significantly correlates in univariate analysis with general psychological dimensions but correlation is weak linear negative in range from -0.32 for hostility to -0.412 for anxiety. In the univariate model the highest predictive value has anxiety accounting for 17% of variability but in the multivariate model no psychological dimension has statistically significant value in predicting mental component of HRQoL (Table 4).

## DISCUSSION

Military service constitutes a specific working environment where the psychophysical combat readiness is a key working element. Therefore, it is necessary to often simulate psychophysical strain that can be expected in military tasks, and monitor soldiers health and fitness. In wars and military actions the non-war injuries and impaired HRQoL can cause notable loss of manpower, i.e. their inability to perform military tasks.

This study demonstrated absence of relationship between HRQoL and combat readiness defined by health and fitness evaluation. Mental and physical components of HRQoL and self-reported health level can not discriminate clinically classified combat ready and unready soldiers. It confirms that those are two separate categories of health status and that normative evaluation fail to detect soldier's daily functioning related to his own health condition.

Some psychological dimensions (obsession-compulsion symptoms, interpersonal sensitivity, depression, psychoticism, and role-emotional of HRQoL) are more pronounced in combat unready soldiers indicating that those dimensions are to some extent estimated in the existing system of medical combat readiness evaluation. The research carried out among American soldiers and veterans of the Gulf War indicated the highest marks in physical functioning and physical role, and the lowest in general health and vitality (5), which corresponds to this research. Croatian soldiers in both groups gave relatively high marks to all HRQoL components, and much higher marks to mental health and physical pain than Americans. The differences in values may be attributed to cultural differences that may modify the understanding of the quality of life. It is demonstrated that multi-item HRQoL instrument SF-8 significantly correlates with one-item self-reported health status of Croatian soldiers, therefore, they are measuring similar construct. Self-rated overall health appears to be a valid measure of health status among soldiers (18). Moreover, poorer self-rated



**Table 4.** Multiple regression model for the prediction of mental component of HRQoL assessed using SF-8

Predictors	B	Std. error	$\beta$	p	Correlations		
					Zero-order	Partial	Semi partial
Constant	56.979	2.079		<0.001			
Chronological age	0.050	0.075	0.066	0.509	0.013	0.034	0.030
Years in military service	-0.060	0.074	-0.081	0.413	-0.007	-0.042	-0.037
Experience in international military missions (1=no, 2=yes)	0.323	0.439	0.035	0.463	0.059	0.037	0.033
Combat readiness	-0.742	0.542	-0.063	0.172	-0.077	-0.069	-0.062
Somatisation	-0.205	0.131	-0.145	0.119	-0.396	-0.079	-0.071
Obsession-compulsion	0.216	0.176	0.124	0.220	-0.338	0.062	0.056
Interpersonal sensitivity	-0.109	0.225	-0.045	0.630	-0.377	-0.024	-0.022
Depression	-0.151	0.175	-0.084	0.389	-0.379	-0.044	-0.039
Anxiety	-0.330	0.237	-0.184	0.165	-0.412	-0.070	-0.063
Hostility	0.107	0.172	0.054	0.532	-0.320	0.032	0.028
Phobic anxiety	-0.452	0.253	-0.179	0.076	-0.397	-0.090	-0.081
Paranoid ideation	-0.172	0.142	-0.096	0.226	-0.334	-0.061	-0.055
Psychoticism	0.225	0.220	0.100	0.307	-0.354	0.052	0.047

R=0.446, R<sup>2</sup>=0.199, F=9.324, p<0.001, B – unstandardized coefficient,  $\beta$  – standardized coefficient

health is a significant predictor of longer sick-leave duration (19). Although in the univariate analyses the combat unready soldiers had a statistically higher impact of limitations on everyday activities due to emotional troubles as well as higher intensities of some psychological dimension than the combat ready soldiers, none of the specific psychological dimensions was a significant predictor of soldier combat readiness in multivariate analyses.

The biopsychosocial model of health assumes that diseases are under the influence of not only the basic pathology, but also the individual's perception, personality traits and stress (20). It seems that a current medical condition or disease contributes to the explanation of 12–24% in the variability of HRQoL (21). Additional cofactors such as socio-demographic, physiological and therapeutic characteristics as well as the duration and intensity of disease must be taken into consideration as they may contribute to the explanation of up to 40% of HRQoL (22, 23).

According to our study variations in psychological traits do not highly influence self-reported HRQoL of soldiers. With the rise in HRQoL the psychological symptomatic dimensions tend to decrease, and psychoticism is the only psychological dimension which, along with the control of other factors in the multivariate model has statistically significant value in the prediction of the physical component of HRQoL. However, it explains only 1% of the variability. In the multivariate model, the higher intensity of psychoticism is in connection with a higher mark of the HRQoL physical component. Psychoticism is characterised by emotional coldness, egocentrism, inability of empathy, thoughtlessness, rashness and impulsiveness (24). There are standards for certain military professions where a slightly more pronounced psychoticism may even be desirable in commanding positions.

As expected, mental component of HRQoL has a stronger correlation with general psychological dimensions than the physical component, and with the rise in mental component of HRQoL the psychological symptomatic dimensions decrease. Anxiety has the highest individual correlation in the univariate model with the

mental component. It is a condition characterised by a feeling of inner angst, agitation, intimidation, and the fear that something terrible is going to happen along with psychomotor tension and inner restlessness (25). It is a result of accumulated stress in life, and an anxious person is constantly in a state of preparedness. Nevertheless, the predictive value of psychological symptomatology is surprisingly low in the explanation of the mental component of the HRQoL, especially because in the multivariate model none of the psychological components presents a significant predictor. Richardson et al. determined that the intensity of depression has a significant predictive role in the assessment of the mental and physical components of HRQoL in war veterans with post-traumatic stress disorder (PTSD) (6). PTSD may affect the quality of life and impair the psychosocial functioning and general well-being (26).

The present study demonstrated that current medical and fitness evaluation in the Croatian Army fail to assess HRQoL. Even with the control of variations in psychological dimensions and demographic factors in addition to clinically assessed combat readiness good prediction of HRQoL can not be accomplished. Epidemiological studies indicate increased symptomatology in soldiers who participated in war events, such as those in the Gulf War, and the impact of war on HRQoL (5, 27–29). Modifying factors such as smoking, combat readiness, morbidity in physical and mental health were independent risk factors for lower HRQoL after the departure to a war mission (5). In our research the participation in war missions was not a significant predictor of lower HRQoL, but shorter years in military service were a significant predictor of better physical component of HRQoL, while the age of the soldier was not. This indicates that the military service with its requirement of constant physical fitness probably increases tiredness in soldiers by lowering their self-assessed health level. It corresponds with the previous finding that active duty soldiers are five times more likely to report active limitations and pain and two times more likely to report not enough rest days (on

a basis of 14+ days duration) than non-military population (8). None of the psychological pre-war morbidity factors in American soldiers was a predictor of the physical component of HRQoL after the Gulf War. However, PTSD and depression were significant pre-war morbidity factors of risk for the after-war lower mental component of HRQoL (5). Moderate combat readiness in comparison with low combat readiness increases the quality of life's physical component by 2.5 scalar points, high readiness in relation to moderate readiness increases the physical component by 4.9 scalar points and the mental component of HRQoL by 3.1 points. General health and vitality were what made the most significant difference between the soldiers who participated in a war from those who did not, followed by the components of physical pain and mental health, while physical and emotional functioning and related roles had the lowest impact (5). The data indicate the importance of HRQoL assessment before going to war and peacekeeping missions.

According to this study the relationship between self-perceived HRQoL and clinically assessed combat readiness is weak with poor influence of psychological dimensions. Therefore, the HRQoL instruments can be valuable tools in evaluation of combat readiness in addition to medical and fitness examination. By introducing a multidimensional approach this would give a biopsychosocial perspective of combat readiness. The HRQoL instruments can be used for identification of soldiers who, although classified as combat ready according to medical and fitness evaluation, have a higher chance of reporting difficulties in performing military tasks due to self-perceived impairment of HRQoL after deployment. It would reduce the loss of manpower and increase the likelihood for efficient performance of military missions.

## CONCLUSION

HRQoL can not discriminate combat ready and unready soldiers, classified according to medical and fitness evaluation. Clinically assessed combat readiness of soldiers and psychological symptomatic dimensions are poor predictors of HRQoL. HRQoL should be introduced as an additional instrument in evaluation of combat readiness.

## Conflict of Interest

None declared

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