VALIDATION OF THE *STUDY BURNOUT INVENTORY* AND THE *COPENHAGEN BURNOUT INVENTORY* FOR THE USE AMONG MEDICAL STUDENTS

JOVANA TODOROVIC[1], ZORICA TERZIC-SUPIC[1], JELENA DIVJAK[2], ZELJKA STAMENKOVIC[1], STEFAN MANDIC-RAJCEVIC[1], SANJA KOCIC[3], SNEZANA UKROPINA[4,5], ROBERTA MARKOVIC[6], OLIVERA RADULOVIC[6], ALEKSANDRA ARNAUT[7], PAVLE PIPERAC[8], MOMCILO MIRKOVIC[9], and DEJAN NESIC[10]

[1] University of Belgrade, Belgrade, Serbia
Faculty of Medicine, Institute of Social Medicine

[2] University of Belgrade, Belgrade, Serbia
Faculty of Medicine

[3] University of Kragujevac, Kragujevac, Serbia
Faculty of Medical Sciences, Department of Social Medicine

[4] University of Novi Sad, Novi Sad, Serbia
Faculty of Medicine, Chair for Social Medicine and Health Statistics with Informatics

[5] Institute of Public Health of Novi Sad, Novi Sad, Serbia

[6] University of Nis, Nis, Serbia
Faculty of Medicine, Department of Social Medicine and Hygiene with Medical Ecology

[7] University of Kragujevac, Kragujevac, Serbia
Faculty of Medical Sciences, Department of Stomatology

[8] University of Belgrade, Belgrade, Serbia
Faculty of Medicine, Department of Humanities

[9] University of Pristina – Kosovska Mitrovica, Kosovska Mitovica, Serbia
School of Medicine, Department for Preventive Medicine

[10] University of Belgrade, Belgrade, Serbia
Faculty of Medicine, Institute of Medical Physiology

Abstract
Objectives: The aim of this study was to assess the validity and reliability of the Serbian versions of the *Copenhagen Burnout Inventory* (CBI) and the *Study Burnout Inventory* (SBI) among fifth-year medical students at 5 universities in Serbia. **Material and Methods:** The study included 573 fifth-year medical students at 5 universities in Serbia. The research instrument consisted of SBI and CBI. The reliability of these instruments was assessed using an internal consistency measure (Cronbach's α), an intra-class coefficient (ICC) and factor analysis. **Results:** Cronbach's α for SBI was 0.83, including for exhaustion 0.73, for cynicism 0.70, and for inadequacy 0.48. The test-retest reliability (ICC) was 0.75. Cronbach's α for personal burnout on CBI was 0.89, for the faculty-related burnout 0.86, and for the faculty-members-related burnout 0.92. Cronbach's α for CBI was 0.93. The factor analysis for SBI showed 2 factors and for CBI 3 factors. **Conclusions:** This study revealed that the Serbian versions of both SBI and CBI could be used for the assessment of burnout in this population. Int J Occup Med Environ Health. 2021;34(6):737–45

Key words:
students, validation, CBI, *Study Burnout Inventory, Copenhagen Burnout Inventory,* SBI

INTRODUCTION

Burnout syndrome is conceptualized as "resulting from chronic workplace stress that has not been successfully managed and is characterized by 3 dimensions: energy depletion or exhaustion, increased mental distance from one's job or feelings of negativism or cynicism related to one's job, and reduced professional efficacy." This definition is contained in the chapter entitled "Factors influencing health status or contact with health services" in ICD-11, and is not classified as an illness or a health condition [1].

Tertiary education is considered highly demanding [2,3]. Study-related fatigue, strain and stress can be the initial signs of burnout in the student population. These can be accompanied with feelings of distancing from studying, a loss of interest and not perceiving higher education as meaningful [3]. Students can also have a feeling of diminished confidence and accomplishment [3].

It was previously shown that almost 50% of medical students develop symptoms of burnout at some point during their studies [4]. The symptoms become more prevalent during the transition to patient-care settings [5], usually during final years of medical studies (for example, in Serbia it is during the fourth, fifth and sixth years of studies at medical faculties). It is, therefore, important to pay attention to prompt detection of burnout among these students. The early detection of burnout can help improve students' well-being and their general mental health. The studies which help identify the prevalence of, and factors associated with, burnout among medical students can help develop evidence-based programs for the prevention of burnout [4].

The most commonly used questionnaire on burnout was developed by Maslach and it measures burnout in 3 dimensions: emotional exhaustion, depersonalization and a lack of personal accomplishment [6]. The main constraint as to the use of the *Maslach Burnout Inventory* (MBI) is that it was intended for the use among service professionals. Consequently, the Danish National Institute of Occupational Health developed the *Copenhagen Burnout Inventory* (CBI) with the aim of measuring burnout in different settings [7,8]. The concept behind the development of CBI was that burnout syndrome is not only associated with emotional exhaustion, but also with physical exhaustion, which develops in the personal sphere, the work sphere and in interactions with clients [7]. This concept has led to the development of 3 subscales of CBI (personal burnout, work-related burnout and client-related burnout) [7]. While CBI can be used in different settings, including the student population, it was not specifically developed for students. The instruments for assessment purposes need to be reliable, but should also be especially adapted for the student population. Therefore, the *Study Burnout Inventory* (SBI) was developed based on the *School Burnout Inventory* and the *Work Burnout Inventory* [3], showing good reliability.

To the best of the authors' knowledge, although studies regarding burnout syndrome were previously conducted in Serbia, MBI was most commonly used as the instrument

in these studies [9–12], although one of the 3 scales of CBI, i.e., the *Work Burnout Scale*, was validated in Serbian practice [13].

The aim of this study was to assess the validity and reliability of the Serbian versions of CBI and SBI among the fifth-year medical students at 5 universities in Serbia.

MATERIAL AND METHODS

The cross-sectional study including 573 fifth-year medical students from 5 universities in Serbia (Belgrade, Kraguje-vac, Nis, Novi Sad and Kosovska Mitrovica) was conducted in the last week of December 2019. The total response rate was 54.06% (573/1060).

Research instrument

The research instrument contained 2 questionnaires on burnout: SBI [3] and CBI [7]. The *Study Burnout Inventory* is a 9-item scale measuring burnout in the following 3 dimensions: exhaustion (4 questions), cynicism (3 questions), and inadequacy (2 questions). The answers are provided on a 6-point Likert scale ranging from 0 ("completely disagree") to 5 ("completely agree"). The overall score in the questionnaire ranges 0–45. The *Copenhagen Burnout Inventory* is a 19-item scale measuring burnout in the following dimensions: personal burnout (6 questions), job-related burnout (7 questions), and client-related burnout (6 questions). The questionnaire was specially adapted for the purposes of this research. The section on job-related burnout was adapted to faculty-related burnout, and the section on client-related burnout was adapted to faculty-members-related burnout.

Answers for CBI are provided on a 5-point Likert scale, ranging from 0 ("never") to 4 ("always"). The answers are then transformed in the percentages of time: 0 – 0%, 1 – 25%, 2 – 50%, 3 – 75%, and 4 – 100%. The score in each dimension is calculated as an average percentage on the questions regarding that dimension, and the total score is calculated as the average score for the 3 dimensions com-

bined. The participants with an overall score of >50% are considered to have developed total burnout, and the participants with >50% in a given dimension are considered to have been burnt out in that specific domain [14]. The questionnaires were forward and back translated to the Serbian language according to the recommendations by the World Health Organization [15]. The pilot testing was done on 20 participants to examine if the questions were clear and understandable, and if their order was correct, as well as to determine the time needed to fill in the questionnaire.

Data collection procedure

The students were asked to fill in the anonymous questionnaire during practical classes in social medicine. The students were given information about the study, its processes and aims, and were then asked to fill in the questionnaire. The authors considered that all the students who had filled-in and returned the questionnaires gave their consent for the participation in the research. The study was approved by the Ethics Committee of the Faculty of Medicine, University of Belgrade, Belgrade, Serbia (No. 1322/V-17).

Study sample

The study included a total of 573 fifth-year medical students from 5 universities in Serbia. The majority of these students were from the University of Belgrade (N = 311, 54.3%), 86 (15.0%) were from the University of Kragujevac, 66 (11.5%) were from the University of Kosovska Mitrovica, 58 (10.1%) were from the University of Nis, and 52 students (9.1%) were from the University of Novi Sad. The majority of the students were females (N = 374, 65.8%). The average age of the study participants was 23.83±1.75 years.

Variables

The authors analyzed 11 variables in total, i.e., sex, age, university, scores on SBI (exhaustion, cynicism, inad-

equacy and overall), and scores on CBI (personal burnout, faculty-related burnout and faculty-members-related burnout and overall).

Statistical analyses

The methods of the descriptive and analytical statistics were applied. The internal consistency of the scales was assessed using Cronbach's α. The test-retest consistency was assessed using intra-class coefficients (ICCs). The exploratory factor analysis was done to explore the factor structure based on the original construct for both questionnaires. The extraction of factors was done using promax rotation as the hypothesis was that the factors are correlated. The values for the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity (preferably significant) were used to assess the suitability of data for factorisation. The criterion for loading and cross-loading was set at 0.4, and based on this, items with loading of <0.4 and cross-loading of >0.4 were deleted. The goodness of fit measures included the goodness of fit index (GFI), the adjusted goodness of fit index (AGFI), the comparative fit index (CFI), and the root mean error of approximation (RMSEA). Finally, Pearson's correlation was used to examine the correlation between the total scores on SBI and CBI. The analyses were done using the SPSS v. 22.0 and the AMOS v. 22.0.

RESULTS

The average score (M±SD) on SBI was 20.04±9.07/45, and the median (Me) score was 20.00. The average score in the exhaustion dimension was 9.74±4.35/20, in the cynicism dimension 5.30±3.70/15, and in the inadequacy dimension 5.01±2.56/10. Cronbach's α was:
- for the entire SBI – 0.85,
- for exhaustion – 0.73,
- for cynicism – 0.78,
- for inadequacy – 0.48.

The test-retest reliability (ICC) was 0.75.

The average score on CBI was M±SD 42.27±16.75/100 (Me = 41.47). The average score on personal burnout was M±SD 36.09±17.27, on faculty-related burnout M±SD 49.12±19.74, and on faculty-members-related burnout M±SD 41.69±22.84. A total of 166 students (32.2%) developed burnout according to CBI.

Cronbach's α was:
- for personal burnout on CBI – 0.89,
- for faculty-related burnout – 0.86,
- for faculty-members-related burnout – 0.92
- for the entire CBI – 0.93.

There were no significant floorings or ceilings.

The average scores and reliability of the scales are presented in Table 1.

There were some significant differences in total scores (M±SD) on SBI between male and female participants (18.56±9.80/45 vs. 20.77±8.62/45, p = 0.007), as well as in the exhaustion (8.89±4.73/20 vs. 10.16±4.08/20, p < 0.001) and inadequacy dimensions (4.57±2.64/10 vs. 5.21±2.51/10, p = 0.005), but the authors did not find any significant difference between the sexes as regards cynicism (5.09±3.86/15 vs. 5.39±3.61/15, p = 0.368).

On CBI, there were some significant differences between male and female participants in the scores (M±SD) on faculty-related burnout (46.01±21.55/100 vs. 50.55±18.83/100, p = 0.015) and personal burnout (30.87±17.04/100 vs. 38.48±16.99/100, p < 0.001), but no differences were found in the scores (M±SD) on faculty-members-related burnout (41.71±25.64/100 vs. 41.72±18.83/100, p = 0.993) and total scores (M±SD) on CBI (38.94±17.60/100 vs. 41.81±15.42/100, p = 0.062).

The exploratory factor analysis for SBI showed 2 factors. The factor loading ranged 0.58–0.84. The 2 factors explained 57.67% of the variance, including factor 1 – 45.66% and factor 2 – 12.01%. The KMO measure of sampling adequacy was 0.871 and Bartlett's test of sphericity was statistically significant (p < 0.001). The results

Table 1. Scores on the *Study Burnout Inventory* (SBI) and the *Copenhagen Burnout Inventory* (CBI), and Cronbach's α among fifth-year medical students in December 2019, Serbia

Inventory and scale	Score [pts] (M±SD)	Cronbach's α	Participants (N = 573) [n (%)]	
			min.	max
SBI				
total	29.09±9.16	0.83	0 (0)	2 (0.4)
exhaustion	13.75±4.35	0.73	6 (1.1)	4 (0.7)
cynicism	8.35±3.99	0.70	49 (8.7)	7 (1.2)
inadequacy	6.99±2.57	0.48	27 (4.7)	24 (4.2)
CBI				
total	42.27±16.75	0.89	0 (0)	0 (0)
personal burnout	36.09±17.27	0.86	6 (1.1)	0 (0)
faculty-related burnout	49.12±19.74	0.92	0 (0)	2 (0.4)
faculty-members-related burnout	41.69±22.84	0.93	15 (2.9)	9 (1.7)

Min. – students with the lowest possible score on the scale; max – students with the highest possible score on the scale.

Table 2. Factors and factor loadings for each item using the principal component analysis with promax rotation and Kaiser normalization – the *Study Burnout Inventory* among fifth-year medical students in December 2019, Serbia

Item (the original scale)	Item description	Factor	
		1	2
7 (EXH)	think about problems related to studying during free time	0.81	
4 (EXH)	often sleep badly because of matters related to studying	0.74	
9 (EXH)	pressure of studying is causing problems in personal relationships	0.74	
1 (EXH)	overwhelmed by studying	0.61	
3 (INAD)	often have feelings of inadequacy	0.64	
6 (CYN)	wondering if studying has a meaning		0.84
5 (CYN)	feel like losing interest in studying		0.83
8 (INAD)	used to have higher expectations		0.73
2 (CYN)	feel lack of motivation in studying		0.58

CYN – cynicism; EXH – exhaustion; INAD – inadequacy.

from the exploratory factor analysis for SBI are presented in Table 2. The internal consistency for factor 1 was 0.76 and for factor 2 0.74. The confirmatory factor analysis of the 2-factor model of SBI showed that GFI was 0.96, AGFI was 0.93; CFI was 0.95, and RMSEA was 0.07 (95% CI: 0.06–0.09).

The component correlation matrix for SBI is presented in Table 3.

Table 3. Component correlation matrix (principal component analysis), promax rotation with Kaiser normalization among fifth-year medical students in December 2019, Serbia

Component	Correlation	
	factor 1	factor 2
Factor 1	1.00	0.56
Factor 2	0.56	1.00

The factor analysis for CBI showed 3 factors. The factor loadings ranged 0.33–0.83. The 3 factors explained 65.61% of the variance, including factor 1 – 46.10%, factor 2 – 13.45%, and factor 3 – 6.07%. The KMO measure of sampling adequacy was 0.931 and Bartlett's test of sphericity was statistically significant (p < 0.0001). The confirmatory factor analysis for the 3-factor model of CBI showed that GFI was 0.87, AGFI was 0.83, CFI was 0.91, and RMSEA was 0.09 (95% CI: 0.08–0.10).

The results from the factor analysis for CBI are presented in Table 4.

In order to maximize factor loadings, as item 13 "Time for friends and family" had insufficient loading, the authors

Table 4. Factors and factor loadings for each item using the principal component analysis with promax rotation and Kaiser normalization – the *Copenhagen Burnout Inventory* among fifth-year medical students in December 2019, Serbia

Item	Item description	Factor		
		1	2	3
FMRB				
FMRB5	tired of working with faculty-members	0.89		
FMRB2	frustrating to work with faculty-members	0.89		
FMRB3	energy to work with faculty-members	0.88		
FMRB1	find it hard to work with faculty-members	0.84		
FMRB6	able to continue working with faculty-members	0.82		
FMRB4	give more than get back	0.79		
PB				
PB2	physically exhausted		0.84	
PB5	feel worn out		0.83	
PB1	feel tired		0.82	
PB4	can't take it anymore		0.80	
PB3	emotionally exhausted		0.79	
PB6	feel weak and susceptible to illness		0.74	
FRB				
FRB2	feel burnt out			0.89
FRB1	emotionally exhausting			0.85
FRB3	faculty is considered frustrating			0.79
FRB6	feel that every hour studying is tiring			0.78
FRB4	feel worn out at the end of the day			0.77
FRB5	exhausted in the morning			0.77
FRB7	time for friends and family			0.32

FMRB – faculty-members-related burnout; FRB – faculty-related burnout; PB – personal burnout.

Table 5. Factors and factor loadings for each item using the principal component analysis with promax rotation and Kaiser normalization – the *Copenhagen Burnout Inventory* if the item with the lowest loading is deleted among fifth-year medical students in December 2019, Serbia

Item	Item description	Factor		
		1	2	3
FMRB				
FMRB5	tired of working with faculty-members	0.89		
FMRB2	frustrating to work with faculty-members	0.89		
FMRB3	energy to work with faculty-members	0.88		
FMRB1	find it hard to work with faculty-members	0.84		
FMRB6	able to continue working with faculty-members	0.83		
FMRB4	give more than get back	0.79		
PB				
PB2	physically exhausted		0.84	
PB5	feel worn out		0.83	
PB1	feel tired		0.81	
PB4	can't take it anymore		0.80	
PB3	emotionally exhausted		0.79	
PB6	feel weak and susceptible to illness		0.74	
FRB				
FRB2	feel burnt out			0.89
FRB1	emotionally exhausting			0.85
FRB3	faculty is considered frustrating			0.80
FRB6	feel that every hour studying is tiring			0.78
FRB5	exhausted in the morning			0.77
FRB4	feel worn out at the end of the day			0.77

Abbreviations as in Table 4.

conducted an exploratory factor analysis after item 13 was deleted. The exploratory factor analysis showed 3 factors that explained 68.86% of the total variance, including factor 1 – 48.31%, factor 2 – 14.17%, and factor 3 – 6.38%. The factor loading for this model is presented in Table 5. The loadings ranged 0.74–0.89. The confirmatory factor analysis for this model showed that GFI was 0.87, AGFI was 0.83, CFI was 0.91, and RMSEA was 0.09 (95% CI: 0.08–0.10).

The component correlation matrix for CBI is presented in Table 6.

Table 6. Component correlation matrix (principal component analysis), promax rotation with Kaiser normalization among fifth-year medical students in December 2019, Serbia

Component	Correlation		
	factor 1	factor 2	factor 3
Factor 1	1.00	0.42	0.52
Factor 2	0.42	1.00	0.68
Factor 3	0.52	0.68	1.00

The correlation between the scores on the instruments was 0.70, $p < 0.001$.

DISCUSSION

This study investigated the validity and reliability of the Serbian versions of SBI and CBI in student populations in Serbia. The authors showed that both questionnaires had good reliability and validity, and could be used for the assessment of burnout in student populations. More specifically, CBI showed a higher internal consistency and Cronbach's α ranged 0.86–0.93. Although SBI had a high Cronbach's α value for the entire scale (0.85), the inadequacy dimension showed the lowest internal consistency of 0.48. This supports the use of both questionnaires in the student population in Serbia.

The internal consistency of CBI in this study was similar, but a bit higher than the previously reported results of 0.82–0.90 [8]. As previously noted [8], there were no flooring or ceiling effects. The exploratory factor analysis showed 3 factors with good factor loadings, and explained >60% of the variance [16]. The factors corresponded to the scales in the instrument. Previous studies showed that the work-related burnout dimension had the lowest factor loadings [8,17]. This was the faculty-related burnout in this study, with the factor loadings varying 0.33–0.80, but this factor explained around 20% of the total variance.

In the study of psychometric characteristics of the Persian version of CBI, the exploratory factor analysis showed that item 13 of the questionnaire ("I do not have enough time for friends and family") belongs to the same factor as the questions regarding personal burnout [17]. In the present study, this item represented the same factor as questions regarding faculty-related burnout, i.e., as in the original questionnaire, although the factor loading for this item was low (0.33) [7]. As the factor loading for this item was low, in the second model the authors deleted the item in order to maximize factor loadings. However, this change did not lead to any difference in the CFA model fit results.

To sum up, SBI is a short and convenient instrument for the assessment of burnout and the analysis performed by the authors showed that it had a good internal consistency as a total scale, although the internal consistency of the inadequacy dimension was quite low. The exploratory factor analysis showed that this scale has 2 factors (compared to the 3 scales of the original questionnaire), and the questions regarding inadequacy are grouped with the questions regarding the other 2 dimensions (one represents factor 1 along with the items regarding exhaustion, and the other represents factor 2 along with questions on cynicism). The internal consistency of SBI when the questions on inadequacy were classified according to the factors from the exploratory factor analysis increased to 0.76 for factor 1 and to 0.74 for factor 2.

The main limitation of this study is that the authors used CBI as a standard for assessing the specificity and sensitivity of SBI, although their study was first to assess its validity. However, there was a strong correlation between the total scores on both scales, and both instruments showed high internal consistency, low flooring and low ceiling effects. The factor analysis for CBI showed that the items group in factors which are in accordance with the dimensions of the instrument, while the analysis for SBI showed that the items group in 2 factors, but the dimensions corresponding to these factors have good internal consistency.

CONCLUSIONS

The assessment of burnout and factors associated with burnout is important for the development of programs aiming to increase students' well-being and improve their mental health, which can also provide a chance of reducing the percentages of students prolonging their studies due to burnout. The proper assessment cannot be done unless there are reliable instruments, convenient for the use in the student population. This study showed that Serbian versions of both SBI and CBI could be used for the assessment of burnout in this population.

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