



## The impact of somatic symptoms on depressive and anxiety symptoms among university students in central Serbia

### Uticaj somatskih tegoba na nastanak depresivnosti i anksioznosti kod studenata u Srbiji

Ivana Simić Vukomanović\*<sup>†</sup>, Goran Mihajlović\*<sup>‡</sup>, Dragan Milovanović<sup>†</sup>,  
 Sanja Kocić\*<sup>†</sup>, Svetlana Radević<sup>†</sup>, Svetlana Djukić<sup>†</sup>, Vladimir Vukomanović<sup>†</sup>,  
 Slavica Djukić Dejanović<sup>§</sup>

\*Institute of Public Health Kragujevac, Kragujevac, Serbia; University of Kragujevac,  
<sup>†</sup>Faculty of Medical Sciences, Kragujevac, Serbia; Clinical Center Kragujevac, <sup>‡</sup>Clinic for  
 Psychiatry, Kragujevac, Serbia; <sup>§</sup>Clinic for Psychiatry “Laza Lazarevic”, Belgrade, Serbia

#### Abstract

**Background/Aim.** Depression and anxiety problems are a major public health concern due to their high prevalence rates, difficult treatment, and often chronic course. This study examined the impact of somatic symptoms on depressive and anxiety symptoms among university students in Serbia. **Methods.** A cross-sectional study was performed among 1,940 students using a questionnaire specially designed for this study which included presence of Somatic and Non-specific Mental Symptoms (SNMS), Beck Depression Inventory and Beck Anxiety Inventory. The presence of somatic and associated non-specific mental symptoms over the last six months served as the basis for creating a new variable called SNMS score. **Results.** Receiver operating characteristic (ROC) curve showed that the SNMS score might be a very good marker for the distinction of students with or without depressive symptoms (area = 0.754,  $p < 0.05$ ). The threshold value was 8.50 (sensitivity 67.6%, specificity 69.4%). Binary logistic regression showed that Odds ratio was 1.052 [95% confidence interval (CI) 1.045–1.059], which

means that an increase in the value of the SNMS score by 1 increases the risk of depressive symptoms by 5.2%. ROC curve showed that the SNMS score might be an excellent marker for the distinction of students with or without anxiety symptoms (area = 0.800,  $p < 0.05$ ). Limit value (cut-off) was 7.50 (sensitivity 74.2%, specificity 71.6%). Binary logistic regression showed that odds ratio was 1.056 (95% CI 1.049–1.064), which means that increasing the value of SNMS score by 1 increases the risk of anxiety symptoms by 5.6%. **Conclusion.** The SNMS score might be a state marker for the screening and distinction of students with depressive symptoms, and excellent state marker for screening and making distinction between students with anxiety symptoms and the students who do not have these symptoms.

**Key words:**  
 depression; anxiety; signs and symptoms;  
 psychophysiologic disorders; surveys and  
 questionnaires; students; serbia.

#### Apstrakt

**Uvod/Cilj.** Depresija i anksioznost predstavljaju ozbiljan javnozdravstveni problem koji karakteriše visoka prevalencija, hronični tok i dugotrajan proces lečenja. Cilj istraživanja bio je da se utvrditi uticaj somatskih i pridruženih nespecifičnih psihičkih simptoma na nastanak depresivnosti i anksioznosti kod ispitivane studentske populacije. **Metode.** Istraživanje je sprovedeno kao epidemiološka studija preseka na uzorku od 1 940 studenata, korišćenjem upitnika konstruisanog za potrebe istraživanja koji je pored karakteristika somatskih i pridruženih nespecifičnih psihičkih simptoma (*Somatic and Non-specific Mental Symptoms* – SNMS), obuhvatao Bekovu skalu za procenu depresivnosti i Bekovu skalu za procenu

anksioznosti. Prisustvo određenih somatskih i pridruženih nespecifičnih psihičkih simptoma tokom poslednjih šest meseci poslužilo je za kreiranje nove varijable nazvane SNMS skor. **Rezultati.** Receiver operating characteristic (ROC) kriva pokazala da je vrednost SNMS skora vrlo dobar marker za distinkciju studenata sa depresivnošću od studenata bez nje (area = 0,754,  $p < 0,05$ ). Granična vrednost bila je 8,50, senzitivnost 67,6%, a specifičnost 69,4%. Binarna logistička regresija pokazala je da vrednost SNMS utiče na pojavu depresivnosti. Količnik rizika (*Odds ratio* – OR) bio je 1,052 [95% interval poverenja (IP) 1,045–1,059], što znači da se povećanjem vrednosti ove promenljive za 1, povećava rizik od nastanka depresivnosti za 5,2%. ROC kriva pokazala je da je vrednost SNMS odličan marker za distinkciju stu-

denata sa anksioznošću, od studenata bez anksioznosti (area = 0,800,  $p < 0,05$ ). Granična vrednost (*cut-off*) bila je 7,50, pri čemu je senzitivnost iznosila 74,2%, a specifičnost 71,6%. Binarna logistička regresija pokazala je da vrednost SNMS utiče na pojavu anksioznosti. OR bila je 1,056 (95% IP 1,049–1,064), što znači da se povećanjem vrednosti ove promenljive za 1, povećava rizik od anksioznosti za 5,6%. **Zaključak.** Vrednost SNMS skora može biti dobar marker za skrining i distinkciju

studenata sa depresivnošću od studenata bez nje, i odličan marker za skrining i distinkciju studenata sa anksioznošću od studenata bez anksioznih simptoma.

**Ključne reči:**  
**depresija; anksioznost; znaci i simptomi; psihofiziološki poremećaji; ankete i upitnici; studenti; srbija.**

## Introduction

Mental health problems are a serious public health problem concern due to their high prevalence rates, difficulties during the treatment, chronic course<sup>1</sup> and at the same time a source of immense human suffering<sup>2</sup>.

Mental disorders account for a large proportion of the disease burden in young people and many such illnesses have typically their first onset during the university age<sup>3,4</sup>.

Lack of recognition of mental health problems among young people, becomes important challenge for medical professionals in the struggle for the disorder identification and consequent treatment, as early as possible<sup>5</sup>.

Depression and anxiety increasingly emphasize the importance of somatic, comorbid symptoms, which increase both medical and economic burden to the society<sup>6</sup>. For example, shoulder or arm pain/discomfort is common among college students. Researchers reported that Nigerian undergraduates had a high prevalence of musculoskeletal pain, where shoulder pain was most common. In Australia, musculoskeletal disorders were a widespread problem for university students; and in the United States, college students reported low back pain, and the majority had musculoskeletal discomfort during/after computer use. Likewise, in Saudi Arabia, about the fourth to the fifth of students complained of headache (17%) and fatigue (24%)<sup>7</sup>. It is well documented that pain or aches in shoulders, arms and neck are prevalent in many societies and are an economic problem due to sickness absence and health-care costs<sup>8</sup>.

Several studies of the relationship among anxiety, depression, and somatic symptoms which included general population have already been conducted in many countries. Based on such experiences, three explanatory hypotheses about the nature of the relationships can be offered. Firstly, depression and anxiety disorders may influence the onset of physical symptoms in many ways<sup>9</sup> e.g. altered perception of physical sensations<sup>10</sup>. Secondly, somatic symptoms, or different types of physical limitations may be predictors of onset of depressive and anxiety disorders. Finally, according to the third hypothesis, numerous environmental, biological and psychological factors may independently influence the onset of both mental disorders and somatic complaints<sup>11</sup>.

In clinical practice, there is often so-called masked depression. It is characterized by somatic "mask", which is comprised of a wide range of somatic disorders. It is not rare that people suffering from masked depression seek help from doctors of different specialties, change healthcare facilities and most often they are diagnosed with hypochondria. In our

culture, this projection of psychological problems to somatic symptoms is explained by, among other things, greater social acceptability of somatic disorders. Stigma and negative attitudes toward seeking help from a psychiatrist are still barriers to improving mental health<sup>11</sup>.

It is estimated that 7.3% to 11% of all patients suffering from depression suffer from masked depression, and on average, an interval between first signs of illness and referral to a psychiatrist, is 3–5 years. The most common motives for the referral are negative findings of somatic examinations and lack of therapy response to the applied somatic therapy. Patients who suffer from this disorder usually complain about headaches in the form of twinges, pinching, pain in the face and teeth and often closely resemble migraine. In addition, there are pains in the lumbar spine and surrounding spinal muscles, and the symptoms are often interpreted as spondyloarthritis or discopathy. The occurrence of paresthesia in the region of extremities, the feeling of heaviness of extremities "as if they were filled with lead" are common; there is also the phenomenon of restless legs, shortness of breath and pain in various parts of the body. There are also vegetative symptoms which frequently appear as dizziness, feeling of emptiness in the head, chest pressure, pain in the heart, tachycardia, dryness in the mouth, anuria, dysphagia, meteorism or difficult breathing. Therefore, the masked depression is a disorder that can mimic different somatic diseases making its diagnosis and treatment difficult<sup>12</sup>.

The aim of this study was to examine the impact of somatic symptoms on depression and anxiety symptoms among a group of University students in Central Serbia.

## Methods

### *Study design and participants*

The research we have conducted was a cross-sectional survey of students attending University of Kragujevac, Serbia, during the 3-years period, that is, from 2012 to 2015. University of Kragujevac, with its twelve faculties, is a state-owned university in central Serbia. Six of its faculties are located in Kragujevac while others are located in five towns in central Serbia, covering the area with more than 2,500,000 inhabitants. All faculties were selected for the survey: Faculty of Agronomy, Faculty of Economics, Faculty of Engineering, Faculty of Mechanical and Civil Engineering, Faculty of Medical Sciences, Faculty of Education, Faculty of Law, Faculty of Natural Sciences and Mathematics, Faculty of Technical Sciences, Teachers Training Faculty, Faculty of

Philology and Arts, Faculty of Hotel Management and Tourism. The students were randomly sampled from each study year from each faculty, in proportion to the size of the faculty in relation to the total number of students at the University. The sample for this survey, was randomly selected: 10.70% students, out of the total of 18,123 students. The students were sorted out from the University student database according to previously generated random order (random computer function).

### Procedure

A self-administered anonymous questionnaire was used and it comprised Somatic and associated Nonspecific Mental Symptoms (SNMS), Beck Depression Inventory and Beck Anxiety Inventory (BAI). Ethical approval was obtained from the Faculty of Medical Sciences Ethical Committee. Participation was voluntary with no financial or other motivation. Informed consent was obtained and confidentiality of the responses was assured. The study was conducted in the participants' classrooms by the leading researcher (I.V.S). Those who were absent during the distribution of questionnaires were excluded. The research was completed within 2 years.

### Instrument

A self-assessment questionnaire (which was assembled for this study) with detailed subdomain questions was used to determine SNMS. Symptoms of depression were evaluated through the Beck Depression Inventory – revision of original instrument (BDI-IA) scale. This scale was developed in the 1960's and is one of the most widely used instruments for measuring the severity of depression, with the focus on behavioral and cognitive aspects of the disorder. It was designed to document a variety of depressive symptoms which the individual experienced over the preceding week. It consists of 21 items, each answer being scored on a scale ranging from 0 to 3<sup>12</sup>.

Symptoms of anxiety were evaluated through the Beck Anxiety Inventory (BAI) scale, a short list describing 21 anxiety symptoms which bothered them in the previous week. The scale consists of 21 items, each answer being scored on a scale ranging from 0 to 3<sup>13</sup>.

The presence of SNMS over the last six months served as the basis for creating a new variable called SNMS score.

Questions from the questionnaire, that were related to the presence of specified nine symptoms reported over the last six months (headache, abdominal pain, back pain, fatigue, despondency, irritability, nervousness, sleep problems, dizziness), were rated with five-graded responses (rarely or never – 0, almost every month – 1, almost every week – 2, more than once a week – 3, almost every day – 4). Therefore, the maximum score for these symptoms was 36. Some clinical findings suggest that somatic and associated nonspecific mental symptoms like despondency, irritability, nervousness, sleep problems may dominate the clinical picture and develop prior to other symptoms and signs of depression<sup>14</sup>.

### Statistical analysis and assessment

Data analysis was carried out using IBM SPSS (Statistical Package for the Social Sciences) software version 19.0. The qualitative variables were presented in number and percentage. The continuous variables (depression, anxiety and symptoms scores), were presented as means and standard deviation (SD). Descriptive statistics for somatic symptoms, depressive and anxiety symptoms were calculated, expressed as appropriately in frequencies, mean values and standard deviation. Student's *t*-test, Fisher's exact test,  $\chi^2$  test, were used to look for any existing differences between somatic symptoms, and depressive/ anxiety symptoms. All tests were 2-tailed, and the level of significance was set at  $p \leq 0.05$ . Binary logistic regression analysis was used to determine associations between depressive, anxiety symptoms and somatic symptoms. The results were reported as odds ratios (OR) with 95% confidence intervals (CI).

### Results

Out of 1,968 distributed questionnaires, a total of 1,940 (98.6%) students completed the questionnaire among which there were 34.7% of males and 65.3% of females) the mean age of the participating students was 21.04 (SD =  $\pm$  2.23) years with the range of 18–57 years.

Distribution of somatic and associated nonspecific mental symptoms of the sample are summarized in Table 1.

**Table 1**

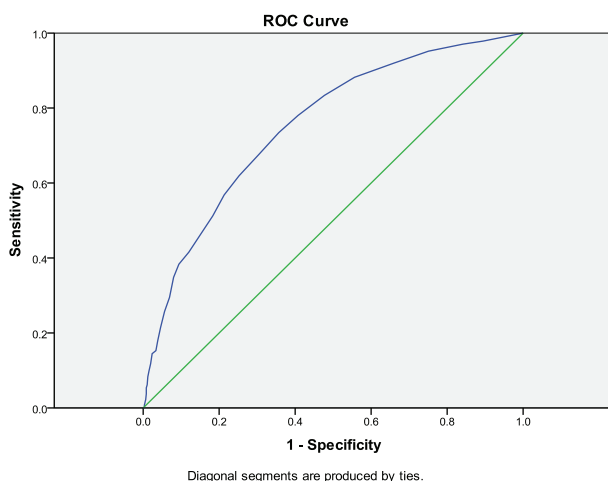
**Distribution of somatic and associated non-specific mental symptoms in the student population**

Simptoms	Rarely or never (%)	Almost every month (%)	Almost every week (%)	More than once a week (%)	Almost every day (%)
Dizziness	84.7	7.7	3.6	2.4	1.5
Problems with sleep	58.0	16.5	8.7	9.0	7.8
Nervousness	22.4	30.9	19.3	15.5	11.9
Irritability	48.2	27.9	11.6	7.9	4.4
Despondency	59.9	20.6	8.8	6.4	4.3
Back pain	52.8	21.1	10.5	8.4	7.2
Fatigue	57.6	19.5	9.7	8.0	5.2
Abdominal pain	45.6	38.6	7.7	6.5	1.6
Headache	41.2	22.3	14.9	14.2	7.4

\*symptoms students felt in the lost six months before the study beginning.

The difference between the mean values of SNMS score between students with depressive symptoms and students without depressive symptoms was statistically significant ( $p < 0.05$ ). The mean value of the SNMS score of students without depressive symptoms was 5.00 (range, 3.00 to 10.00), while the mean value of the new variable in students with depressive symptoms was 12.00 (range, 7.00 to 18.00).

Receiver operating characteristic (ROC) curve showed that the SNMS score might be a very good state marker for the distinction of students with depressive symptoms from students without it (area = 0.754,  $p < 0.05$ ). The threshold value was 8.50, the sensitivity was 67.6% and specificity 69.4% (Figure 1).

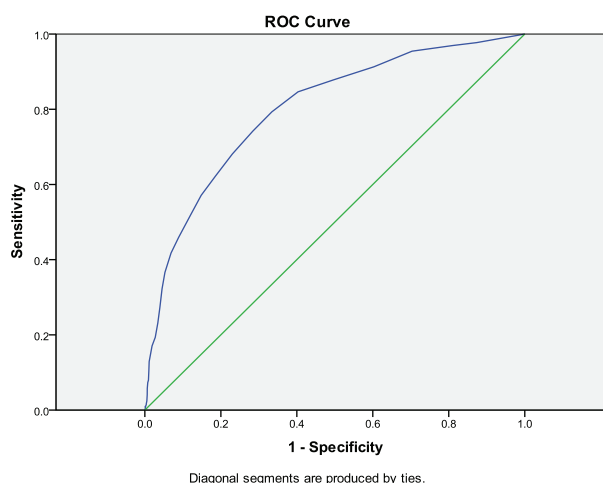


**Fig. 1 – Receiver operating characteristic (ROC) curve of the sum score of Somatic and associated Non-specific Mental Symptoms according to depressive symptoms.**

Binary logistic regression showed that SNMS score might affect the occurrence of depressive symptoms. Odds ratio was 1.052 (95% CI 1.045 to 1.059), which means that an increase in the value of the SNMS score by 1 increases the risk of depressive symptoms by 5.2% over the baseline population rate.

The difference of mean values of the SNMS score between patients with anxiety symptoms and those without it was statistically significant, too ( $p < 0.05$ ). The mean value of the SNMS score of the somatic and associated nonspecific mental symptoms in students without anxiety symptoms amounted to 4.00 (range, 2.00 to 8.00), whereas the mean value of the new variable in students with anxiety symptoms was 12.00 (range, 7.00 to 17.00).

ROC curve shows that the SNMS score might be valuable state marker for the distinction of students with anxiety symptoms, from students without anxiety symptoms (area = 0.800,  $p < 0.05$ ). Limit value (cut-off) was 7.50, wherein sensitivity was 74.2% and specificity was 71.6% (Figure 2). Binary logistic regression showed that the SNMS score might affect the occurrence of anxiety symptoms. Odds ratio was 1.056 (95% CI 1.049 to 1.064), which means that an increase in the value of score of somatic symptoms by 1 increases the risk of anxiety symptoms by 5.6%.



**Fig. 2 – Receiver operating characteristic (ROC) curve of the sum score of Somatic and associated Non-specific Mental Symptoms according to anxiety symptoms.**

## Discussion

Our study is one of the largest epidemiological studies regarding mental health status and somatic symptoms among university students in this region. The first objective of this study was to examine the distribution of some somatic symptoms among university students in central Serbia.

Our results show that headache and back pain represent common symptoms among university students, i.e. 22.3% of respondents had headache almost every month and 7.4% on daily basis over the last six months. The literature indicates that most common somatic symptoms among student population are headache, menstrual cramps, back pain, fatigue and sleeping problems<sup>15</sup>. Worldwide, 54.4% of the adolescent population suffer from headache. A study conducted in Germany shown that over 80% of adolescents had headache symptoms in the last 6 months. One study showed that 30.3% of Chinese adolescents experienced headache more than once a week during the previous 3 months<sup>16</sup>. The data combined from 56 independent studies (analyzing a total number of 34,904 students) revealed that pooled migraine prevalence amounts to 16.1%<sup>17</sup>. The study conducted on a sample of 4,406 students in China showed that the prevalence of migraine among university students was 9.0%<sup>18</sup>, which was in accordance with the prevalence found in Chinese adults in the general population (8,9%)<sup>19</sup>. Previous epidemiological studies linked anxiety and depression with migraine suggesting the presence of such comorbidity among 30%–84% people. It was proven that depression and anxiety increase the risk of migraine when they occur separately as well, however, if the depression and anxiety occur together, the risk becomes even higher<sup>20</sup>.

The results of this study suggest that 21.1% of students had back pain during the last six months almost every month, while 7.2% had back pain every day. The obtained results reveal a high prevalence of back pain among student population. The data from the current literature showed that back pain in student population varies between 20%–70%. In several studies, obtained values for back pain prevalence were

higher than the results obtained by this study. For example, in a study conducted in China on the sample of 2,849 adolescents, the prevalence amounts to 41.4%, among Brazilian school children to 55.5% ( $n = 802$ ) and 51.3% among 546 Danish adolescents<sup>21</sup>. The reason may be that heavy academic pressure induces an increase in risk factors for somatic symptoms [elevated levels of mental stress, lack of sleep and changes in adolescent living habits (smoking, alcohol and coffee consumption)] which can together influence the occurrence of mental disorders. Relationship between chronic pain and depression or anxiety attract particular attention in the field. About 35% of patients with chronic pain meet the criteria for an anxiety disorder, while 30%–60% of patients with chronic pain suffer from depression<sup>22</sup>. It was shown that chronic pain in childhood and adolescence heightens the risk of depressive and anxiety disorders in adulthood in specific samples<sup>23</sup>.

The main objective of this study was to examine the impact of somatic symptoms on depressive and anxiety symptoms among University students in central Serbia.

In our study, the mean value of the sum score of somatic and associated non-specific mental symptoms among student population without depressive symptoms was 5.00 (range, 3.00 to 10.00), while the mean value of the new variable in students with depressive symptoms was 12.00 (range, 7.00 to 18.00). The mean value of the sum score of the somatic and associated non-specific mental symptoms in students without anxiety symptoms amounts to 4.00 (range, 2.00 to 8.00), whereas the mean value of the new variable in students with anxiety symptoms is 12.00 (range, 7.00 to 17.00).

Our findings are similar to those of the study conducted at two universities in Mexico, which included 506 psychology showing students that the intensity of physical manifestations is more positively correlated with scores derived from two rating scale (Beck Depression Inventory and Social Anxiety Scale for Adolescents)<sup>15</sup>. The indicated that pain-related complaints presented to general practitioners including undefined somatic symptoms (muscle pain, headache, and abdominal pain) are from 2.5 to 10 times more frequent in people with panic disorder, generalized anxiety disorder and major depression than in general population<sup>15</sup>. Patients who felt some kind of somatic pain also had worse mental functioning and higher scores on rating scales for depression, social anxiety and post-traumatic stress disorder<sup>24</sup>. It was suggested in current literature that somatic symptoms directly relate to difficulties in everyday functioning, disability, increased use of psychoactive substances, impaired quality of life as well as reduced use of health care services<sup>6</sup>. The research in the United States showed that 87% of students were feeling mild fatigue while studying. Students who were feeling moderate and severe fatigue scored higher on the BDI scale for the assessment of depression than those who were feeling mild fatigue. Students with severe fatigue also got higher scores on the scale for anxiety assessment<sup>25</sup>. Other studies also reported that depression disorders were in a stronger correlation with somatic problems of the musculoskeletal system<sup>26</sup> while cardiopulmonary symptoms were more associated with anxiety disorders<sup>9, 27</sup>.

Our results suggest that the SNMS score might be a very good marker for the distinction of students with depressive symptoms from students without it. In other words, the sum score of somatic and associated non-specific mental symptoms might affect the occurrence of depressive symptoms, which means that an increase in the value of the sum score of somatic and associated non-specific mental symptoms by 1, increases the risk of depressive symptoms by 5.2% over baseline population rate. Several studies have reported the association between depression and pain (e.g. severity, frequency, duration and number of symptoms). Patients with some pain symptoms (e.g. back pain, headache, abdominal pain, chest pain and facial pain) are 3 to 5 times more likely to be depressed than patients without pain, and pain symptoms are associated with at least twice increased risk for coexisting depression. Additionally, one population-based study revealed that subjects with chronic pain (defined as pain felt during most days in at least a month) were 3 times more likely to meet depression criteria than those without chronic pain. The association between depression and pain became stronger as severity of either condition increases. Additionally, more frequent pain episodes and longer duration of pain were associated with depression. An international study showed that patients with pain lasting longer than 6 months were more than four times likely to have a depression disorder than those without chronic pain<sup>28</sup>.

Chronic pain and depression are considered to be the harshest expressions of human suffering. Clinical experience suggests that physical pain and depression are often intertwined, and that they are in mutual interaction<sup>22</sup>. Some consider the pain one of the symptoms of depression, which could explain the effectiveness of antidepressants in the suppression of painful condition such as neuropathic pain<sup>29</sup>.

Our results indicate that the sum score of somatic symptoms might be a valuable marker for the distinction of students with anxiety symptoms, i.e. the sum score of somatic symptoms might affect the occurrence of anxiety symptoms which means that an increase in the value of the score of somatic symptoms by 1 increases the risk of anxiety by 5.6%.

Data from other studies suggest that anxiety disorders may be present in up to 60% of patients with chronic pain, i.e. more severe chronic pain was associated with more severe anxiety symptoms<sup>30</sup>. Anxiety is associated with pain, as a symptom, regardless of its anatomic localization<sup>19</sup>. The research, conducted by World Health Organization (WHO), which involved 5,447 students in 15 research centers, located in America, Europe, Asia and Africa, found that people with chronic pain were four times more likely to suffer from anxiety disorders and depression<sup>31</sup>.

The symptom of chronic pain can be a potential risk factor for recurrent depressive and anxiety disorders. Neuroimaging studies showed overlapping of neural networks of emotions and pain, particularly in prefrontal cortex<sup>32</sup>. Pain could affect regulation of the hypothalamic-pituitary-adrenal axis (increasing cortisol levels) as well as the activity of the autonomic nervous system (increased sympathetic nervous system activity and decreased parasympathetic nervous system activity) which may lead to the onset of new depressive

episodes<sup>33</sup>. On the other side, some studies failed to find association between pain symptoms and recurrence of anxiety<sup>32</sup>.

Depressive and anxiety disorders, in comorbidity with physical manifestations, are associated with an increased number of suicides, decreased quality of life and significant economic burden on the health care system<sup>24</sup>.

The limitation of our study is the cross-sectional design, which does not permit inferences about possible causal relations between the somatic variables and depressive and anxiety symptoms. It was not possible to assess the test-retest reliability of BDI/BAI in this sample as the survey was anonymous. Another limitation was the self-reported nature of this study. Finally, the sample represents a group of students in just one university of Serbia, which may limit generalizations of the results on the other universities.

Therefore, the careful rater could rather easily screen a student with depression and anxiety with existing and validated tools if additional attention was paid to the domains related to somatic symptoms. Future studies are needed for developing the novel, valid diagnostic rating scales highly specific for detection of depressive and anxiety disorders in students suffering predominantly from non-specific physical complains without obvious causes.

The results of this study illustrated that student population talks about somatic symptoms rather than about mental

problems and highlight the importance of recognizing those symptoms and connection between them and depressive and anxiety disorders.

### Conclusion

The SNMS score might be a state marker for the screening and distinction of students with depressive symptoms and excellent state marker for screening and making a distinction between the students with anxiety symptoms and the students who do not have these symptoms.

Somatic symptoms could be a predictor of depression and anxiety among students, and early screening could improve their prevention and early diagnose and treatment.

### Acknowledgements

This work was partially supported by the University of Kragujevac Faculty of Medical Sciences (Junior Project 13-12).

### Conflict of Interest

The authors fully declare that there is no conflict of interest that could be perceived as prejudicing the impartiality of the research reported.

## R E F E R E N C E S

- Melo-Carrillo A, Van Oudenbore L, Lopez-Avila A. Depressive symptoms among Mexican medical students: High prevalence and the effect of a group psychoeducation intervention. *J Affect Disord* 2012; 136(3): 1098–103.
- Sokratous S, Merkouris A, Middleton N, Karanikola M. The prevalence and socio-demographic correlates of depressive symptoms among Cypriot university students: A cross-sectional descriptive co-relational study. *BMC Psychiatry* 2014; 14: 235.
- Chen L, Wang L, Qiu XH, Yang XX, Qiao ZX, Yang YJ, et al. Depression among Chinese university students: Prevalence and socio-demographic correlates. *PLoS ONE* 2013; 8(3): e58379.
- Sarokhani D, Delpisheb A, Veisani Y, Sarokhani MT, Manesh RE, Sayehmiri K. Prevalence of Depression among University Students: A Systematic Review and Meta-Analysis Study. *Depress Res Treat* 2013; 2013: 373857.
- Simić-Vukomanović I, Mibajlović G, Kocić S, Djonović N, Banković D, Vukomanović V, et al. The prevalence and socioeconomic correlates of depressive and anxiety symptoms in a group of 1,940 Serbian university students. *Vojnosanit Pregl* 2016; 73(2): 169–77.
- Beesdo K, Jacobi F, Hoyer J, Low NC, Höfler M, Wittchen HU. Pain associated with specific anxiety and depressive disorders in a nationally representative population sample. *Soc Psychiatry Psychiatr Epidemiol* 2010; 45(1): 89–104.
- El Ansari W, Oskrochi R, Haghgoo G. Are students' symptoms and health complaints associated with perceived stress at university? Perspectives from the United Kingdom and Egypt. *Int J Environ Res Public Health* 2014; 11(10): 9981–10002.
- Bruls VE, Bastiaenen CH, de Bie RA. Non-traumatic arm, neck and shoulder complaints: Prevalence, course and prognosis in a Dutch university population. *BMC Musculoskelet Disord* 2013; 14: 8.
- Bekhuis E, Boschloo L, Rosmalen JG, Schoevers RA. Differential associations of specific depressive and anxiety disorders with somatic symptoms. *J Psychosom Res* 2015; 78(2): 116–22.
- Rief W, Broadbent E. Explaining medically unexplained symptoms-models and mechanisms. *Clin Psychol Rev* 2007; 27: 821–41.
- Simić Vukomanović I. Assessment of mental health and prevention of mental disorders among University students [dissertation]. Kragujevac: Faculty of Medicine, University of Kragujevac; 2016. (Serbian)
- Beck AT, Steer RA. Manual for the Beck Depression Inventory. San Antonio, TX: Psychological Corporation; 1993.
- Beck AT, Steer RA. Beck Anxiety Inventory (BAI) Manual. Oxford, UK: Pearson; 1990.
- World Health Organization. ICD-10 Classification of Mental Disorders and Behavioural Disorders. Belgrade: Institute for Textbooks and Teaching Aids; 1992. (Serbian)
- González Ramírez MT, Landero Hernández R, García-Campayo J. The relationship among depression, anxiety, and somatic symptoms in a sample of university students in northern Mexico. *Rev Panam Salud Publica* 2009; 25(2): 141–5. (Spanish)
- Zhang Y, Deng G, Zhang Z, Zhou Q, Gao X, Di L, et al. A cross sectional study between the prevalence of chronic pain and academic pressure in adolescents in China (Shanghai). *BMC Musculoskelet Disord* 2015; 16: 219.
- Wang X, Zhou HB, Sun JM, Xing YH, Zhu YL, Zhao Y. The prevalence of migraine in university students: A systematic review and meta-analysis. *Eur J Neurol* 2016; 23(3): 464–75.
- Wang X, Sun J, Xing Y, Zhou H, Zhao Y, Zhu Y. The prevalence and awareness of Migraine Among University Students in Harbin, China. *J Oral Facial Pain Headache* 2015; 29(4): 384–9.
- Wang X, Xing Y, Sun J, Zhou H, Yu H, Zhao Y, et al. Prevalence, associated factors, and impact on quality of life of mi-

- graine in a community in Northeast China. *J Oral Facial Pain Headache* 2016; 30(2): 139–49.
20. *Oh K, Cho SJ, Chung YK, Kim JM, Chu MK.* Combination of anxiety and depression is associated with an increased headache frequency in migraineurs: A population-based study. *BMC Neurol* 2014; 14: 238.
  21. *Noll M, Candotti CT, Rosa BN, Loss JF.* Back pain prevalence and associated factors in children and adolescents: An epidemiological population study. *Rev Saude Publica* 2016; 50: pii: S0034-89102016000100219.
  22. *de Heer EW, Gerrits MM, Beekman AT, Dekker J, van Marwijk HW, de Waal MW.* The association of depression and anxiety with pain: A study from NESDA. *Plos One* 2014; 15(10): e106907.
  23. *Noel M, Groenewald CB, Beals-Erickson SE, Gebert JT, Palermo TM.* Chronic pain in adolescence and internalizing mental health disorders: A nationally representative study. *Pain* 2016; 157(6): 1333–8.
  24. *Gerrits MM, van Marwijk HW, van Oppen P, van der Horst H, Penninx BW.* Longitudinal association between pain, and depression and anxiety over four years. *J Psychosom Res* 2015; 78(1): 64–70.
  25. *Nyer M, Mischoulon D, Alpert JE, Holt DJ, Brill CD, Yeung A, et al.* College students with depressive symptoms with and without fatigue: Differences in functioning, suicidality, anxiety, and depressive severity. *Ann Clin Psychiatry* 2015; 27(2): 100–8.
  26. *Means-Christensen AJ, Roy-Byrne PP, Sherbourne CD, Craske MG, Stein MB.* Relationships among pain, anxiety, and depression in primary care. *Depress Anxiety* 2008; 25(7): 593–600.
  27. *van Boven K, Lucassen P, van Ravesteijn H, Olde Hartman T, Bor H, van Weel-Baumgarten E, et al.* Do unexplained symptoms predict anxiety or depression? Ten-year data from a practice-based research network. *Br J Gen Pract* 2011; 61: e316–25.
  28. *Bair MJ, Robinson RL, Katon W, Kroenke K.* Depression and pain comorbidity: A literature review. *Arch Intern Med* 2003; 163(20): 2433–45.
  29. *Ligthart L, Gerrits MM, Boomsma DI, Penninx BW.* Anxiety and depression are associated with migraine and pain in general: An investigation of the interrelationships. *J Pain* 2013; 14(4): 363–70.
  30. *Bair MJ, Wu J, Damush TM, Sutherland JM, Kroenke K.* Association of depression and anxiety alone and in combination with chronic musculoskeletal pain in primary care patients. *Psychosom Med* 2008; 70(8): 890–7.
  31. *World Health Organization.* The world health report. Mental health: New understanding, new hope. Geneva: World Health Organization; 2001.
  32. *Gerrits MM, van Oppen P, Leone SS, van Marwijk HW, van der Horst HE, Penninx BW.* Pain, not chronic disease, is associated with the recurrence of depressive and anxiety disorders. *BMC Psychiatry* 2014; 14: 187.
  33. *Gerrits MM, Vogelzangs N, van Oppen P, van Marwijk HW, van der Horst H, Penninx BW.* Impact of pain on the course of depressive and anxiety disorders. *Pain* 2012; 153(2): 429–36.

Received on June 17, 2016.

Revised on October 03, 2016.

Accepted on October 05, 2016.

Online First December, 2016.