

# Evaluation of the Beck Depression Inventory in a Nonclinical Student Sample

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## ABSTRACT

*Depression is one of the most common psychological disorders in individuals seeking psychiatric treatment, and a frequent psychological disorder among patients who seek primary healthcare. Therefore, it is vitally important to employ reliable and valid diagnostic instruments and norms, both in clinical and research work to investigate this problem.*

*This article is part of a larger study which has been conducted for ten years now with the aim to create a clearer picture about the level of depression which may be expected in the nonclinical population in Serbia, and in that way provide a basis for comparisons when diagnosing the clinical population. The subsidiary aims were to monitor potential changes in level of depressive reactions within the set time and to examine the psychometric properties and factor structure of the Beck Depression Inventory (BDI) scale. The sample consisted of 782 students (40% male, 60% female), mean age = 23.10 years, SD = 1.782.*

*Mean score on the BDI-IA scale was 6.69; SD = 6.412. The study showed no significant relationships between the BDI scores and sociodemographic variables such as age, economic status, and educational profile, but showed significant differences within gender ( $t(780) = 3.222, p = 0.001$ ). There was also a relatively stable level of depressive reactions in this population over the previous ten years. The Cronbach's coefficient of the BDI scale was  $\alpha = 0.860$ , with the majority of item-total correlations above 0.37.*

*The three-factor structure represents cognitive aspect, affective component of depression, and somatic problems attached to depression. The cognitive factor prevails in the entire sample, which is in accordance with the Beck theory about dysfunctional attitudes, ie cognitive vulnerability is a psychological predisposition to depression.*

**Keywords:** Beck Depression Inventory, nonclinical student population, psychometric properties

# Evaluación del Inventario de la Depresión Beck en una Muestra No Clínica de Estudiantes

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## RESUMEN

*La depresión es uno de los desórdenes psicológicos más comunes en los individuos que buscan tratamiento psiquiátrico, y un trastorno psicológico frecuente entre los pacientes que buscan atención primaria de la salud. Por consiguiente, es sumamente importante emplear normas e instrumentos de diagnóstico confiables y válidos en el trabajo investigativo o en el clínico, para investigar este problema.*

*Este artículo es parte de un estudio mayor, llevado a cabo por espacio de diez años, con el objetivo de crear un cuadro más claro del nivel de depresión que puede esperarse en la población no clínica de Serbia, y de esa manera proveer una base para las comparaciones a la hora de diagnosticar la población clínica. Los objetivos secundarios fueron monitorear los cambios potenciales a nivel de las reacciones depresivas dentro del tiempo establecido y examinar las propiedades psicométricas y la estructura factorial del Inventario de Depresión de Beck (escala de BDI). La muestra estuvo formada por 782 estudiantes (40% varones, 60% hembra), edad  $M = 23.10$ ,  $SD = 1.782$ .*

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*La puntuación media en la escala de BDI-IA fue 6.69; SD = 6.412. El estudio no mostró una relación significativa entre las puntuaciones de BDI y las variables sociodemográficas tales como la edad, la condición económica, y el perfil educacional, pero mostró diferencias significativas dentro del género ( $t(780) = 3.222, p = 0.001$ ). Hubo también un nivel relativamente estable de reacciones depresivas en esta población en los últimos diez años. El coeficiente de Cronbach en la escala de BDI fue = 0.860, hallándose la correlación ítem-total por encima de 0.37.*

*La estructura trifactorial representa el aspecto cognitivo, el componente afectivo de la depresión, y los problemas somáticos vinculados con la depresión. El factor cognitivo prevalece en toda la muestra, lo cual concuerda con la teoría de Beck sobre las actitudes disfuncionales, es decir, la vulnerabilidad cognitiva es una predisposición psicológica a la depresión.*

**Palabras claves:** Inventario de Depresión de Beck, población estudiantil no clínica, propiedades psicométricas

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## INTRODUCTION

Depression is one of the most common psychological disorders in individuals seeking psychiatric treatment (1), and a frequent psychological disorder among patients who seek primary healthcare (2, 3). University students around the world are vulnerable to depression, alcohol abuse and suicide (4, 5). Several studies have revealed that medical students are susceptible to high rates of morbidity during their undergraduate years (6–8) and this can be related to impairment in the development of professional, academic and social skills (6, 9).

The main aim of this study was to create a clearer picture about the level of depression which may be expected in the general, nonclinical student population, and in that way provide a basis for comparisons when diagnosing the clinical population. The subsidiary aims were to monitor potential changes in the level of depressive reactions within the set time and to examine the psychometric properties and factor structure of the Beck Depression Inventory (BDI). This instrument is one of the ten most utilized instruments in the clinical practice of American psychologists (10, 11), and it was also proven to be an efficient research instrument (12, 13). Although replaced with BDI-II, the BDI-IA version still displays reliable psychometric characteristics and it is useful for everyday clinical work (14, 15). Our study was started in 2001, at which point the latest version was not widely used in this region. Consequently, for the purposes of conducting a longitudinal study, the implementation of the same instrument was therefore imposed. A university student population was investigated because of the fact that attending university is a highly stressful period which can cause depression (15, 16), and because it has not been sufficiently investigated in the Serbian environment.

This article is part of a larger study which has been conducted for ten years now and it includes the investigation of different levels of depression in the adolescent population. Consequently, the entire younger population will be covered, with all its developmental characteristics.

## SUBJECTS AND METHODS

The study examined the level of potential depressive reactions on the nonclinical sample of students over the past ten years and the psychometric properties and factor structure of the BDI. Namely, in this paper we will present the data gathered from 2001, when the scale was first employed, to 2011, when it was employed for the sixth time.

The sample consisted of 782 students (40% male, 60% female), mean age = 23.10 years, SD = 1782, ranging from 18 to 30 years old. The reason for having an “older” sample, in comparison to studies conducted throughout the world, lies primarily in the fact that students in Serbia are not yet obliged to complete their courses regularly, year after year<sup>1</sup>, which means that many university students are over 25 years old. As of 2009, the variable economic status was also included into analyses, and the results showed that the majority of the participants described themselves as belonging to middle (27.3%) and upper middle (56%) economic status. The study recruited students from the Faculty of Medicine (n = 590), Faculty of Philology and Arts (n = 70), University of Kragujevac, and students (n = 122) from several faculties of the University of Belgrade. As we have already pointed out in the introduction, several studies have indicated that medical students are susceptible to depressive symptoms (8, 17) which may cause higher scores on the BDI scale since a great part of the sample included medical students. On the other hand, the results of some different studies (4, 18) have disputed this claim. Finally, the study recruited only those students who currently or during the previous two weeks had not suffered from a serious physical condition or illness, in order to avoid its influence on the somatic score of the BDI scale.

All the participants completed a brief, anonymous sociodemographic questionnaire (age, gender, grade, economic status) and the BDI-IA.

<sup>1</sup> Students are not required to pass all their examinations in a set time, therefore their studies can be prolonged for years.

*Beck Depression Inventory*

Symptoms of depression were evaluated through the BDI-IA scale, developed in the 1960s to measure depression severity, with the focus on behavioural and cognitive dimensions of depression (10). It consists of 21 items, each answer being scored on a scale ranging from 0 to 3. The rating scale was as follows: 0–9 – no symptoms, 10–15 – mild mood change or mild depression state; 16–19 – mild to moderate depression, 20–29 – moderate depression and 30–63 – severe or clinical depression (12). Scales have clinical utility and display reliable psychometric characteristics across a broad spectrum of both clinical and nonclinical populations (19). The internal consistency for the BDI-IA was always good, with average alpha coefficient of 0.86 for psychiatric patients and 0.81 for nonpsychiatric samples (19), and with highly intercorrelated items (20). In Serbian research, the scale has shown similar consistency of 0.87 for nonpsychiatric samples (21, 22). This version has also demonstrated high retest correlation, strong convergent and discriminant validity, and adequate factorial validity (19).

The difference in variables was analysed by means of unpaired *t*-tests and ANOVA, and correlation done with the Pearson’s coefficient. All tests were 2-tailed, with  $p \leq 0.05$  considered statistically significant and  $p > 0.05$  but  $\leq 0.10$  indicative of trends. The data were analysed with SPSS for Windows, version 16.

**RESULTS**

Mean score on the BDI-IA scale of the sample was 6.69, SD = 6.412, with a maximum of 38 points. The distribution was significantly curved towards lower values, which is expected due to the nonclinical nature of the sample ( $SK = 1.404$ ;  $CK = 2.096$ ). A significant difference between the BDI score in males (mean = 5.79, SD = 6.101) and females (mean = 7.29; SD = 6.549) was found ( $t(780) = 3.222$ ;  $p = 0.001$ ). The correlation analysis has not shown a significant correlation between the BDI score and age ( $r = 0.061$ ;  $p = 0.181$ ), and there is no significant difference between the BDI scores in regard to economic status  $F(5) = 0.222$ ;  $p = 0.952$ .

There is also no significant difference in the BDI scores in relation to the year of testing  $F(5) = 1.972$ ;  $p = 0.081$ , which supports the idea of a relatively stable level of depressive reactions in this population during the previous ten years. Finally, a higher level of depression was identified in the medical student population in comparison to other profiles, however, in our study, that difference did not exceed the border of significance ( $p = 0.077$ ).

In regard to the individual items, for the item ‘weight loss’, a significant difference was found in favour of female gender ( $t(777) = 4.379$ ;  $p = 0.001$ ), and a similar situation may be found for the items ‘sadness’, ‘guilty feelings’, ‘self-dislike’, ‘self-criticism’, ‘irritability’ and ‘changes in appetite’; however, the difference is smaller in favour of females. As far as age is concerned, there is a difference for the items

‘weight loss’, work difficulty’ and suicidal thoughts’, with higher scores in younger students.

The Cronbach’s coefficient of the BDI scale was  $\alpha = 0.860$ , with the majority of item-total correlations above 0.37, suggesting a high internal consistency of the BDI. The item intercorrelation matrix has shown a low correlation for the items ‘change in body image’, ‘weight loss’ and ‘somatic preoccupation’ with other items, and this is consistent with previous results (14). After the initial analysis, due to low loadings, the item ‘punishment feelings’ as well as the items ‘somatic preoccupation’ and ‘change in body image’ were excluded from further analysis.

Consequently, the correlation matrix between the assessed items was factor-analysed, using the principal components method (Varimax rotation). By employing Keiser criterion, three factors have been extracted, which on the whole explain 47.94% of the total variance. Factor loadings  $> 0.5$  are marked in bold (Table).

Table: Factor loadings on Beck Depression Inventory-IA items

	Cognitive	Affective	Somatic
Past failures	<b>0.563</b>	0.320	-0.025
Guilty feelings	<b>0.642</b>	0.210	0.066
Self-dislike	<b>0.555</b>	0.317	0.109
Self-criticalness	<b>0.630</b>	0.200	0.020
Indecisiveness	<b>0.679</b>	0.069	0.187
Work difficulty	<b>0.602</b>	0.197	0.148
Sadness	0.334	<b>0.547</b>	0.223
Pessimism	0.106	<b>0.680</b>	-0.036
Loss of pleasure	0.462	<b>0.526</b>	0.051
Suicidal thoughts	0.131	<b>0.594</b>	-0.015
Crying	0.310	<b>0.565</b>	0.173
Irritability	0.387	<b>0.540</b>	0.102
Loss of interest in people	0.267	<b>0.533</b>	0.148
Loss of interest in sex	-0.005	<b>0.569</b>	0.333
Changes in sleeping pattern	0.293	0.148	<b>0.583</b>
Fatigue	0.438	0.044	<b>0.519</b>
Changes in appetite	0.143	0.099	<b>0.740</b>
Weight loss	0.013	0.008	<b>0.709</b>

*I factor*, which explains 31.03% of the total variance, comprises six items which relate to the cognitive aspect of depression or negative self-evaluation (pessimism, sense of failure, guilt, dislike of self, self-accusation *etc*). This factor corresponds well with the ‘cognitive distortions’ factor detected in similar studies (23).

*II factor*, with 9.55% of the total variance explained, includes eight items describing the affective component of depression based on sadness, dissatisfaction, crying and irritability symptoms.

*III factor*, which explains 7.35% of the total variance, covers four items describing somatic problems attached to depression (insomnia, fatigue, appetite and loss of weight).

In terms of cut-off scores for the classification of the non-clinical population, the lower limit for the mild depression state in our research (range from 11 to 16) is more towards higher values than those proposed by standards. As

this is only a slight departure, application of existing international standards is still appropriate.

## DISCUSSION

Mean BDI-IA score of our sample falls into the category of "no symptoms", as was expected for a nonclinical population. If we compare these results with the results of some other studies which included a nonclinical student sample, we may notice that these studies have obtained results similar to ours: mean = 7.42, SD = 6.67 (15), and mean = 7.66, SD = 6.98 (24). The studies in the region also show certain similarities, for example, in a study conducted in Croatia, as much as 82.17% of the adolescent participants were placed in the group with no symptoms [0–13] (25). In our study, 86.7% of participants were placed in that group.

Possible explanations for significant differences within the gender variable could be found in increased developmental challenges in pubertal girls, dissatisfaction with weight and attainment of a mature female body, and increased importance of the feminine sex in role identification (26). These findings correspond with the idea that men and women respond to depressing life events differently. Men tend to stop depression before it ramifies, women tend to remain focussed on the depressed mood, prolong its duration and extend its impact (27).

The items 'punishment feelings', 'somatic preoccupation' and 'change in body image' were not statistically significant in the university student population. Feelings of punishment represent a core symptom of depressive disorder which is not to be expected in its full manifested form in the healthy population. Furthermore, an excessive preoccupation with somatic symptoms is also not to be expected in the nonclinical student population, insofar as the students who had had some somatic illnesses in the previous two weeks were not included in the study. Finally, at the age encompassed in this study, the notion of the self in a bodily sense (body image) is already created, thus, as expected, the item measuring change in body image has not shown a solid sensitivity in the university student population.

Although the BDI research in the non-psychiatric student population samples tends to produce large general factors (28), in this study that was not the case. The three factor results of this study tally to a certain extent with the results of the previous studies, such as the two-factor model in the study by Beck and his associates in the student population (14) or a similar model in the already mentioned study in the nonclinical student sample (15). The only difference is that in both studies, the cognitive and affective factors emerged as one bigger factor, whereas the item distribution on the factors is identical, with a higher per cent of the explained variance in our study (48% in comparison to 41% of the variance in the mentioned study).

Similar to this, Beck and his colleagues reported that a two-factor solution (cognitive-affective and somatic dimen-

sions) most parsimoniously summarized the data for both psychiatric outpatients and college students (29). This factor solution represents the psychological/somatic dichotomization in the BDI (30). In our study, the category 'psychological factors' has apparently been too general; hence its division into the cognitive and affective factor was inevitable, as it was in the case of some previous studies which included similar populations (21). In a similar study, employing cluster-analytical techniques<sup>2</sup> to derive the underlying factors, a structure similar to ours was obtained (6). What is more, a similar factor structure was found for women and men, with a slightly higher loading on the cognitive factor for the female sample. Generally speaking, the cognitive factor prevails in the entire sample, which is completely in accordance with the Beck theory about dysfunctional attitudes, *ie* cognitive vulnerability is a psychological predisposition to depression (31).

## CONCLUSION

The study showed no significant relationships in the student population between the BDI and sociodemographic variables such as age, economic status, and educational profile, but showed significant differences within the gender variable. As with the previous studies, this version of the BDI scale has shown satisfactory psychometric characteristics, which is the reason why it is still being used in contemporary research (32), despite the latest version of the scale, whereas potential limitations of its employment in scientific research primarily reflect the limitations of all self-administered inventories.

Based on the whole study, as well as some previous research (33), our propositions for practical work and the use of this scale would be to change the time frame within the scale instructions from one week to two weeks, to increase compatibility with the *DSM-IV* (34), and to include increased options in appetite, weight, and sleep changes items.

The three-factor structure in this study, although differing from the most frequent two-factor structure, may be of greater use in the differentiation of the basic causes lying at the core of depressive reactions in the nonclinical population. Most previous studies (with BDI-IA, but also BDI-II) have shown the existence of cognitive, affective and somatic factors only in different combinations (15, 19, 20). Should a similar structure be confirmed in a clinical sample as well, it would be of great importance to the adjustment of different forms of treatment which may be provided for individuals with depressive symptoms.

With regard to future studies, we suggest the employment of a more comprehensive general questionnaire and more adequate investigation into the history of potentially depressive or other mental problems of the subjects.

<sup>2</sup> Groups the elements of the analysis into an appropriate number of mutually exclusive subsets.



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