



The Serbian version of the Brunnsviken brief quality of life scale: reliability, validity, and psychometric features among the population of high school students

Srpska verzija kratke skale *Brunnsviken* o kvalitetu života: pouzdanost, validnost i psihometrijske karakteristike srednjoškolaca

Milica Pantić*, Nemanja Rančić†‡, Danijela Djoković*, Goran Mihajlović*

*University of Kragujevac, Faculty of Medical Sciences, Kragujevac, Serbia; †University of Defence, Faculty of Medicine of the Military Medical Academy, Belgrade, Serbia; ‡Military Medical Academy, Center for Clinical Pharmacology, Belgrade, Serbia

Abstract

Background/Aim. Measuring the quality of life (QoL) is vital in daily clinical practice because it shows significant information in addition to symptoms. There are a large number of scales for assessing the QoL. The Brunnsviken Brief Quality of Life scale (BBQ) measures importance-adjusted satisfaction across six life areas. A validation study of the BBQ scale showed good questionnaire features (high concurrent and convergent validity, internal and test-retest reliability, and sensitivity to change). Therefore, the BBQ scale is excellent for use in psychiatric patients to measure outcomes, as well as for everyday screening. **Methods.** This prospective cross-sectional study was performed among the final-year students in five high schools in Kragujevac, Serbia. Students completed the BBQ questionnaire. Statistical analysis was performed using a standard statistical method for scale validation and standardization. **Results.** Our study showed that the BBQ scale had high internal consistency (Cronbach's alpha = 0.687). That result showed that the scale had good reliability in our study. The average BBQ score was 69.63 ± 16.70 (male: 69.66 ± 18.46 ; female: 69.83 ± 15.78 , $p = 0.944$). **Conclusion.** The Serbian version of BBQ satisfies all the criteria of successful validation. Therefore, this scale can be helpful in assessing the QoL in the healthy youth population in Serbia.

Key words: quality of life; serbia; students; surveys and questionnaires.

Apstrakt

Uvod/Cilj. Merenje kvaliteta života (KŽ) je veoma važno u svakodnevnoj kliničkoj praksi, jer pored simptoma pruža značajne informacije. Postoji veliki broj skala za procenu KŽ. Kratka *Brunnsviken* skala o KŽ (BKŽ) meri zadovoljstvo u šest životnih oblasti. Validaciona studija BKŽ skale je pokazala dobre karakteristike upitnika (visoku konkurentnu i konvergentnu validnost, visoku internu pouzdanost i pouzdanost ponovnog testiranja i osetljivost na promene). Zbog toga je upitnik BKŽ odličan za upotrebu kod psihijatrijskih bolesnika za merenje ishoda lečenja, kao i za svakodnevni „skrining“. **Metode.** Prospektivna studija preseka sprovedena je među učenicima završnih razreda pet srednjih škola u Kragujevcu, Srbija. Učenici su popunili upitnik BKŽ. Statistička analiza izvršena je korišćenjem standardne statističke metode za validaciju i standardizaciju skale. **Rezultati.** Naša studija je pokazala da je skala BKŽ imala visoku internu konzistentnost (Cronbach-ov alfa = 0,687). Takav rezultat je pokazao dobru pouzdanost skale u našoj studiji. Prosečan skor BKŽ bio je $69,63 \pm 16,70$ (muškarci: $69,66 \pm 18,46$; žene: $69,83 \pm 15,78$, $p = 0,944$). **Zaključak.** Srpska verzija BKŽ zadovoljava sve kriterijume uspešne validacije. Zbog toga, ta skala može biti korisna za procenu kvaliteta života populacije zdravih mladih osoba u Srbiji.

Ključne reči: kvalitet života; srbija; studenti; ankete i upitnici.

Introduction

Quality of life (QoL) measures provide information beyond what is conveyed by symptom measures, making them meaningful complements in daily clinical practice¹. The defini-

tion of the term “quality of life” is essential. However, authors are often unable to define precisely what they mean by the QoL². On the other hand, subjects differ from each other according to what they deem important for a quality life³. Moreover, there is an overlap between the QoL and life satisfaction⁴.

There are a large number of scales for assessing the QoL; more than 150 instruments for measuring the QoL were published back in 1994². Today, there are numerous valid and reliable self-rating scales for the assessment of subjective QoL [for instance, RAND-36, Assessment of QoL (AQoL-4D), EuroQol (EQ-5D), Healthy Days core questions (CDC HRQoL-4), Patient-Reported Outcomes Measurement Information System – Global Health Scale (PROMIS), Quality of life scale (QoL scale), Medical Outcomes Study Short-Form 36 (SF-36), etc.]⁵⁻¹⁵. Considering that these previously enumerated scales measure the lack of symptoms, these scales are inappropriate for use in healthy subjects. Moreover, for measuring the QoL, these scales are valid and reliable, but several limitations affect their wide application¹. A good scale for clinical practice should be brief, have a simple scoring procedure, and have easy and free accessibility. However, all of these scales lack some of these characteristics.

The Brunnsviken Brief QoL (BBQ) measures importance-adjusted satisfaction across six life areas¹. The original validation study of the BBQ scale showed good questionnaire features (high concurrent and convergent validity, internal and test-retest reliability, and sensitivity to change). Therefore, the BBQ scale is excellent for use in psychiatric patients for measuring outcomes, as well as for everyday screening¹. The BBQ is freely accessible for non-commercial use in at least 30 different languages (<http://www.bbqscale.com>)¹⁶. Lindner et al.¹ showed that this scale for measuring the QoL is a valid and reliable instrument. Moreover, this scale was shown to be sensitive to differences between subjects with clinical symptoms and subjects without them, while it was not sensitive to gender or age.

The aim of the study was to evaluate the reliability, validity, and factor structure of the BBQ scale among the population of high school students in Serbia.

Methods

The study was conducted at five High Schools in Kragujevac (Serbia) among 225 subjects. Data for this study were collected during the 6 months, from October 2020 to February 2021. Approval for this study was signed by the School Principals, after which they informed school psychologists, who distributed questionnaires in paper form to students. All of the respondents were adults, so parental approval was not required. Data were collected from this non-clinical sample anonymously.

The BBQ scale was first translated into Serbian (by a native Serbian speaker), and then it was translated again from Serbian into English (by a native English speaker), using the procedure of forward-backward translation. This procedure comprises the following steps: initial translation, translation synthesis, back translation, committee review (in this case, two psychiatrists) and pretesting, and drafting a final version of the scale. After that, the original English version (Appendix 1) of the questionnaire and the English version obtained after the translation from Serbian into English

were compared, and these two versions were identical¹⁷. The Expert Committee drafted the final Serbian versions of the BBQ scale (Appendix 2), which was pretested on 10 students.

BBQ questionnaire was used for measuring QoL¹. The BBQ scale has 12 items which measure six life areas: Leisure (1st and 2nd items), View on life (3rd and 4th items), Creativity (5th and 6th items), Learning (7th and 8th items), Friends and Friendship (9th and 10th items), and View on self (11th and 12th items)^{1,18}. Each pair of items for each of the six life areas makes a question using satisfaction and importance. Items are scored using a five-step Likert rating scale (from 0 – Strongly disagree to 4 – Strongly agree). The score is computed by multiplying the Satisfaction and Importance items for each of the six life areas. The total BBQ score represents the sum of the six products for Satisfaction and Importance items for each of the six life areas. Possible values of the score are from 0 to 96.

In order to assess the test-retest reliability of the questionnaire, a test was performed in a 2-week interval on the same 24 respondents, 10 male and 14 female. The average age in this group was 17.05 [standard deviation (SD) 0.23].

All respondents also answered the World Health Organization Quality-of-Life Scale (WHOQOL-BREF). The WHOQOL-BREF is a 26-item instrument consisting of four domains: physical health, psychological health, social relationships, and environmental health; it also contains QoL and general health items. Each item of the WHOQOL-BREF is scored from 1 to 5 on a response scale, which is stipulated as a five-point ordinal scale^{19,20}. The scores are then transformed linearly to a 0-100 scale.

The statistical analysis was performed using the program IBM SPSS Statistics 26.0 (IBM, USA, 2019). Continuous variables are shown as mean \pm SD. Questionnaire reliability analysis was performed by determining Cronbach's alpha (α). Mutual correlations of questions were analyzed with the help of a correlation matrix (inter-item Pearson's correlations). The Kaiser-Meyer-Olkin Measure of Sampling Adequacy and Bartlett's test were performed to examine the suitability of the results for factor analysis. Factors were extracted after orthogonal rotation using the varimax method with the criterion for the number of the extracted components, eigenvalue > 1 . The factor loading of 0.3 or greater was considered¹⁷.

The study was approved by the Ethics Committee of the Faculty of Medical Sciences in Kragujevac (Approval No. 01-6228, from July 30, 2020). Data were collected anonymously.

Results

The study was conducted among 225 subjects (70 males and 155 females). The average age in the whole group was 17.82 (SD 0.41).

The average BBQ score was 69.63 ± 16.70 . According to gender, there were no significant differences by BBQ between males and females (male: 69.66 ± 18.46 ; female: 69.83 ± 15.78 ; independent samples *t*-test, $p = 0.944$).

The BBQ total score followed an approximately normal distribution. The BBQ scale was found to have high internal consistency with Cronbach's $\alpha = 0.687$, which means that the reliability of the scale is good.

Six item pairs of BBQ were subjected to principal components analysis (PCA). Prior to conducting the analysis, the suitability of the data for factor analysis was assessed. Examination of the correlation matrix revealed many correlation coefficients greater than 0.3 (Table 1). Correlations between the item pairs for each of the six life areas' original items also showed a good correlation in all life areas (from 0.284 to 0.640). The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy value of 0.763 indicated the adequacy of the sample, while the value of Bartlett's Test of Sphericity < 0.001 was highly statistically significant, which altogether indicated the factorability of the correlation matrix. After that, a factor analysis was conducted to determine how many phenomena are measured by the BBQ questionnaire.

The analysis of the main components revealed the presence of two components with characteristic values over 1, which explains a total of 58.10% of the variance (I 41.05%; II 17.05%). The scree plot revealed the existence of a clear breakpoint behind the two components (Figure 1). Based on Katel's criteria, it was decided to keep both components.

The component matrix revealed the existence of a simple structure, with two components having quite high weights (I component in the range of 0.480–0.810, II component in the range of 0.323–0.596). To make these components easier to interpret, a varimax rotation was performed. The rotated solution revealed the existence of a simple structure, with two components having quite high weights (I component in the range of 0.543–0.791, II component in the range of 0.312–0.764) (Table 2). Finally, the first component includes item questions View of self, Leisure time, View on life, and Learning. The second component includes questions about Friends, Friendship, and Creativity. Name suggestions of the first and second components are "view of one's own life" and "contact with the environment", respectively.

Finally, if any item is removed in this two-component model, the internal reliability will not change significantly; Cronbach's α ranges from 0.578 to 0.686.

The total BBQ scores in the 2-week interval on the same 24 subjects had a strong positive correlation (Pearson's $r = 0.989$, $p < 0.001$) (Figure 2A), suggesting satisfactory test-retest reliability.

Regression analysis between the BBQ and the WHOQOL-BREF scale showed a strong positive correlation (Pearson's $r = 0.640$, $p < 0.001$) (Figure 2B). The average QoL measured by the WHOQOL-BREF scale was 98.51 ± 12.70 .

Table 1

Correlation matrix for Brunnsvikien Brief Quality of Life scale

Items	Mean \pm SD	Leisure time	View on life	Creativity	Learning	Friends and friendship	View of self	Item-pair
Leisure time	11.04 \pm 4.39	1.000						0.450
View on life	12.50 \pm 4.41	0.343	1.000					0.450
Creativity	10.58 \pm 4.72	0.116	0.378	1.000				0.444
Learning	9.30 \pm 4.81	0.218	0.370	0.263	1.000			0.612
Friends and friendship	13.24 \pm 4.01	0.106	0.321	0.266	0.157	1.000		0.284
View of self	12.98 \pm 4.35	0.393	0.529	0.225	0.357	0.181	1.000	0.640

SD – standard deviation

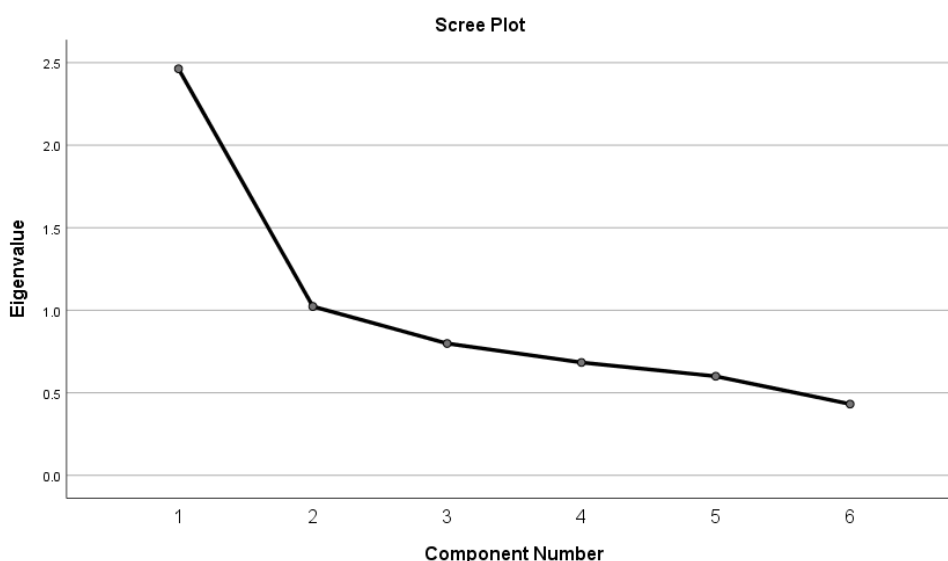


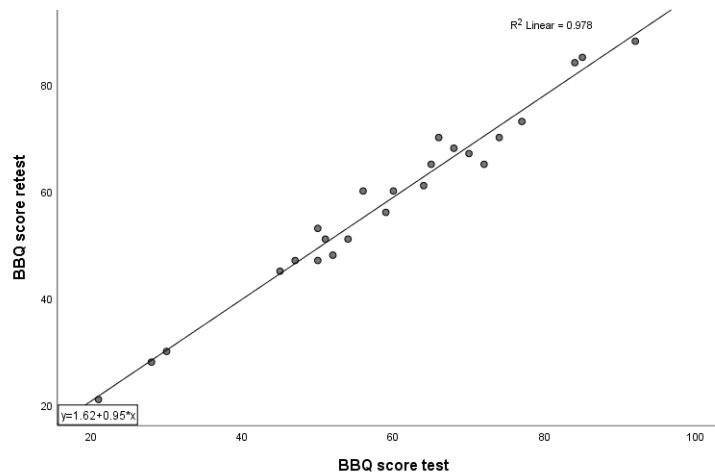
Fig. 1 – Scree plot diagram of factor analysis

Table 2

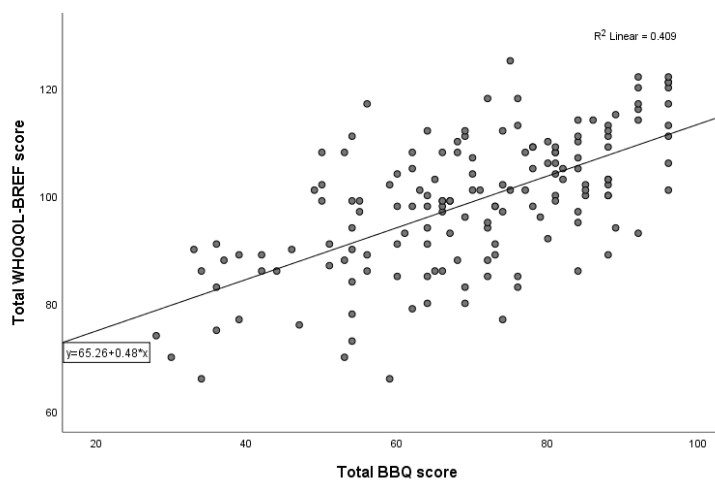
Component matrix for Brunnsviken Brief Quality of Life scale after Varimax rotation with Kaiser normalization

Variable	Pattern matrix	
	1	2
View of self	0.791	
Leisure time	0.777	
View on life	0.648	0.486
Learning	0.543	0.312
Friends and Friendship		0.764
Creativity		0.744

Extraction method: principal component analysis.



A)



B)

Fig. 2 – A) The total Brunnsviken Brief Quality of Life (BBQ) scale score: test vs. retest; B) Regression results between both scales for measuring the quality of life: the BBQ questionnaire and the World Health Organization Quality-of-Life Scale (WHOQOL-BREF).

Discussion

Self-assessment of health status and QoL are an integral part of population health studies²¹. The assessment of QoL is complex and can be based on a different set of indicators, which may differ between countries. Therefore, the choice of the questionnaire, as well as translation and validation, represents an adequate and the most important step in the QoL as-

essment. Since there are numerous scales for measuring QoL, health professionals are often in a situation to choose one of the many questionnaires for measuring QoL²². A health professional with a good understanding of the disease and/or the research requirements can select a questionnaire for measuring QoL by carefully examining the scale items and judging to what extent the set of items matches the research requirements.

The respondent's education level is very important in the cases of self-administered questionnaires because understanding the questions and the response rates significantly influence the results of the questionnaires. Completing the questionnaire without interviewers significantly increases the probability of misunderstanding and missing responses, as well as anxiety and uncertainty experienced by the respondents^{23,24}. The face-to-face questionnaires are the best option for these people²⁵⁻²⁷. There are also biased respondents to distort responses in a favorable direction to avoid negative answers in the case of self-administered questionnaires.

Assessing the QoL of young healthy people has long been a topical issue. In their previous study, Chen et al.²⁸ showed the development and psychometric assessment of the Young Adult Quality of Life (YAQOL) instrument, which measures the QoL of young adults aged 18 to 25. The YAQOL instrument has 14 multi-item scales. This instrument assesses physical health and aspects of psychological well-being, social relationships, role function, and environmental context. The average reliability coefficient for this instrument was 0.73. Twelve out of all 14 YAQOL scales distinguished young adults with personality disorders from the subjects without personality disorders. A negative relationship was also shown between the YAQOL scale scores and psychiatric disorder symptoms. Therefore, the YAQOL instrument reliability and utility were shown as strong measures of QoL in young adults.

Measuring the QoL is essential in daily clinical practice because it shows significant information in addition to symptoms. The BBQ self-rating scale of QoL has all the good characteristics that a scale should have – it is brief, easy to use with a simple scoring procedure, and has free accessibility¹. The first validation study of the BBQ scale showed good questionnaire features – that the scale is a valid and reliable measure of QoL. Furthermore, this scale appeared to be sensitive to the difference between subjects with clinical symptoms and subjects without them. Therefore, the BBQ scale is excellent for use in psychiatric patients for measuring outcomes, as well as subjects without psychiatric symptoms. The BBQ has shown high internal consistency, high test-retest reliability, and satisfactory classification accuracy when comparing clinical patients with healthy controls¹.

In our study, the BBQ showed good internal reliability. The Cronbach's α as a measure of internal consistency in our study was 0.687. This value may appear as merely unsatisfactory in light of the often-reported threshold of 0.70²⁹. However, this interpretation guideline is well argued to be inappropriately applied in cases such as the BBQ because scales with few items (such as the BBQ) tend to have lower α . In this case, inter-item correlations, preferably between 0.20 and 0.40, are considered more appropriate measures of scale reliability³⁰. Six item pairs of the BBQ during the analysis of the main components revealed the presence of two components which explains a total of 58.10% of the variance. The average BBQ score was 69.63 ± 16.70 . According to gender, there is no significant difference between males and females by BBQ. Our factor analysis showed that the first component includes item questions about the View of

self, Leisure time, View on life, and Learning, while the second component includes questions about Friends and Friendship and Creativity. We suggested the name "view of one's own life" for the first component and "contact with the environment" for the second component. The first component refers to the characteristics of the individual's personality against which one perceives their own life and assesses its quality. On the other hand, the second component portrays a person's relationship with the environment, i.e., describes how a person experiences themselves through the eyes of the environment (meaning how a person thinks he/she is judged by other people or what role he/she plays in daily life situations). However, in the original article, the parallel analysis scree plot for the BBQ revealed a marked, consistent drop in eigenvalues following the first factor and a large difference *vis-à-vis* the resampling-derived eigenvalue only for the first factor, suggesting a satisfactory and interpretable unifactorial solution¹. Because of that, the BBQ was designed to measure a single latent factor corresponding to overall subjective QoL. Similar observations have been shown in our paper, so a one-factor solution could also be applied here.

In our study, similar to the first validation study of BBQ¹, men and women did not differ in BBQ scores, suggesting that the BBQ was not biased toward any sex group. Moreover, the BBQ in our study showed good reliability in terms of internal. In our study, regression analysis between the new validation BBQ scale and the previously validated WHOQOL-BREF scale showed a strong positive correlation, similar to the first study with this scale¹. That shows that the newly translated QoL measurement scale, the BBQ scale, measures QoL in the same way as the previously validated and widely used scale, the WHOQOL-BREF scale.

The BBQ questionnaire can be applied in clinical practice. The BBQ was already used in the randomized controlled clinical trial as a secondary outcome measure after an intervention – internet-delivered extinction therapy for worry³¹. The study investigated an effect of a newly developed internet-based extinction therapy protocol in reducing worry in a sample of high-worrier subjects. The study showed a very large reduction of worry symptoms in a sample of high-worrier subjects compared to a control group. On the other hand, there was also a moderate effect on QoL. In the new study, these authors showed that internet-delivered extinction therapy was superior to waiting-list in reducing cognitive avoidance, intolerance of uncertainty, depressive symptoms, and also increased quality of life³².

In addition, BBQ was applied in a four-week randomized controlled pilot study for measuring QoL to test the effectiveness of the intervention "Boost & Balance online course" (combination of positive psychology, yoga, and mindfulness practice for five min per weekday) on measures of ill-being, well-being, and mindfulness³³. Intervention in this study showed a significant decrease in aspects of psychological ill-being and a significant increase in aspects of psychological well-being, as well as the level of mindfulness in a group of office workers (mean of BBQ was pre-intervention 61.14 vs. post-intervention 64.73), in comparison to a control group assigned to a waitlist condition (mean of BBQ was pre-intervention 66.95 vs. post-intervention

64.53). The BBQ was used in several other studies, and it showed satisfactory results in all of them^{34–38}.

Previous findings show that QoL instruments can help health professionals make informed decisions about disease management⁹. Furthermore, the instruments for assessing QoL are valuable tools for monitoring health-related QoL.

Limitations of the study

Our Serbian validation study of BBQ did not include a clinical sample. Future studies should investigate whether the BBQ is as valid and reliable when used in clinical samples.

Conclusion

This study showed nearly identical results as the first validation study of BBQ. The Serbian version of BBQ satisfies all the criteria of successful validation. Therefore, this scale will help assess the QoL in the healthy Serbian youth population. We hope that the BBQ scale for measuring the QoL may help in the everyday screening of mental disorders among young patients. In the end, the BBQ self-rating scale of the QoL has all the good characteristics that a scale should have – it is brief, easy to use, with a simple scoring procedure, and free accessibility.

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Appendix 1

Original Brunnsviken Brief Quality of life (BBQ) scale in English

Brunnsviken Brief Quality of life scale (BBQ)

The following 12 questions are about how you experience your quality of life. It covers six areas, how satisfied you are with these, and how important they are to you. Circle the number that best reflects your experience.

	Do not agree at all				Agree completely	
1	I am satisfied with my leisure time : I have the opportunity to do what I want in order to relax and enjoy myself.	0	1	2	3	4
2	My leisure time is important for my quality of life.	0	1	2	3	4
3	I am satisfied with how I view my life : I know what means a lot to me, what I believe in, and what I want to do with my life.	0	1	2	3	4
4	How I view my life is important for my quality of life.	0	1	2	3	4
5	I am satisfied with opportunities to be creative : to get to use my imagination in my everyday life, in a hobby, on the job, or in my studies.	0	1	2	3	4
6	Being able to be creative is important for my quality of life	0	1	2	3	4
7	I am satisfied with my learning : I have the opportunity and desire to learn new, exciting things and skills that interest me.	0	1	2	3	4
8	Learning is important for my quality of life	0	1	2	3	4
9	I am satisfied with friends and friendship : I have friends that I associate with and who support me (as many friends as I want and need).	0	1	2	3	4
10	Friends and friendship are important for my quality of life	0	1	2	3	4
11	I am satisfied with myself as a person : I like and respect myself.	0	1	2	3	4
12	My satisfaction with myself as a person is important for my quality of life	0	1	2	3	4

The BBQ may be used freely and without costs by researchers and clinicians. For more information, visit www.bbqscale.com

Appendix 2**Translation of the Brunnsviken Brief Quality of Life (BBQ) scale to Serbian****Kratka skala Brunnsviken za procenu kvaliteta života (BKŽ)**

Pred vama se nalazi dvanaest tvrdnji koje se tiču načina na koji doživljavate kvalitet svog života. Skala uključuje šest aspekata kvaliteta života, a vaš zadatak je da procenite u kojoj meri ste njima zadovoljni i koliko su oni važni za vas. Za svaku tvrdnju zaokružite broj koji najbolje odražava vaš stepen slaganja sa njom.

Od 0 – uopšte se ne slažem, do 4 – u potpunosti se slažem.

1	Zadovoljan/na sam svojim slobodnim vremenom: jer mogu da radim kako bi se opustio i uživao.	0	1	2	3	4
2	Moje slobodno vreme je važno za kvalitet mog života.	0	1	2	3	4
3	Zadovoljan/na sam time kako gledam na život: znam šta mi mnogo znači, u šta verujem i šta želim od života.	0	1	2	3	4
4	Način na koji doživljam svoj život važan je za kvalitet mog života.	0	1	2	3	4
5	Zadovoljan/na sam svojim mogućnostima da koristim maštu u svakodnevnom životu, kada se bavim nekim hobijem ili kada sam u školi.	0	1	2	3	4
6	Mogućnost da budem kreativan/a je važna za kvalitet mog života.	0	1	2	3	4
7	Zadovoljan/na sam svojim učenjem: imam mogućnost i želju da naučim nešto novo i uzbudljivo, kao i da usvojim veštine koje me interesuju.	0	1	2	3	4
8	Učenje je važno za kvalitet mog života.	0	1	2	3	4
9	Zadovoljan/na sam svojim prijateljima i prijateljstvima: imam prijatelje sa kojima se družim i koji me podržavaju (onoliko prijatelja koliko želim da imam i koliko mi je potrebno).	0	1	2	3	4
10	Prijatelji i prijateljstva su važni za kvalitet mog života.	0	1	2	3	4
11	Zadovoljan/na sam sobom kao osobom: volim i poštujem sebe.	0	1	2	3	4
12	Za kvalitet mog života važno je da sam zadovoljan/na sobom kao osobom.	0	1	2	3	4

BKŽ mogu koristiti slobodno istraživači i kliničari bez ograničenja i naknade. Za dodatne informacije, posetite veb-sajt www.bbqscale.com.