https://doi.org/10.7251/SSH26V087V **UDC:** 616.98:578.834]:613-056.24
Original scientific paper ***Originalni naučni rad***

Metric Characteristics of a Short Scale for Self-assessment of Students' Quality of Life during the COVID-19 Pandemic

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Abstract: *With the aim of determining the metric characteristics of the adapted research instrument, applied in the process of detecting students' perception of the quality of life after the period of closure of cities, institutions, schools, institutions of different profiles, i.e. measures to restrict movement and "live" social interaction during the pandemic caused by the SARS-CoV-2 corona virus, its statistical valorization was performed. The questionnaire, which is based on the assessment scale for the quality of life among the student population (PQL-S), was tested through two statistical procedures: (1) checking its internal agreement (Scale Reliability Analysis) based on Cronbach's Alpha coefficient values; and (2) factor analysis (Principal Components Analysis, with the Direct Oblimin method of rotation). The research sample consisted of students of the Academy of Applied Studies in Belgrade (n = 1260). The results indicate good metric characteristics for the short twelve-item scale, demonstrating satisfactory reliability (Cronbach's α = .806). The scale also showed good validity, supported by a Kaiser-Meyer-Olkin measure of .805 and a significant Bartlett's test of sphericity (p < .001). Furthermore, application of the validated scale revealed a significant decline in students' self-assessed quality of life in the post-pandemic period (p < .001). Statistical conclusions were made with a significance level of 0.05 (p < .05). The application of the validated scale revealed a significant decline in students' quality of life perceptions in the post-pandemic period. The good metric characteristics of the instrument represent a quality basis for its possible application within the student population.*
Keywords: *scale, validity, quality of life, students*

Introduction

The determinism of the modern understanding of the quality of life refers dominantly to its essential multidimensionality. It includes several synergistically related factors related to the individual, among which the following stand out: physical health, psychological state, status of economic independence, social relations, personal beliefs, attitudes and value orientations, relation to existential aspects of the immediate environment, etc. (Nešić & Srdić, 2021). According to the still dominant definition of the World Health Organization (WHOQOL group, 1996) on the foundation of standards for the perception of quality of life, it is about a person's individual perception and perception of his own life position experienced through the context of the cultural and value system in which he lives. The key element in this complex process refers to the alignment of individual goals, expectations and interests, within the set and generally accepted social norms and standards (Nešić, 2016).

The view that the concept of quality of life is primarily perceived at the individual level through the personal set of values of a certain person has a solid foundation in the fact that, essentially, it is about the overall general well-being of each individual, which implies the existence of objective factors (mainly from the external environment), with subjective evaluation of physical, material, social and emotional well-being (Nešić et al., 2018).

When considering the quality of life of young people, especially the student population, it is necessary to think through the aspect of the influence of the environment as its integral component. Depending on how young people perceive their current quality of life, their attitude towards identifying, valuing, and adopting a certain lifestyle will also depend. In the search for their own identity, the feeling of adequate quality of life can represent a significant determinant of their social connection, preferences, aspirations, and/or distancing (Nešić et al., 2015). The period of study (the so-called student life) is a specific part of a young person's life, characterized by numerous challenges, but also opportunities. It is about a period in a young man's life that is characterized by adjustment processes. First of all, it implies a significant number of changes of cognitive, emotional and social character that occur in every young per-

son, and are conditioned, among other things, by significant changes in the period of time devoted to the study of the chosen field of study. Starting from information to developing a systematic and critical opinion about various facts and data essential for the development of lifestyle and habits, which is followed by the adoption of new (specific) norms of behavior in the conditions of a new living environment and relative separation from parents and family.

Although periods of great crises (such as the COVID-19 pandemic) most often condition changes in the experience of the quality of life (individuals, but also society as a whole), the very context of the experience of the quality of life, essentially, remains based on two key factors: (1) subjectivity (primarily understandable from the individual's perspective) and (2) multidimensionality (assessment of several different dimensions of an individual's life) (Slavuj, 2012; Nešić, 2016; Joković et al., 2017). In general, the perception of the quality of life during the pandemic period, as well as during the so-called post-covid regressed significantly, especially in the context of psychological and social factors that contribute to the individual sense of quality of life in the non-pandemic period (Leong Bin Abdullah et al., 2021; Stella Epifanio, 2021; Fiqueroa-Quiñones et al., 2022; Višnjić, Kok, Višnjić, Jovanović & Marković, 2023).

Self-assessment of quality of life is one of the important aspects of most population studies, including among the student community. It can be based on a different set of indicators, depending on research and social needs, scientific coverage, regional affiliation of the population, economic conditions, etc. Therefore, the appropriate selection of questionnaires is an important segment of research operations. Also, the individual experience of the quality of life represents for the individual the most authentic attitude towards this issue in the concrete living environment. In this regard, scalar-type survey instruments, based on the identification of respondents' self-assessment, proved to be very practical and reliable enough for a relatively clear identification of certain segments of the quality of life.

The aim of this research was twofold. The first, primary aim was to examine the metric characteristics (validity and reliability) of a short scale for the self-assessment of students' quality of life, constructed based on the PQL-S instrument, in order to verify its suitability for use in this population. The second aim, achieved by applying the validated scale, was to identify and analyze changes in the students' perception of quality of life after the period of the COVID-19 pandemic, compared to the period before its outbreak. In this way, the research strives to provide both a practical assessment tool and empirical insight into the well-being of the student population during a crisis.

Material and Methods

Sample of respondents

The research was conducted within the framework of a broader research project at the Academy of Applied Studies Belgrade, as a transversal study (survey method), with the aim of identifying the perception of quality of life among students in the period after the COVID-19 pandemic.

The sample of respondents consisted of a total of 1260 students of the Belgrade Academy of Applied Studies. Subsampling was carried out according to the criteria of being infected with the corona virus: (1) had been infected with covid-19 and (2) had not been infected with the corona virus.

Sample of measures

A five-point short scale for self-assessment of quality of life was used as a research instrument. The construct of this scale was based on the PQL-S instrument (Nešić, 2016), which was redesigned on this occasion and reduced to a short twelve-item Likert-type scale.

The item indicators included the following areas that determine the quality of life: (1) the level of daily physical activities, (2) the regularity of engaging in sports and recreational activities (SRA), (3) opportunities for exercising sports recreation in the place of residence, (4) general work capacity, (5) quality and regularity of daily meals, (6) sleep and rest, (7) self-confidence, (8) social relationships and environmental support, (9) relationships with friends, (10) contacts on social networks, (11) atmosphere at work/school and (12) family environment. As it is a reconstructed version of the validated scale for the student population, in the process of analyzing the results, its reliability was determined by calculating the Cronbach's Alpha coefficient.

Statistical analysis

Statistical procedures of a descriptive and comparative type were applied in the process of processing the empirical material. Basic descriptors were determined by calculating frequency distributions, standard deviation, arithme-

tic mean, as well as contingency analysis. In the area of comparative statistics, factor analysis (Principal Component Analysis with Direct Oblimin rotation) was applied. The suitability of data for factor analysis was assessed prior to the analysis, with the Kaiser-Meyer-Olkin measure confirming sampling adequacy and Bartlett's test of sphericity indicating that correlations were appropriate for factoring. Statistical inferences were conducted at a significance level of 0.05 ($p < .05$). The data analysis involved utilizing the Statistical Package for Social Sciences (SPSS) version 26.0 by SPSS Inc. in Chicago, IL, USA.

Results

The procedure that preceded the analysis and explanation of the results of the empirical material included the determination of the internal agreement of the applied scale. Reliability was identified by calculating the Cronbach's Alpha coefficient, which in this case was $\alpha = 0.806$, which significantly exceeds the recommended theoretical level of 0.7 (DeVellis, 2003; Hair et al., 1998) (Table 1).

Table 1. *Results of scale reliability analysis (n = 1260)*

Item	Indicator	Cronbach's Alpha if Item Deleted	Mean	Standard Deviation
1	Level of daily physical activities	0.780	3.36	0.978
2	Frequency of engaging in sports and recreational activities	0.788	2.97	1.197
3	Sleep and rest	0.798	3.65	1.074
4	Quality and regularity of meals	0.788	3.60	1.049
5	General work capacity	0.785	3.58	1.010
6	Self-confidence	0.782	3.88	0.983
7	Social relationships and support from the environment	0.777	4.15	0.881
8	Relationships with friends	0.781	4.43	0.814
9	Contacts on social networks	0.792	4.07	0.970
10	Atmosphere at work	0.781	3.85	1.013
11	Family environment	0.785	4.48	0.816
12	Opportunities for recreation in the place of residence	0.785	3.95	1.098
	Cronbach's Alpha for the Entire Scale	0.806	3.74	0.557

As the scale showed appropriate reliability and good internal agreement of item indicators, conditions were created that enable research capacity and its applicability for further processing. By applying factor analysis, an attempt was made to determine the latent structure of the space of self-assessment of the quality of life among students. The scalar average of the scale as a whole was at the level of moderate satisfaction with the quality of life (3.74), while the values within the item indicator ranged from 2.97 to 4.48. The Kaiser-Meyer-Olkin Measure of Sampling Adequacy (0.805) and Bartlett's Test of Sphericity, $\chi^2 = 4092.627$, $p < .001$, indicated the data were suitable for factor analysis.

The analysis of the main components obtained after oblique rotation (Direct Oblimin method of rotation) revealed the presence of three components with characteristic values (eigenvalues) over one, which explain 32.28%, 13.45% and 10.31% of the variance (Table 2), which explains a significant percentage of the total variance (56.076%) and indicates the stable factorability of this scale. These values also support the recommendations on the interpretation of factor analysis results (Pallant, 2009).

Table 2. *Total variance explained for the self-report scale*

Component	Total	% of Variance	Cumulative %
1	3.874	32.281	32.281
2	1.618	13.458	45.766
3	1.237	10.310	56.076

All 12 variables gave the appropriate factor weight to the extracted components in isolated factors (Table 3), additionally confirming that the short scale of self-assessment of the quality of life among students has appropriate

validity, which creates perspectives that it can be applied as an appropriate scale for assessing some aspects of the quality of life among students.

Table 3. *Results of the factor analysis of the short self-assessment scale (Pattern Matrix)*

Variable	Factor I		Factor II		Factor III	
	Factor weight	Communality	Factor weight	Communality	Factor weight	Communality
Relationships with friends	0.862	0.683				
Social relations and support from the environment	0.844	0.683				
Contacts on social networks	0.663	0.430				
Family environment	0.631	0.447				
Self-confidence	0.503	0.391				
Atmosphere at work	0.408	0.371				
Opportunities for recreation in the place of residence	0.369	0.328				
Frequency of engaging in sports and recreational activities			0.882	0.725		
Level of daily physical activities			0.859	0.725		
General working capacity			0.614	0.463		
Sleep and rest					0.882	0.754
Quality and regularity of meals					0.818	0.728

Kaiser-Meyer-Olkin Measure of Sampling Adequacy = 0.805
Bartlett's Test of Sphericity, $\chi^2 = 4092.627$, $p < .001$

The hierarchical structure of the assembly matrix (Pattern Matrix) indicates the hierarchical structure of the extracted factor. Projections on the first main component are realized by seven items (relationships with friends, social relations and environmental support, contacts on social networks, family environment, self-confidence, atmosphere at work/school and opportunities for recreation at the place of residence). It is noticeable that this factor includes indicators related to factors of the students' living environment and which can greatly influence the quality of their life. Respecting the semantics of the included items, this factor can be named as the factor of the *external environment*.

The second single factor includes three item indicators (regularity of engaging in physical activities, level of daily physical activities and general work capacity). It is unequivocally observed that this factor is saturated with items related to habits and attitude towards physical activities and recreation, and their consequence on the general working capacity of students, which is very important for the overall experience of the quality of life. Based on the semantic context, this factor is called the *physical activity* factor.

Although the saturation of only two items (sleep/rest and quality of daily meals) can be observed in the third single factor, their contextuality in a broader sense has the capacity for significant implications on the overall quality of life. Therefore, this factor was retained within the construct of the latent structure of the researched area of perception of the quality of life among students. Bearing in mind the wording of the items in the instrument as a logical terminological framework for this factor, the *lifestyle* factor was imposed.

The determined results of the empirical material in the space of the latent structure can be logically interpreted and connected with the expressed self-assessment of the quality of life of the respondents. The item indicators, which tried to determine how students perceive their overall quality of life in the period before the outbreak of the COVID-19 pandemic and the current living conditions (conditionally post-COVID period), showed that there are significant differences in the perception of the quality of life. It is clearly observed that, evaluating the quality of life before the outbreak of the pandemic, the largest percentage of respondents (60.9%) perceived their life as above average, while an almost negligible number (2.2%) were those who declared that they lived below the usual average for this part of our population. This was expected, given that the majority of respondents were those who were not infected with COVID 19 (70.7%) (Table 4).

Table 4. *Self-assessment of quality of life before the pandemic by COVID-19 infection*

Quality of life before the pandemic	COVID-19		Total
	Yes	No	
Below average	14	14	28
	1.1%	1.1%	2.2%
Average	124	341	465
	9.8%	27.1%	36.9%
Above average	231	536	767
	18.3%	42.5%	60.9%
Total	**369**	**891**	**1260**
	29.3%	70.7%	100.0%

$\chi^2(2) = 7.598, p = .022$

However, after a two-year period of living in a pandemic environment (with all the social restrictions, changes in the way of social and individual functioning, etc.) the experience of the quality of life has changed significantly. There is a noticeable decrease in the number of those who rate the current quality of life as above average (22%), while the number of respondents who now (according to their opinion) live average, has increased significantly (66.3%). Also, there is a noticeable increase in the percentage of those who think that they are living much worse now, i.e. below the average (11.7%) (Table 5), which is also detected in respondents who were not infected with the virus that causes the COVID-19 infection.

Conversely, in the post-pandemic period, the difference in quality of life assessments between infected and non-infected students was not statistically significant, $\chi^2(2) = 3.136$, $p = .208$.

Table 5. *Self-assessment of quality of life in the post-pandemic period by COVID-19 infection status*

Quality of life in the post-pandemic	COVID-19		Total
	Yes	No	
Below average	52	96	148
	4.1%	7.6%	11.7%
Average	242	593	835
	19.2%	47.1%	66.3%
Above average	75	202	277
	6.0%	16.0%	22.0%
Total	369	891	1260
	29.3%	70.7%	100.0%

$\chi^2(2) = 3.136, p = .208$

All this points to the fact that the pandemic had a significant impact on the respondents' perception of a decrease in the general quality of life. The significance of the observed empirical differences is also confirmed by the results of the contingency analysis, which revealed a statistically significant difference between the pre-pandemic and post-pandemic periods, $\chi^2(4) = 140.924$, $p < .001$ (Table 6).

Table 6. *Contingency analysis of self-assessed quality of life before and after the pandemic*

Self-assessment of quality of life	n	%
Before COVID-19	1260	100
Post-COVID period	1260	100

$\chi^2(4) = 140.924, p < .001$

The identified values of the empirical results can be considered as corresponding with similar recent studies that determined that the feeling of the quality of life among the student population changed significantly after the

pandemic period (Aristovnik, 2020; Aucejo et al., 2020; Vrdoljak, 2021; Farnell, Skledar-Matijević & Šćukanec-Schmidt, 2021; Bekić & Malčić, 2022).

Discussion

This study sought to develop and validate a concise instrument for assessing student quality of life in the context of the COVID-19 pandemic and to employ this tool to capture shifts in quality of life perceptions following this global crisis. The findings, interpreted against the study's dual aims, provide clear evidence of the scale's robustness and reveal a significant pandemic-related decline in student well-being.

Specifically, in relation to the first aim of examining the scale's metric characteristics, the results unequivocally show that the short scale possesses satisfactory metric characteristics. Its good degree of internal consistency (Cronbach's $\alpha = 0.806$) and clear three-factor structure explaining 56.07% of the variance confirm that the scale is a reliable and valid instrument suitable for the rapid assessment of quality of life in the student population. Concerning the second aim of identifying pandemic-related changes, the application of the scale revealed a dramatic and statistically significant decline in students' perception of their quality of life in the post-pandemic period. This finding clearly indicates that the COVID-19 pandemic and its psychosocial context had a significant negative impact on all three identified dimensions of well-being: the external environment, physical activity, and lifestyle.

Interpretation of Findings

The obtained Cronbach's alpha coefficient value of 0.806, which is higher than the recommended theoretical threshold of 0.7 (DeVellis, 2003), indicates solid internal consistency of the scale. This result is consistent with the reliability of the original PQL-S questionnaire (Nešić, 2016) on which the scale is based, as well as with other short instruments constructed to assess specific aspects of quality of life (Nešić et al., 2018). This suggests that the shortened version, despite the reduction in the number of items, successfully retained its reliability as a measurement instrument, which is crucial for its practical applicability.

The results of the factor analysis (Principal Components Analysis) confirmed the multidimensional nature of the quality of life concept, revealing a clear three-factor structure. This structure, comprising the factor of external environment (social relations, family, self-confidence), the factor of physical activity (activity level, sports, work capacity), and the factor of lifestyle (sleep, nutrition), is partially consistent with broad definitions of quality of life that emphasize physical, psychological, and social well-being as key dimensions (WHOQOL group, 1996; Nešić & Srdić, 2021).

Comparison with Recent Studies

Although the number and content of factors may differ from some more general models, the presence of factors related to social relations and physical activity consistently emerges as a critical component of student well-being in research conducted during the pandemic (Leong Bin Abdullah et al., 2021; Figueroa-Quiñones et al., 2022). Our results thus emphasize that these areas were particularly sensitive to the disruptions caused by the crisis.

The most striking finding of this study is the dramatic decline in students' self-assessed quality of life after the pandemic. The percentage of students rating their life as "above average" fell from 60.9% to just 22.0%, while the percentage of those rating themselves as "below average" increased from 2.2% to 11.7%. The confirmed dramatic decline in students' quality of life was statistically significant ($p < .001$). This finding is compellingly consistent with the results of numerous global studies that have documented the difficulties faced by the student population. Our data directly support the research of Aristovnik et al. (2020), who found a significant deterioration in the mental health, social, and academic well-being of students on a global sample. Similarly, Aucejo et al. (2020) reported a large decrease in satisfaction with education and life in general, which directly relates to our finding of a reduced rating of overall quality of life.

It is particularly interesting that the decline in quality of life was also recorded among students who had not been infected with the virus. This highlights that the psychosocial context of the pandemic itself – restrictive measures, social isolation, changes in the academic environment – had a more crucial impact on the experience of quality of life than the individual's health status alone. This assertion aligns with the findings of research by Farnell et al. (2021), who emphasize the loss of daily routines and reduced social contacts as key stress factors. Additionally, the study by

Višnjić et al. (2023) on students in Serbia also linked increased social media use during the pandemic with higher levels of anxiety, depression, and stress, indirectly supporting our finding that aspects of the "external environment" were critical.

The identified factors in our study provide even deeper insight. The decline in the domain of physical activity (Factor 2) directly reflects the closure of sports facilities and movement restrictions, which was a constant finding during the lockdown period (Bekić & Malčić, 2022). The reduction in social support and quality of family atmosphere (Factor 1) was also expected given the disruption of "live" interactions, which is also confirmed by the research of Epifanio et al. (2021) in the Italian population. Finally, the disruption of sleep patterns and eating habits (Factor 3, lifestyle) represents another universal consequence of disrupted daily routines during the crisis (Leong Bin Abdullah et al., 2021).

Implications of the Study

This study has dual implications. Theoretical implications lie in contributing to the validation of a short yet reliable quality of life assessment instrument that can serve as a basis for future comparative research in the region. Practical implications are more direct: the identified key areas of deterioration (social relationships, physical activity, sleep and eating habits) provide clear guidelines for universities and student services to design targeted support programs and interventions aimed at preserving the mental health and well-being of the student population in times of crisis. Finally, the good metric properties of the scale and the clear factor structure we obtained make this instrument a useful tool for future research. It enables a quick and efficient assessment of key quality of life domains among students, which is of particular importance for monitoring the long-term effects of the crisis and evaluating support programs.

Limitations of the Study

The application of this modified scale was tested on the population of students of the Academy of Applied Studies in Belgrade, which can be a relative limitation of this study. In this sense, it is recommended that in subsequent research it be additionally checked on a wider student sample, given that it showed correct metric characteristics. It is realistic to expect that the questionnaire/scale will prove to be reliable and applicable in the practice of quality of life research in the wider student population.

Conclusion

This research confirmed that the short self-assessment quality of life scale has satisfactory metric characteristics, demonstrating good reliability and a clear three-factor structure encompassing the dimensions of external environment, physical activity, and lifestyle. The application of the scale revealed a dramatic decline in students' perception of their quality of life after the COVID-19 pandemic, indicating the profound impact of the crisis on their well-being. These findings have immediate practical implications: the scale can be used as a quick and reliable tool for assessing the well-being of the student population in times of crisis, and the identified sensitive areas (physical activity, social ties, lifestyle) provide clear guidelines for designing targeted support programs and interventions by university services.

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Primljen: 10. maj 2025. / Received: May 10, 2025
Izmjene primljene: 01. decembar 2025. / Changes Received: December 01, 2025
Prihvaćen: 20. decembar 2025. / Accepted: December 20, 2025