

MEASURING STRESS – METHODS AND TOOLS

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Abstract: To validate PSS-14 Romanian version and identify reliable and simple tools which can be used for measuring stress level in current practice. **Materials and methods:** PSS-14 Romanian version, a five-level qualitative scale and a decimal scale were applied to 928 Romanian subjects, selected through the “snowball method”, for measuring perceived stress level. Intraclass correlations and Alpha Cronbach coefficient were used for assessing internal consistency of PSS-14 and Spearman coefficient for testing correlations. **Results:** Cronbach’s Alpha values for PSS-14 items were ≥ 0.700 (0.746 and 0.878 for standardized coefficient), showing internal consistency. Spearman correlation (0.375, $p < 0.05$) revealed positive, medium and significant correlations between simple scales scores and PSS-14 scores. **Conclusions:** PSS-14 RO is an adequate tool for measuring the perceived stress level in Romanian patients. When appropriate, a simple Likert qualitative scale or a decimal self-assessment scale can quickly provide to health professionals results with indicative value.

INTRODUCTION

In the modern society, stress became one of the most important risk factors, being related to multiple aspects of our adaptative functioning with impact on health status, social role, quality of life, life satisfaction and wellbeing.(1) Stress response is closely related to individual reactions towards environmental changes, perceived as threats and demanding appropriate coping response.(2,3) Measuring perceived stress level and assessing the relation with various personal characteristics became very important and useful for medical, public health, and social interventions.

AIM

The main aim of our research was to validate PSS-14 Romanian version and to identify reliable and simple tools which can be used for measuring stress level in current practice. In order to reach this purpose, we followed three objectives: measuring the perceived stress level using three different methods, assessing the external and internal consistency and validity of PSS-14 Romanian version, exploring the possibility of using simple instruments - the qualitative Likert type five levels scale or a simple decimal scale – to measure perceived stress level, with indicative value.

MATERIALS AND METHODS

In order to reach the three objectives, we performed an observational cross-sectional study in a group of 928 adult subjects, from different geographical regions of Romania, selected by the “snowball” method. This study was a part of a wider research, in which a self-administered set of three printed questionnaires has been used as a data collection tool. The set of tools included Perceived Stress Scale with 14 items (PSS-14) Romanian version, SF-36v2RO 2012 and a general

questionnaire collecting demographic, socio-economic, health status data, perceived health related quality of life (decimal scales) and perceived stress level information based on a self-assessment qualitative Likert five levels scale and a decimal scale, which were applied simultaneously.

Perceived Stress Scale with 14 items (PSS-14), designed to assess “the degree to which individuals appraise situations in their lives as stressful”, is considered one of the most robust and reliable primary psychological instrument for measuring individuals’ perceived stress related to recent objective events, for different categories of subjects.(4,5) PSS – 14, which has been validated only for persons with minimum junior high level of education (exclusion criteria) includes fourteen questions exploring potential stressful experiences met during the last month. The responses of PSS - 14 varies from 0 to 4 for each item and ranging from never, almost never, sometimes, often and very often respectively, based on their occurrence. Items 1, 2, 3, 8, 11, 12 and 14 are negatively stated, the response “never” being quantified as 0 points, while items 4, 5, 6, 7, 9, 10 and 13 are the positively stated, and the response “never” gets 4 points. PSS-14 scores are obtained by summing across all 14 items, after reverse scoring of positively stated items results. The final score can vary from 0 to 56, the higher scores indicating higher levels of stress and lower scores indicating lower levels of stress, with no specific thresholds.(5)

In our study, we applied a Romanian version of the PSS-14 scale which has been used in two other previous studies.(6,7) Considering that we could not identify published data regarding the validation process for PSS-14 Romanian version, we performed an internal consistency and a validity assessment, analysing the correlations between the results of PSS-14 Romanian version and those of two other instruments for measuring perceived stress level - a qualitative Likert scale

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with five levels (not stressed, a little stressed, moderately stressed, stressed, very stressed) and a decimal scale with scores from 0 to 10, where 0 was the lowest and 10 the highest possible stress level that could be imagined by the subjects.

RESULTS

The qualitative measurement revealed a distribution with close proportions for the two extremes – 6% and 5,5 % being not stressed or very stressed, while the highest proportion was represented by the moderately stressed group – 40.8%, with a higher overall proportion in the low and moderate stressed zone (table no. 1).

Table no. 1. Perceived stress level – qualitative and quantitative measurement (decimal scale)

Perceived stress level	No. of subjects	Proportion Qualitative (%)	Cumulated Proportion Qualitative %	Average score $\pm$ SD Decimal scale	Median Decimal scale
not stressed	56	6.0	6.0	1.84 $\pm$ 2.93	1.00
a little stressed	264	28.4	34.4	4.53 $\pm$ 2.65	4.00
moderately stressed	379	40.8	75.2	5.97 $\pm$ 1.47	6.00
stressed	178	19.2	94.4	7.15 $\pm$ 1.43	7.50
very stressed	51	5.5	100.0	8.35 $\pm$ 1.91	9.00
Total	928	100.0		5.67$\pm$2.48	6.00

On the decimal scale, subjects' self-assessment showed an average score of 5,672 $\pm$.48, with a minimum of 0 points, max 10, a median score of 6.00, and a non-symmetrical distribution of the individual scores ($p < 0.001$, Shapiro Wilks test) (table no. 1).

The next step was to assess the concordance between the stress level measured with the qualitative scale and the scores measured with the simple decimal scale, calculating the average score $\pm$ SD, median, minimum and maximum scores for each qualitative level. The comparison of the medians two by two, on neighbouring levels of stress, revealed statistically significant differences between the five qualitative levels of perceived stress ($p < 0.001$, Mann Whitney U test). In this context, we may consider that there is a concordance between the respondents' opinions regarding the stress level on the qualitative scale and the score on the decimal scale (table no.1).

The perceived stress level measured in the 928 subjects with PSS-14 Romanian version revealed an average score of 22.69 $\pm$ 6.73 (min 1, max 46 points), with a median score of 23. The relationships between stress level and different socio-demographic and economic characteristics have been analysed in a previous phase of the research.(8)

Table no. 2. PSS-14 Ro - Inter-items correlations matrix

PSS3	PSS8	PSS11	PSS12	PSS14	PSS4	PSS5	PSS6	PSS7	PSS9	PSS10	PSS13
.453	.203	.343	.147	.351	.205	.214	.146	.243	.164	.266	.176
.442	.347	.407	.186	.470	.302	.363	.291	.425	.236	.373	.282
1.000	.228	.412	.209	.473	.287	.260	.184	.329	.284	.285	.208
.228	1.000	.325	.174	.376	.247	.227	.233	.201	.143	.205	.175
.412	.325	1.000	.303	.455	.268	.215	.215	.326	.277	.300	.198
.209	.174	.303	1.000	.237	.073	.034	-.034	.042	.075	.078	.052
.473	.287	.412	.209	1.000	.366	.332	.299	.412	.263	.380	.347
.287	.247	.268	.073	.366	1.000	.446	.382	.357	.260	.356	.290
.260	.227	.215	.034	.332	.446	1.000	.471	.404	.248	.409	.375
.184	.233	.215	-.034	.299	.382	.471	1.000	.401	.240	.455	.362
.329	.201	.326	.042	.412	.357	.404	.401	1.000	.270	.459	.344
.284	.143	.277	.075	.376	.260	.248	.240	.270	1.000	.410	.253
.285	.205	.300	.078	.380	.356	.409	.455	.459	.410	1.000	.370
.208	.175	.198	.052	.347	.290	.375	.362	.344	.253	.370	1.000
.620	.506	.625	.334	.720	.588	.607	.568	.639	.505	.651	.542

For PSS-14 Romanian, internal consistency analysis has been performed using the intraclass correlation and Alpha Cronbach coefficients. We observed direct positive correlations between all the fourteen items of PSS-14 Romanian version

scale and the total PSS-14 score shows direct correlations, at least medium with each individual item (table no. 2).

Alpha Cronbach coefficient was 0.746 (> 0.700 , considered as acceptable), while standardised Alpha Cronbach was 0.878, suggesting an adequate internal consistency of PSS-14 Romanian version questionnaire. External validity for PSS-14 Romanian version was measured by analysing the correlation between the PSS-14 score and the results provided by the decimal scale. Considering that both scores had non-Gaussian distributions, we utilised Spearman correlation coefficient, which showed a direct, medium and statistically significant correlation between the two scores (table no. 3).

Table no. 3. Correlation PSS-14 and decimal scale scores

	Decimal scale	PSS -14 Score
Spearman Coeff.	1.000	.375
Sig. (2-tailed)	.	.000
N	928	928

Similarly, we observed that both average and median PSS-14 scores for different stress levels measured on the qualitative scale successively increased, with statistically significant differences between the neighbouring scores (table no. 4).

The last step of our analysis was to check the potential correlations between the stress level measured with PSS-14 and the decimal scale and the results for perceived health related quality of life and health status, measured with the decimal scale, whose utility has been proved in a previous analysis.(10) Spearman coefficient (two tails) calculation revealed a negative weak correlation between stress levels and health status scores (medium for PSS-14 and weak with the decimal score, valid for 99% of the subjects) (table no. 5).

Table no. 5. Correlation PSS-14 and decimal scales scores

Score	Test	Decimal scale for health status
PSS-14 Romanian version	Spearman Coeff.	-.389
	p (2 tails)	.000
	N	928
Decimal scale stress score	Spearman Coeff.	-.152
	p (2 tails)	.000
	N	928

DISCUSSIONS

Even though we applied a PSS-14 Romanian version which was previously utilised in at least two other studies in Romania (6,7), we were not able to identify published results referring to instrument validation. To mitigate the risk of instrument generated bias, we assessed both internal consistency, which proved adequate (Cronbach's Alpha 0.746 and standardized item 0.878), and validity – by analysing the correlations between the results of PSS-14, qualitative scale levels and decimal scale scores, using Spearman correlation for non-Gaussian distributions, which showed a direct, medium and statistically significant correlation between the two scores. Based on these results, we consider that PSS-14 Romanian version is an instrument with adequate internal consistency and validity, and that it can be used on the Romanian population.

The concordance between the results of perceived stress level measurement obtained using the three different instruments suggests that applying simple instruments can also offer relevant information. Taking into account that stress is one of the main risk factors for health status, the two simple instruments could also be utilised for systematic risk assessment for stress related health problems, but further research regarding the significance of each level of perceived stress should be performed.

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Table no. 4. Correspondence between qualitative scale stress level and PSS -14 scores

Perceived stress level	Average PSS-14 score	95% CI p<0.05		Median Score PSS-14	Variance	SD	Min	Max	Inter-Quartiles interval
not stressed	15.17	13.23	17.11	14.00	52.44	7.24	1.00	32.00	10.75
a little stressed	20.32	19.56	21.07	21.00	39.10	6.25	4.00	41.00	7.75
moderately stressed	22.94	22.39	23.48	23.00	29.13	5.39	7.00	39.00	7.00
stressed	26.07	25.16	26.98	26.00	37.86	6.15	3.00	46.00	9.00
very stressed	29.51	27.71	31.30	30.00	40.57	6.36	10.00	43.00	9.00

CONCLUSIONS

Our results have potential practical implications for situations when applying more complex instruments like PSS-14 or other questionnaires (9) is difficult. The simple request of stress self-assessment, using one of the two simple tools can offer to the health professionals (physicians, psychologists, therapists, etc.) an image on the perceived stress level which can impact on person's health status. These two simple instruments can be applied together with the decimal scale for measuring the general wellbeing, whose utility has been proven in a previous analysis, as a set of simple tools, generating quick results with indicative value.(10) Further research is needed for a better understanding of the significance of different stress level.

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