Stress associated with undergraduate medical courses: A translation and validation of the Perceived Medical School Stress Instrument into Polish and its adaptation to the Polish environment

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Abstract: O b j e c t i v e s: Medical students are more susceptible to depression than other students. Moreover, students with the symptoms of depression statistically more often abuse drugs and have suicidal thoughts and anxiety. The level of stress and the factors that lead to in among medical students at Polish universities have not yet been measured. The aim of this study was to translate to Polish and validate the Perceived Medical School Stress Instrument (PMSS-PL) and to measure the resulting version's psychometric abilities.
M a t e r i a l s   a n d   M e t h o d s: We validated the Polish translation of PMSS in accordance with the recommendations published by the Translation and Cultural Adaptation group of the Quality of Life Special Interest group of the International Society for Pharmacoeconomics and Outcomes Research. The Perceived Stress Scale (PSS-10) was used as an external test to validate the PMSS-PL questionnaire. A total of 430 undergraduate medical students at the Medical College of Jagiellonian University took part.
R e s u l t s: The mean PMSS-PL score was 36.43 and it varied from 13 to 65. The mean PSS-10 was 21.35. The internal reliability, as indicated by Cronbach's alpha, was 0.803, which means there was internal reliability between PSS-10 and PMSS-PL. Moreover, all questions from PMSS-PL had a positive discrimination power, so each question correlated positively with the other questions in PMSS-PL.
C o n c l u s i o n s: PMSS-PL may be used to psychometrically analyze the stress load on undergraduate medical students at Polish universities. The PMSS-PL may also be used as an external test for validating and calculating the reliability and accuracy of other psychometric instruments.

Key words: stress, medical students, validation of PMSS.

Introduction

Stress may be short-term or long-term in nature. The first type can be beneficial for memory, as it leads to the formation of new neurons. The second type may however lead to general disorders of health [1] as a result of the excessive stimulation of the limbic system, the reticular system, and the sympathetic nervous system [2]. This leads to the excessive production and secretion of cortisol by the adrenal cortex [3], which has both diabetogenic and ketogenic effects, exponentiates the effects of catecholamines, and decreases the production of lymphocytes, eosinophils, and basophiles [2]. Much research has shown that stress is also a factor in the development of certain diseases, such as cardiovascular diseases, but also diabetes and depression [3–6].

During the six years of Polish undergraduate medical studies, students experience both stresses that are specific to their studies and stresses of a more general nature. The specific stresses can vary by year of study, and include high expectations of others, high levels of competition, overwork, working with cadavers, the lack of time for relaxation, and contact with ill and suffering patients [7–11]. The work of Moir *et al.* indicates that medical students are more susceptible to depression than students of other medical professions [12], with almost one third of medical students worldwide suffering from it [13]. Moreover, students with the symptoms of depression statistically more often abuse drugs and have suicidal thoughts and anxiety [8, 12, 14]. The level of stress and the ability to cope with it both directly affect mental health, which is why it is important to characterize the level of stress perceived by medical students and to find the factors that induce it. In the longer term, this may help us to decrease, the stressful factors present in undergraduate medical studies.

The level of stress and the factors that lead to chronic stress among medical students at Polish universities have not yet been measured. The aim of this study was to translate from English to Polish and to validate an international questionnaire "The Perceived Medical School Stress Instrument" (PMMS) and to measure the resulting version's psychometric abilities.

Materials and Methods

PMSS which was created by Vitaliano *et al.* [15–16] has been broadly used to measure stress in medical students and has been translated and validated in several countries including Germany, United Kingdom and Norway [15–19]. The questionnaire allows to assess the stressful factors directly associated with undergraduate medical studies.

The Polish version of PMMS (PMMS-PL) contains thirteen items answered on a five-point scale, as in the original PMSS [15–17]. The answers in the instrument of Vitaliano *et al.* were given on a scale of 0 to 4, but we decided to employ the scale that

has been used in studies conducted in other European countries, namely from 1 (I totally disagree) to 5 (I totally agree) [18, 20].

The Perceived Stress Scale (PSS-10) was used as an external test to validate the PMSS-PL questionnaire. The PSS-10 allows the assessment of a range of subjective feelings and thoughts associated with personal problems, behavior, and ways of coping with it. The PSS-10 contains ten questions with a five-point answer scale ranging from 0 (never) to 4 (very often), with a reverse response in four positively stated items. The maximum score is 40. A score between 20 and 40 indicates a high stress level, 14–19 indicates a medium stress level, and 0–13 indicates a low stress level [21–23].

Printed versions of the PMSS-PL and PSS-10 were presented to all second-year and third-year medical students at the Jagiellonian University Medical College (JUMC) during the winter exam session. The purpose of the study was explained and the students were informed that participation was voluntary and anonymous. The survey was approved by the Jagiellonian University Bioethical Committee (No. 1072.6120.292.2019).

The inclusion criterion was that each participating second-year or third-year medical student at JUMC returned fully completed PSS-10 and PMSS-PL question-naires.

We validated the Polish translation of PMSS in accordance with the recommenda-tions published by the Translation and Cultural Adaptation group of the Quality of Life Special Interest group of the International Society for Pharmacoeconomics and Outcomes Research [24].

Preparation

All available questionnaires measuring the stress level associated specifically with undergraduate medical studies were analyzed. We decided to choose a slightly mod-ified Norwegian version of the PMSS, which was written in English and which was based on original English version of the questionnaire [15–17]. The modification was about omitting item 11 regarding elective and clerkships and adding an item regarding stress connected with accommodation. This questionnaire had been used repeatedly in countries with similar culture and traditions to Poland [15–19].

Forward translation

The translation of the PMSS questionnaire from English to Polish was performed by two independent professional translators, one of whom was a speaker of both Polish and English.

Comparison

Both translations were examined meticulously by a team consisting of a clinical psychologist, a physician, a dentist, a medical student, and the two translators. Each member of the team was fluent in English. The discrepancies that appeared in the translations were discussed and a compromise was arrived at. The only item that was dubious was Question 9, so we decided to prepare two versions of this item. This item was then presented to two groups of 30 medical students each, who were asked to evaluate their level of understanding from 1 (do not understand at all) to 5 (understand fully). The median value for version 1 of the item was 5; version 2 scored 3. An analysis is presented in Table 1. This result allowed us to select version 1 as the easiest to understand variant of Question 9 (the details appear in Table 3) and to create an initial version of the PMSS-PL questionnaire.

Table 1. Comparison of two versions of question 9.

Question 9 'The majority of students feel that success in medical school is in spite of the administration rather than because of it'.	Version 1 Większość studentów uważa, że administracja (dziekanat) nie pomaga w osiągnięciu sukcesu na studiach	Version 2 Większość studentów uważa, że sukces w szkole medycznej uzyskuje się pomimo działań administracji bardziej niż dzięki tym działaniom	p
avg ± SD	4.8 ± 0.55	2.87 ± 1.61	
median	5	3	$p < 0.01$*
quartile	5–5	1–4.75	

p — Mann–Whitney test
* — statistical significance ($p < 0.05$)

Table 2. Analysis of understanding PMSS-PL questions by two independent Medical Undergraduate students.

Questions		Year		p
		Year 3	Year 5	
Question 1	avg ± SD	3.83 ± 1.21	4.03 ± 1.25	$p = 0.417$
	median	4	5	
	quartile	3–5	3–5	
Question 2	avg ± SD	5 ± 0	4.9 ± 0.31	$p = 0.081$
	median	5	5	
	quartile	5–5	5–5	

Table 2. Cont.

Question 3	avg ± SD	4.53 ± 0.82	4.47 ± 0.97	p = 0.963
	median	5	5	
	quartile	4–5	4.25–5	
Question 4	avg ± SD	4.83 ± 0.59	4.87 ± 0.51	p = 0.677
	median	5	5	
	quartile	5–5	5–5	
Question 5	avg ± SD	4.93 ± 0.25	4.83 ± 0.53	p = 0.611
	median	5	5	
	quartile	5–5	5–5	
Question 6	avg ± SD	4.33 ± 0.92	4.67 ± 0.66	p = 0.108
	median	5	5	
	quartile	4–5	5–5	
Question 7	avg ± SD	4.3 ± 1.24	3.9 ± 1.52	p = 0.33
	median	5	5	
	quartile	4–5	3–5	
Question 8	avg ± SD	4.73 ± 0.74	4.7 ± 0.84	p = 0.775
	median	5	5	
	quartile	5–5	5–5	
Question 9	avg ± SD	4.8 ± 0.55	4.73 ± 0.51	p = 0.705
	median	5	5	
	quartile	5–5	5–5	
Question 10	avg ± SD	4.53 ± 0.9	4.63 ± 0.67	p = 1
	median	5	5	
	quartile	5–5	4.25–5	
Question 11	avg ± SD	3.97 ± 1.27	4.13 ± 1.22	p = 0.593
	median	5	5	
	quartile	3–5	3–5	
Question 12	avg ± SD	4.83 ± 0.53	4.83 ± 0.75	p = 0.666
	median	5	5	
	quartile	5–5	5–5	
Question 13	avg ± SD	4.73 ± 0.83	4.6 ± 1.13	p = 0.95
	median	5	5	
	quartile	5–5	5–5	

p — Wilcoxon signed-rank test

Table 3. PMSS and PMSS-PL.

Question	English Version	Polish Version
Question 1	Medical school fosters a sense of anonymity and feelings of isolation among the students	Szkoła medyczna sprzyja poczuciu anonimowości i izolacji wśród studentów
Question 2	I am concerned that I will not be able to endure the long hours and responsibilities associated with clinical training and practice	Obawiam się, że nie dam rady sprostać długim godzinom zajęć oraz odpowiedzialności związanej z zajęciami klinicznymi i praktykami
Question 3	I do not know what the faculty/administration expect of me	Nie wiem, czego oczekuje ode mnie wydział lub pracownicy administracji
Question 4	Medical training controls my life and leaves too little time for other activities	Moje życie jest podporządkowane studiom medycznym, co pozostawia mi za mało wolnego czasu na inne aktywności
Question 5	I am concerned that I will be unable to master the entire pool of medical knowledge	Jestem przekonany/a, że nie dam rady opanować całej wiedzy medycznej
Question 6	This medical school is fostering a physician role at the expense of one's personality and interests	Mój uniwersytet medyczny promuje rolę lekarza kosztem osobowości i zainteresowań
Question 7	Medical school is more competitive than I expected	Uniwersytet medyczny jest bardziej konkurencyjny, niż się spodziewałem/am
Question 8	The attitude of too many of the faculty is that students should be subjected to 'baptism of fire'	Zbyt wielu wykładowców uważa, że studenci powinni zostać „rzuceni na głęboką wodę"
Question 9	The majority of students feel that success in medical school is in spite of the administration rather than because of it	Większość studentów uważa, że administracja (dziekanat) nie pomaga w osiągnięciu sukcesu na studiach
Question 10	Medical school is cold, impersonal and needlessly bureaucratic	Uniwersytet medyczny jest zimny, bezosobowy oraz nadmiernie biurokratyczny
Question 11	Medical school is more of a threat than a challenge	Uniwersytet medyczny to w większym stopniu zagrożenie niż wyzwanie
Question 12	Personal finances are a source of concern to me	Moja sytuacja finansowa jest dla mnie źródłem zmartwień
Question 13	Accommodation is a source of concern to me	Moja sytuacja mieszkaniowa jest dla mnie źródłem zmartwień

Back translation

The back translation from Polish to English was performed by a translator who was not previously associated with the study. He was a native speaker of both Polish and English.

Review of back translation

The back translation of PMSS-PL was compared to the original English version of PMSS. The minor discrepancies that we found were considered for the final version of PMSS-PL. A consensus was achieved.

Harmonization

All the translations were examined once again, with small discrepancies thoroughly discussed; many of them could be explained as arising from language differences.

Cognitive debriefing

The first version of PMSS-PL was presented to 30 third-year medical students and 30 fifth-year medical student. Students who took part in this anonymous and voluntary survey assessed their understanding of all the questions on a scale from 1 (I do not understand at all) to 5 (I understand completely). The collected results were analyzed.

Review of cognitive debriefing

Among the third-year medical students, the median of understanding of items 2–13 was 5, but for item 1 the score was 4. For fifth year medical students, the median for all items was 5 (see details in Table 2). This means that most of the students from both groups understood every question very well. Furthermore, there were no statistically significant differences in understanding of the questions between years. On the basis of these result, the final version of PMSS-PL was created.

Proofreading

The team examined the final version of PMSS-PL and made a minor punctuation correction. The final version of the PMSS-PL questionnaire is presented in Table 3.

Final report

The word 'administration' in Question 9 of the English version of PMSS was initially translated as 'administracja'. The team from abovementioned point 3 'Comparison' discussed the issue, deciding that two version of this question should be created and tested. The first version contained the word 'administracja', while the second version employed the wording 'administracja (dziekanat)'. The level of understanding of version that said 'administracja (dziekanat)' was statistically significantly higher than that of the version that said 'administracja' alone.

Statistical analysis

The quantitative variables in two groups were compared using the Mann–Whitney test and the Wilcoxon signed rank test. The internal reliability (consistency) was assessed using Cronbach's alpha. The construct validity was assessed by correlating the results from PMSS-PL and PSS-10. The results of PMSS-PL in three and more groups were compared using the Kruskall–Wallis test. Where statistically significant differences were found, a post hoc analysis (the Dunn test) was performed to identify the statistically significant differences between groups. Correlations between the result of the PMSS-PL and the quantitative variables were analyzed using Spearman's rank correlation coefficient. The significance level was taken as 0.05. The analysis was performed in R version 3.6.2 [25].

Results

A total of 430 students from the 2nd and 3rd years of the medical undergraduate degree at JUMC took part. The overall response rate was 93%; the response rate was 99% for 2nd year and 87% for 3rd year. See Table 4 for group characteristics.

The mean PMSS-PL score was 36.43 (SD = 8.44), and it varied from 13 to 65. The mean PSS-10 was 21.35 (SD = 6.98), and it varied from 4 to 40. The internal consistency, as indicated by Cronbach's alpha, was 0.803, which means that there was internal reliability between PSS-10 and PMSS-PL [26]. Moreover, all questions from PMSS-PL had a positive item-total correlation, so each question correlated positively with the other questions in PMSS-PL. This data is presented in Table 5. The construct validity was statistically significant (p <0.05) and positive, meaning that the higher the PSS-10 score, the higher the PMSS-PL score. The Spearman correlation coefficient was 0.502, which additionally suggests that PMSS-PL is not a secondary instrument in comparison to PSS-10. This data is presented in Table 6. We did not observe any statistically significant differences between sex, age, year of study, or whether the students were paying or not for studies.

Table 4. Characteristic of the study group.

Parameters		Overall (N = 430)
Age	avg ± SD	20.99 ± 1.12
	median	21
	quartile	20–21
Sex	Female	260 (60.47%)
	Male	170 (39.53%)
Year of study	II Year	227 (52.79%)
	III Year	203 (47.21%)
Payment	Free	238 (55.35%)
	Chargeable	47 (10.93%)
	Lack of data	145 (33.72%)

Table 5. Cronbach alpha and item-total correlation of all 13 questions of PMSS-PL.

Question	Cronbach Alpha	Item-total correlation
1	0.807	0.215
2	0.787	0.478
3	0.789	0.457
4	0.797	0.364
5	0.792	0.417
6	0.773	0.628
7	0.79	0.445
8	0.784	0.509
9	0.796	0.371
10	0.777	0.594
11	0.776	0.6
12	0.8	0.334
13	0.804	0.256

Table 6. Construct validity between PSS-10 and PMSS-PL.

Questionaires	Spearman's rank correlation coefficient	p
PSS-10 and PMSS-13	0.502	p <0.001

Discussion

This study has shown for the first time that the PMSS-PL questionnaire, translated into Polish and validated for the Polish environment, is reliable and accurate at the same degree as other validated translations of the PMSS into Norwegian and German [7, 18]. Validation was performed in accordance with the recommendations published by the Translation and Cultural Adaptation group of the Quality of Life Special Interest group of the International Society for Pharmacoeconomics and Outcomes Research, ensuring that the validation is reliable and trustworthy.

The study shows that 2nd year and 3rd year students studying at JUMC had in general high stress levels, and are generally more stressed that general population in the same age [21, 27]. PMSS validated into German language had 56.3% of response rate (n = 169 of total 300 students) and Cronbach alpha was 0.81. The Cronbach alpha of Norwegian validated version of PMSS, was 0.77. The general stress level associated with medical studies, as assessed using the PMSS-PL questionnaire, was higher on average for Polish students than for students from Norway and Germany [18–20].

The PMSS-PL questionnaire could be a useful instrument to evaluate stress levels of students in Poland. Furthermore, detailed analysis of the answers to each question of the instrument may help find the factors that cause the most stress for medical students. In further research, this knowledge may assist in finding adequate and effective methods for identifying stressors and providing assistance where needed. All of this should help strengthen medical students' ability to cope with stress. In the same way, it may help lower susceptibility to the symptoms of depression and other emotional disturbances.

Conclusions

The Polish version of the PMSS created in this study has been proven to be a reliable and dependable instrument. Our results indicate that this PMSS-PL may be used to psychometrically analyze the stress load on undergraduate medical students at all Polish universities. The PMSS-PL may also be used as an external test for validating and calculating the reliability and accuracy of other psychometric instruments that measure general stress.

Acknowledgements

Conflict of interest

None declared.

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