THE VALIDITY AND FACTOR STRUCTURE OF *STRENGTH OF MOTIVATION FOR MEDICAL STUDENTS - REVISED QUESTIONNAIRE* – EXPLORATORY FACTOR ANALYSIS ON ROMANIAN STUDENTS

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ABSTRACT. Instruments that are meant to quantify the measurement of the strength of motivation in medical schools try to determine how the students start and pursue their medical training. Strength of motivation for medical school was defined as the student's readiness to start and continue medical training regardless of setbacks, disappointments, sacrifices or misfortune. **Aim:** To validate a revised version of *Strength of Motivation for Medical Students Questionnaire* (SMMS) and to explore its relation to a few variables that are related to this concept. **Methods:** Exploratory factor analysis was used to verify the factor structure of SMMS-Revised of Kusurkar et al. from 2011 in a sample of 601 medical students from all 6 years of study. It was used as a method of factor extraction Principal components analysis and as a method of factor rotation both VARIMAX and Direct Oblimin but we kept the solution in which was used the VARIMAX rotation because the results were similar. **Results:** The SMMS-R is a good and reliable tool with a god internal consistency (alpha Chronbach = 0.797) that can measure the level of motivation of medical students. The scores obtained by our participants showed a high level of motivation both for the total motivation score and also for the scores of the three subscales. We found no significant correlation with the total score of *Perceived Stress Scale - 10* by Cohen & Williamson in 1988 and a negative correlation ($r = -.095$, $p = .020$) with the total score at *Beck Depression Inventory* - Beck et al, 1961. **Conclusion:** The SMMS-R is valid for use in medical students but we advise that this tool should only be used for research purposes or for evaluation of medical students after they have been admitted into the medical field.

Keywords: strength of motivation, validation, exploratory analysis, medical training

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REZUMAT. Validitatea şi structura factorului de puterea a motivării la studenţii la medicină – Chestionar revizuit – analiza factorială exploratorie la studenţii români. Instrumentele ce au ca scop măsurarea nivelului de intensitate al motivaţiei studenţilor mediciniști încearcă să determine modul în care studenţii încep şi apoi îşi continuă parcursul academic în domeniul medical. Intensitatea motivaţiei studenţilor mediciniști a fost definită ca reprezentând disponibilitatea studenţilor de a începe şi de a continua pregătirea în domeniul medical indiferent de obstacolele întâmpinate, dezamăgiri, sacrificii sau ghinioane. **Obiectiv:** Validarea versiunii revizuite a Chestionarului de Intensitate a Motivaţiei Studenţilor Mediciniști (SMMS) şi explorarea relaţiei acestuia cu o serie de variabile legate de acest concept. **Metode:** Pentru a verifica structura factorială a SMMS-R (Kusurkar et al., 2011) a fost folosită analiza factorială exploratorie pe un eşantion format din 601 studenţi mediciniști ce erau înscrişi în cei şase ani de studii. Ca metodă de extragere a factorilor a fost folosită analiza componentelor principale (Principal components analysis) şi ca metodă de rotaţie a factorilor s-au folosit atât VARIMAX cât şi Direct Oblimin dar a fost reţinută soluţia în care s-a folosit metoda VARMAX deoarece rezultatele din ambele soluţii erau similare. **Rezultate:** Chestionarul SMMS-R reprezintă o unealtă de evaluare bună şi de încredere cu o consistenţă internă bună (alpha Chronbach = 0.797) ce poate măsura nivelul de motivaţie al studenţilor mediciniști. Scorurile obţinute de către participanţii noştri denotă un nivel ridicat al motivaţiei atât pentru scorul total obţinut cu ajutorul acestui chestionar cât şi pentru scorurile celor trei subscale ale instrumentului. Nu s-au găsit corelaţii seminificative statistic cu scorul total obţinut la Scala Nivelului de Stres Perceput (*Perceived Stress Scale - 10*, Cohen & Williamson, 1988) însă a fost evidenţiată o corelaţie negativă (r = -.095, p = .020) cu scorul total obţinut la Inventarul de Depresie (*Beck Depression Inventory*, Beck et al, 1961). **Concluzie:** Chestionarul SMMS-R este o măsură validă ce poate fi folosită cu studenţii mediciniști însă se recomandă ca acest instrument să fie folosit numai în scop de cercetare sau pentru evaluarea studenţilor mediciniști după ce aceştia au fost admişi deja la studii în domeniul medical.

Cuvinte cheie: intensitatea motivaţiei, validare, analiză exploratorie, pregătire medicală

Introduction

Motivation is an important factor for academic achievements and success, especially for medical students where important factors are mixing: a long period of time for formation, close relationship and interaction with patients, illness and sufferance and the importance of good academic results that assure a better job.

The original instrument for the measurement of motivation of the students who choose a medical career is *The Strength of Motivation for Medical School–Revised* (SMMS-R) questionnaire, developed by Nieuwhof et al. (2004) and revised by Kusurkar et al. in 2011 and reloaded in 2017.

The SMMS-R has been used to evaluate the relationship between demographic variables (age, gender and educational background) and students' motivation for medical school. (An et al, 2017; Kusurkar et al, 2010).

As the Nieuwhof et al developed in 2002 (unpublished, first involving only freshman students) and presented in 2004, this tools was not designed to be used as an instrument of evaluation for admission to medical school but "to carry out studies to uncover relationships between motivation, teaching-learning processes and academic success." (Nieuwhof et al., 2004)

The aim of this study is to validate a revised version of *Strength of Motivation for Medical Students Questionnaire* (SMMS) and to explore its relation to a few variables that are related to this concept.

Material And Methods

Instruments

SMMS-R intended to measure the strength of motivation of students to start and pursue medical training. In this questionnaire the authors did not investigate the quality of this concept but the strength of it. Strength of motivation for medical school was defined as the student's readiness to start and continue medical training regardless setbacks, disappointments, sacrifices or misfortune (Nieuwhof et al, 2004). The results they obtained showed that this questionnaire was constructed for evaluative purposes and not to be a criterion for selecting medical students. The reliability of the original version of SMMS is good (Cronbach's alpha = .79) and the test-retest reliability (correlation = 0.71).

In our study we used the revised version of this instrument (SMMS-R, Kusurkar et al, 2011) that has 15 items instead of 16, as the original version did. Regarding the scoring of the SMMS-R, each item could obtain a score of 1, 2, 3, 4 or 5 depending on the answer chosen by the participant, 1 meaning strong disagreement with the statement, 2 – moderate disagreement, 3 – neutral, 4- moderate agreement and 5 – strong agreement. The items 2, 4, 8, 9, 11, 13 and 14 are reverse scored. Eight of the items of this scale suggest a positive relation to motivation (e.g., "I would always regret my decision if I hadn't availed myself to the opportunity to study medicine"), while the other

seven items are reverse scored and suggest a negative relation to motivation (e.g., "If studying took me more than an average of 60 hours a week, I would seriously consider quitting").

SMMS-R contains three subscales: *willingness to sacrifice* that includes items 5, 7, 9, 10 and 12, *readiness to start* with items 1, 3, 6, 11 and 15 and *persistence* composed of items 2, 4, 8, 13 and 14. The score on each subscale can be used separately or the scores on three subscales can be summed up to give the overall *Strength of Motivation for Medical School*. The maximum total score that can be obtained is 75 and the minimum total score is 15. For each subscale the maximum possible score for each subscale is 25 and the minimum possible score is 5.

The first subscale named *willingness to sacrifice*, measures the willingness of a student to sacrifice for the medical education. The second subscale, *readiness to start,* is a measure of a student's readiness and will to enter medical study and the third subscale, *persistence*, measures a student's persistence in medical study in spite of unfriendly circumstances during or after the study.

The authors of this instrument advised that this scale is not meant to be used as a measure for selecting students for admission into the medical study and they recommend that this questionnaire to be used only for research purposes or for evaluation of medical students after they have been admitted into the medical field.

In order to test the relationship of SMMS-R with other instruments, we also administered to the participants the *Perceived Stress Scale - 10* (PSS – 10) (Cohen & Williamson, 1988) which measures the perceived stress on a scale from 0 (never) to 4 (very often). The authors of this instrument stated that this is not a diagnostic tool. The high scores obtained by the participants represent a high risk for developing a stress related disease. The alpha Chronbach score for this scale is 0.850.

We also administered the *Beck Depression Inventory* (*BDI* - Beck et al, 1961) which is one of the most used instrument in assessing depression. The instrument contains a number of 21 items, the answers are rated on a 4 step Likert scale from 0 to 3, the subjects having to choose the answer that matches their opinion. It contains 21 symptoms of the most common psychological and psychiatric symptomatology: mood, pessimism, sense of failure, lack of satisfaction, guilty feelings, sense of punishment, self-hate, self-accusations, self-punitive wishes, crying spells, irritability, social withdraw, indecisiveness, body image, work inhibition, sleep disturbance, fatigability, loss of appetite, weight loss, somatic preoccupations and loss of libido. The alpha Chronbach score for this inventory is 0.874.

Participants

At this study have participated a number of 650 students and the questionnaires were filled in between July - September 2016. The data we included in this research refers to 601 students, those who filled in completely the questionnaires (92.46% response rate). All the participants are studying General Medicine in the University of Medicine and Pharmacy "Grigore T. Popa" of Iasi, Romania, and are coming from all 6 years of study.

Regarding the year of the study of our participant sample, 106 (17.64%) of our subjects were enrolled in the first year at the time they filled in the questionnaire, 96 (15.97%) were in the second year, 112 (18.64%) were in the third year, 110 (18.30%) were in the fourth year, 75 (12.48%) were in the fifth year and 102 (16.97%) were in the sixth year of study. 466 (77.54%) were living in an urban area and 134 (22.30%) in a rural area, 163 (27.12%) of the subjects are males and 438 (72.88%) are females.

Ethical approval

The present study was conducted in accordance with the Declaration of Helsinki and ethical approval was granted by the university Research Ethics Committee. Informed consent was obtained from the subjects prior the beginning of the study and they were also informed about the goal of the study. Students were also informed that they may address to two psychologists working with Center of Career Counseling to receive psychological support.

Statistical analysis

The statistical analysis was performed using SPSS Statistics v23.0.0 for MAC.OSX and for the factor analysis we used Exploratory Factor Analysis which is a statistical approach for determining the correlation among the variables in a dataset and which provides a factor structure or a grouping of variables based on strong correlations. The statistical difference was defined as $p < 0.05$.

Results

The reliability coefficient for the three dimensions of the SMMS-R is: *willingness to sacrifice* (5 items) we obtained an alpha Chronbach = 0.708; *readiness to start* (5 items) alpha Chronbach – 0.657 and *persistence* (5 items) with an alpha Chronbach of 0.599. Even though the results for the reliability analysis can be considered a bit low, other authors using this scale obtained similar results regarding the alpha Chronbach of the three dimensions: 0.70, 0.67 respectively 0.55 (Kusurkar et al, 2011).

Because the lowest scores are on the *persistence* scale, we recommend prudency in interpreting the results for this subscale. Despite this, the alpha Chronbach for the the total score of SMMS-R is 0.797 which can be considered a good measure of internal consistency.

Also, the results we obtained showed that our subjects have a high level of motivation M = 55.02 ± 9.19 (the maximum score being 75). The means for the three factors are: 18.21 ± 3.89 for *willingness to sacrifice*, 18.99 ± 4.04 for *readiness to start* and 17.81 ± 3.76 *persistence*, also indicated a high level of motivation for all of them (the maximum score being 25 for all subscales). The higher the score is, the greater is the strength of motivation.

For the Exploratory Factor Analysis, it was used as a method of factor extraction Principal components analysis and as a method of factor rotation it was used both VARIMAX and the Direct Oblimin methods because according to the theory, the factors of this questionnaire should correlate between them. We then compared the factorial solutions obtained and we noticed that they do not differ that much so we kept the solution in which it was used the VARIMAX rotation.

The results presented in *Table* 1 proves that there are a lot of sets of correlations above 0.30 so we can conclude that using Exploratory Factor Analysis for these variables is appropriate. Also, the value of the determinant is above 0.00001 (Determinant = .046) so we can draw the conclusion that there is no multicoliniarity or singularity among the variables we considered for the analysis.

Table 1. Correlation Matrix

Items	I1	I2	I3	I4	I5	I6	I7	I8	I9	I10	I11	I12	I13	I14	I15
1	1.000	-.025	.325	-.224	.335	.340	.300	-.066	-.152	.233	-.367	.222	-.177	-.106	.218
2	-.025	1.000	-.072	.170	-.049	-.131	-.074	.243	.161	-.066	.142	-.007	.255	.153	-.081
3	.325	-.072	1.000	-.292	.295	.283	.284	-.153	-.161	.265	-.312	.208	-.116	-.049	.227
4	-.224	.170	-.292	1.000	-.310	-.267	-.232	.197	.397	-.211	.338	-.257	.289	.135	-.096
5	.335	-.049	.295	-.310	1.000	.364	.505	-.099	-.308	.380	-.378	.330	-.189	-.069	.161
6	.340	-.131	.283	-.267	.364	1.000	.426	-.105	-.253	.253	-.428	.294	-.243	-.157	.200
7	.300	-.074	.284	-.232	.505	.426	1.000	-.047	-.245	.296	-.344	.375	-.151	-.099	.183
8	-.066	.243	-.153	.197	-.099	-.105	-.047	1.000	.295	-.114	.230	-.030	.267	.224	-.078
9	-.152	.161	-.161	.397	-.308	-.253	-.245	.295	1.000	-.318	.396	-.190	.346	.142	-.058
10	.233	-.066	.265	-.211	.380	.253	.296	-.114	-.318	1.000	-.371	.348	-.187	-.034	.166
11	-.367	.142	-.312	.338	-.378	-.428	-.344	.230	.396	-.371	1.000	-.209	.303	.122	-.201
12	.222	-.007	.208	-.257	.330	.294	.375	-.030	-.190	.348	-.209	1.000	-.168	-.110	.169
13	-.177	.255	-.116	.289	-.189	-.243	-.151	.267	.346	-.187	.303	-.168	1.000	.370	-.028
14	-.106	.153	-.049	.135	-.069	-.157	-.099	.224	.142	-.034	.122	-.110	.370	1.000	.010
15	.218	-.081	.227	-.096	.161	.200	.183	-.078	-.058	.166	-.201	.169	-.028	.010	1.000

The results we obtained at the KMO and Barlett's Test s show that for the sfericity test Barlett x2 (105) = 1822.890, p=.000 which means that the correlation matrix differs significantly from the identity matrix in which the variables would not correlate with each other, this proves that our variables are appropriate / adequate for factorization. The KMO index = .861suggest that this set of variables is very good for the exploratory factor analysis.

After inspecting the lower half of *Table* 2 (the principal diagonal of the Anti-image Correlation field) we noticed that there are no values under 0.50. Considering the evaluation criterion of the KMO Coefficients proposed by Kaiser and Rice, these coefficients are really good, which shows that they are adequate for the factorial analysis.

Table 2. Anti-image Matrices

		I1	I2	I3	I4	I5	I6	I7	I8	I9	I10	I11	I12	I13	I14	I15
Anti-image Covariance	Item1	.748	-.047	-.118	.026	-.077	-.081	-.030	-.029	-.040	-.012	.110	-.020	.037	.035	-.082
	Item2	-.047	.879	-.002	-.064	-.030	.043	.025	-.130	-.011	.006	-.009	-.057	-.120	-.036	.058
	Item3	-.118	-.002	.767	.118	-.036	-.045	-.051	.074	-.043	-.071	.049	-.009	-.028	-.018	-.091
	Item4	.026	-.064	.118	.723	.065	.020	-.017	-.022	-.161	-.038	-.056	.092	-.066	-.004	-.017
	Item5	-.077	-.030	-.036	.065	.621	-.042	-.194	.000	.052	-.106	.043	-.047	.007	-.022	.001
	Item6	-.081	.043	-.045	.020	-.042	.674	-.130	-.026	.014	.011	.128	-.063	.040	.046	-.049
	Item7	-.030	.025	-.051	-.017	-.194	-.130	.630	-.045	.033	-.009	.041	-.127	-.025	.025	-.025
	Item8	-.029	-.130	.074	-.022	.000	-.026	-.045	.815	-.128	.001	-.063	-.037	-.066	-.117	.040
	Item9	-.040	-.011	-.043	-.161	.052	.014	.033	-.128	.675	.103	-.106	-.003	-.106	.010	-.037
	Item10	-.012	.006	-.071	-.038	-.106	.011	-.009	.001	.103	.720	.107	-.157	.024	-.046	-.033
	Item11	.110	-.009	.049	-.056	.043	.128	.041	-.063	-.106	.107	.612	-.049	-.063	.016	.048
	Item12	-.020	-.057	-.009	.092	-.047	-.063	-.127	-.037	-.003	-.157	-.049	.749	.035	.045	-.061
	Item13	.037	-.120	-.028	-.066	.007	.040	-.025	-.066	-.106	.024	-.063	.035	.705	-.221	-.042
	Item14	.035	-.036	-.018	-.004	-.022	.046	.025	-.117	.010	-.046	.016	.045	-.221	.829	-.042
	Item15	-.082	.058	-.091	-.017	.001	-.049	-.025	.040	-.037	-.033	.048	-.061	-.042	-.042	.888
Anti-image Correlation	Item1	.889a	-.058	-.156	.036	-.112	-.114	-.044	-.038	-.056	-.016	.163	-.027	.051	.044	-.101
	Item2	-.058	.782a	-.002	-.080	-.041	.055	.033	-.154	-.014	.007	-.012	-.071	-.152	-.042	.066
	Item3	-.156	-.002	.883a	.159	-.053	-.063	-.073	.094	-.060	-.096	.071	-.012	-.038	-.023	-.110
	Item4	.036	-.080	.159	.874a	.097	.029	-.025	-.029	-.231	-.052	-.084	.125	-.092	-.006	-.021
	Item5	-.112	-.041	-.053	.097	.881a	-.064	-.309	.001	.081	-.159	.069	-.068	.011	-.031	.001
	Item6	-.114	.055	-.063	.029	-.064	.900a	-.199	-.034	.021	.015	.199	-.089	.058	.061	-.063
	Item7	-.044	.033	-.073	-.025	-.309	-.199	.855a	-.063	.050	-.013	.066	-.185	-.037	.034	-.034
	Item8	-.038	-.154	.094	-.029	.001	-.034	-.063	.796a	-.172	.001	-.090	-.047	-.087	-.143	.048
	Item9	-.056	-.014	-.060	-.231	.081	.021	.050	-.172	.848a	.148	-.165	-.005	-.154	.014	-.047
	Item10	-.016	.007	-.096	-.052	-.159	.015	-.013	.001	.148	.868a	.161	-.214	.034	-.059	-.042
	Item11	.163	-.012	.071	-.084	.069	.199	.066	-.090	-.165	.161	.889a	-.073	-.096	.022	.065
	Item12	-.027	-.071	-.012	.125	-.068	-.089	-.185	-.047	-.005	-.214	-.073	.852a	.049	.058	-.075
	Item13	.051	-.152	-.038	-.092	.011	.058	-.037	-.087	-.154	.034	-.096	.049	.822a	-.289	-.054
	Item14	.044	-.042	-.023	-.006	-.031	.061	.034	-.143	.014	-.059	.022	.058	-.289	.726a	-.049
	Item15	-.101	.066	-.110	-.021	.001	-.063	-.034	.048	-.047	-.042	.065	-.075	-.054	-.049	.857a
a. Measures of Sampling Adequacy(MSA)																

As it is presented in *Table* 3, factor 1 explains 27.92%, factor 2 explains 10.96% and factor 3 explains 7.03% of the items' variance. In total, the three factors explain 45.92% of the items' total variance.

Table 3. Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.189	27.924	27.924	4.189	27.924	27.924	3.150	21.003	21.003
2	1.645	10.964	38.888	1.645	10.964	38.888	2.198	14.652	35.655
3	1.056	7.038	45.927	1.056	7.038	45.927	1.541	10.271	45.927
4	.999	6.662	52.589						
5	.871	5.807	58.396						
6	.822	5.482	63.878						
7	.781	5.205	69.083						
8	.731	4.874	73.957						
9	.707	4.717	78.674						
10	.624	4.158	82.831						
11	.606	4.043	86.874						
12	.546	3.639	90.513						
13	.507	3.379	93.893						
14	.482	3.213	97.106						
15	.434	2.894	100.000						
Extraction Method: Principal Component Analysis.									

Regarding the percent of the no redundant residuals greater than 0.05, in our case this percent was of 60%. Normally, this value should be under 50%. So, we can conclude that the three factor model is somehow adequate for our data.

Table 4 presents the way in which the items group in factors (in the analysis in which we used the Direct Oblimin method of factor rotation, the results in the Pattern Matrix and Structure Matrix are almost identical). Factor 1 groups items 5, 7, 12, 10, 6, 4, factor 2 groups items 13, 8, 2, 14, 9 and factor 3 groups items 15, 3 and 1.

Table 4. Rotated Component Matrix

	Component		
Items	1	2	3
Item5	.721		
Item7	.699		
Item12	.662		
Item10	.597		
Item6	.549		
Item11	-.505		
Item4	-.426	.418	
Item13		.690	
Item8		.657	
Item2		.575	
Item14		.571	
Item9	-.441	.524	
Item15			.755
Item3			.571
Item1	.440		.448
Extraction Method: Principal Component Analysis.			
Rotation Method: Varimax with Kaiser Normalization.			
a. Rotation converged in 5 iterations.			

Compared to the way the items of this questionnaire have grouped in the original scale, our analysis shows that there are slight changes regarding the manner in which the items form the three factors. Regarding the first factor of the questionnaire, *willingness to sacrifice*, our results show that it contains 2 items form the *readiness to start* factor and one item from persistence, the factor readiness to start has remained with only three items instead of five and the third factor, *persistence* contains also one item from the *willingness to sacrifice* scale. The comparative results are presented in *Table* 5.

Table 5. Comparative analysis of the factors

Original scale			Our results		
Willingness to sacrifice	*Readiness to start*	*Persistence*	*Willingness to sacrifice*	*Readiness to start*	*Persistence*
Item 5	Item 1	Item 2	Item 5	Item 15	Item 13
Item 7	Item 3	Item 4	Item 7	Item 3	Item 8
Item 9	Item 6	Item 8	Item 12	Item 1	Item 2
Item 10	Item 11	Item 13	Item 10		Item 14
Item 12	Item 15	Item 14	Item 6		Item 9
			Item 11		
			Item 4		

From the Scree Plot graph (*Figure* 1) it can be observed that starting from the forth factor comes a plateau and most authors suggest that in Exploratory Factor Analysis it should be extracted the number of factors that can be observed before the beginning of this plateau, in our case, the number is three so this proves that the items of instrument group in three factors, even if some factors contain a higher number of items than others.
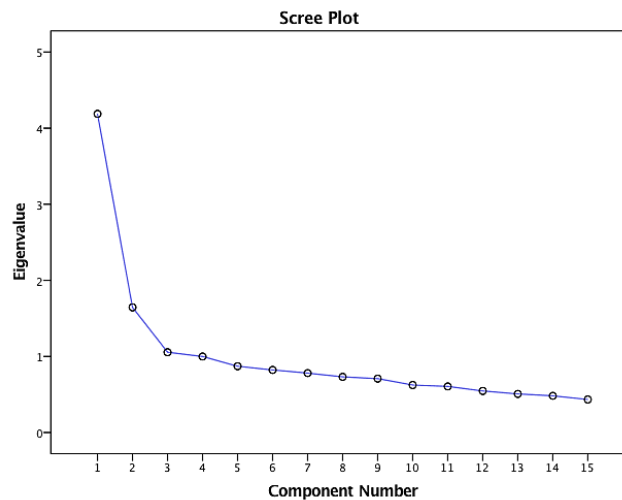
Figure 1. Scree Plot

Concerning the relationship of this scale with other instruments, the total score of SMMS-R does not correlate with the total score of *Perceived Stress Scale - 10* (PSS – 10) developed by Cohen & Williamson (1988), one of the instruments that we used in our study, but it does have a modest correlation (r = -.095, p = .020) with the total score at *Beck Depression Inventory* (*BDI* - Beck et al, 1961), one of the most used instruments for the assessment of depression.

Conclusions

The results we obtained show that *The Strength of Motivation for Medical School - Revised Questionnaire* is a good and reliable tool that can measure the level of motivation of medical students to start and pursue medical training. The participants in our study have a high level of motivation when it comes to the total motivation score and also for the scores of the three subscales.

This instrument has a good internal consistency for the the total score (alpha Chronbach = 0.797) and acceptable for the three dimensions of the SMMS-R: *willingness to sacrifice* (alpha Chronbach = 0.708); *readiness to start* (alpha Chronbach = 0.657) and *persistence* (alpha Chronbach = 0.599), even though we recommend prudency in interpreting the results for the third subscale, persistence.

The Exploratory Factor Analysis proved that regardless of the method of factor rotation that it was used, VARIMAX or the Direct Oblimin method, we obtain similar factorial solutions because according to the theory, the factors of this questionnaire correlate between them. Even though the items did not group in factors as the ones in the original questionnaire, our results prove that there are slight changes that do not influence the quality of this questionnaire to measure the three dimensions of the strength of motivation for medical school.

Regarding the relationship of this questionnaire with other instruments we found no significant correlation with the total score of *Perceived Stress Scale - 10* (Cohen & Williamson, 1988). The total score of SMMS-R did correlate negatively (r = -.095, p = .020) with the total score at *Beck Depression Inventory* (*BDI* - Beck et al, 1961), suggesting that the more depressed a student will feel, the less motivated they will be in pursuing their medical training.

Just like the authors of this instrument we also advised that this scale to not be used as a measure for selecting students for admission into the medical study but only to be used for research purposes or for evaluation of medical students after they have been admitted into the medical field.

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REFERENCES

An, M., Kusurkar, R.A., Li, L., Xiao, Y., Zheng, C., Hu, J., & Chen, M. (2017). Measurement invariance of the strength of motivation for medical school: a multi-group confirmatory factor analysis. *BMC medical education*, *17*(1), 116.

Kusurkar R.A., Croiset G, Kruitwagen CLJJ, Ten Cate ThJ. (2011). Validity evidence for the measurement of the Strength of Motivation for Medical School. *Advances Health Sciences Education*; *16*, 183–195.

Kusurkar, R., Kruitwagen, C., ten Cate, O., & Croiset, G. (2010). Effects of age, gender and educational background on strength of motivation for medical school. *Advances in health sciences education*, *15*(3), 303-313.

Labăr A.V. (2008). *SPSS Pentru Științele Educației*, Editura Polirom.

Nieuwhof MGH, Ten Cate TJ, Oosterveld P, Soethout MBM. Measuring Strength of Motivation for Medical School. Medical Education Online [serial online] 2004; 9: 16. Retrieved May 16, 2013, from *http://www.med-ed-online.org*.