

12. Foresta C et al. Blood levels, apoptosis, and homing of the endothelial progenitor cells afterskin burns and escharectomy. *J Trauma*. 2011; 70: 459–465.
13. Wolf FI, Trapani V, Simonacci M, Ferre S, Maier JA. Magnesium deficiency and endothelial dysfunction: is oxidative stress involved? *Magnes Res*. 2008; 21: 58-64.
14. Spasov AA, Iejica IN, Haritonova MV, Jeltova AA, Ozerov AA. Vliyanie solei magniya na koncentraciu endotelial'noi NO-sintazi v usloviyah alimentarnogo deficit magniya [Effect of magnesium salts at concentrations of endothelial NO-synthase in terms of nutritional magnesium deficiency]. *Vestnik Orenburgskogo gosudarstvennogo universiteta [Bulletin of the Orenburg State University]*. 2011; 15: 156-157.
15. Kawasaki K, Eiji K, Yoshitsugu C, Satou M, Hiroshi T, Hikaru K, Satoru T, Noriomi M, Ikuo K. Magnesium sulfate may ameliorate oxidativestress through increasing glutathione synthesis gene in preeclampsia. *Placenta*. 2016; 46: 119.
16. Andreev AV, Gromova OA, Fedotova EL, Burtsev EM. Vlianie preparata Magne B6 na cerebrovaskularnuu reaktivnost' u detei s sindromomdeficita vnimaniya v zavisimosti ot soderjaniya magniya v organizme [The impact with attention deficit disorder drug Magne B6 on cerebrovascular reactivity in children, depending on the content of magnesium in the body]. *Klin. Farmakologiya i terapiya [Clinical Pharmacology and Therapeutics]*. 2000; 5: 31-34.

© S. Turan, M. Elcin, A. Derese, 2017

УДК 61:378.4(560).091.212:303.62

DOI: 10.20969/VSKM.2017.10(2).53-57

ADAPTATION OF THE MEDICAL ACHIEVEMENT SELF-EFFICACY SCALE (MASS) INTO TURKISH

TURAN SEVGI, MSc, PhD, Associate Professor of Medical Education, Hacettepe University Faculty of Medicine, Department of Medical Education and Informatics, Sıhhiye Campus, Turkey, 06100, Ankara, e-mail: sturan@hacettepe.edu.tr
ELCİN MELİH, MD, MSc, CHSE, Professor of Medical Education, Hacettepe University Faculty of Medicine, Department of Medical Education and Informatics, Sıhhiye Campus, Turkey, 06100, Ankara,
DERESE ANSELME, MD, PhD, Associate Professor of Family Medicine and Medical Education, Ghent University Faculty of Medicine, Department of Family Medicine and Primary Health Care, De Pintelaan 185, 6K3, 9000, Ghent, Belgium

Abstract. Aim. Curriculum innovators are eager to evaluate the overall effects of curriculum changes. In a Belgian-Turkish collaboration we developed a scale, for content validity based on the competency frameworks of CanMEDs and The Five Star Doctor, to measure self-efficacy changes in undergraduate medical students. In this study, the reliability and construct validity of Medical Achievement Self-efficacy Scale (MASS) among Turkish medical students were examined. **Material and methods.** The MASS contains 18 items, to be rated on a five-point Likert scale. The study was conducted with undergraduate medical students at Hacettepe University ($n=547$). The Turkish form of the scale was examined for content validity by five experts. Cronbach's alpha was calculated for reliability of the scale. Item-total correlation was calculated and the scores of lowly and highly performing groups were compared by means of a t-test. Exploratory factor analysis was conducted to determine the construct validity. **Results and discussion.** The content validity of the Turkish MASS was considered appropriate. The reliability of the scale was high (Cronbach's $\alpha=0,89$). Item-total correlation coefficients of the Turkish MASS ranged from 0,53 to 0,70. Lower and upper score groups were compared as an indicator of the discriminant validity. All items discriminated significantly between lowly and highly performing students. Factor analysis showed that the scale has a one factor structure which explains 37,89% of the variance. Factor loadings ranged from 0,56 to 0,73. **Conclusions.** The study showed the reliability and delivered evidence about the construct validity of the Turkish adaptation of the MASS.

Key words: academic self-efficacy, medical students, scale development.

For reference: Turan S, Elcin M, Derese A. Adaptation of the Medical Achievement Self-efficacy Scale (MASS) into Turkish. *The Bulletin of Contemporary Clinical Medicine*. 2017; 10 (2): 53—57. DOI: 10.20969/VSKM.2017.10(2).53-57.

АДАПТАЦИЯ ШКАЛЫ САМОЭФФЕКТИВНОСТИ МЕДИЦИНСКИХ ДОСТИЖЕНИЙ (MASS) ДЛЯ ТУРЦИИ

ТУРАН СЕВГИ, магистр наук, доцент кафедры медицинского образования и информатики медицинского факультета Университета Хачеттепе, кампус Сıххийе, Турция, 06100, Анкара, e-mail: sturan@hacettepe.edu.tr
ЭЛЬЦІН МЕЛІХ, магистр наук, сертифицированный педагог в области симуляционной медицины, профессор кафедры медицинского образования и информатики медицинского факультета Университета Хачеттепе, кампус Сıххийе, Турция, 06100, Анкара
ДЕРЕСЕ АНСЕЛМЕ, докт. мед. наук, профессор кафедры медицинского образования и информатики медицинского факультета Университета Хачеттепе, кампус Сıххийе, Турция, 06100, Анкара

Реферат. Цель. Новаторы образовательного процесса стремятся оценить общие последствия изменений в учебной программе. В бельгийско-турецком сотрудничестве мы разработали шкалу валидности содержания для измерения изменений самооэффективности студентов-медиков на основе квалификационных рамок CanMEDs и The Five Star Doctor. В данном исследовании была проверена достоверность и обоснованность шкалы самооэффективности медицинских достижений (MASS) среди турецких студентов-медиков. **Материал и методы.** MASS содержит 18 пунктов, которые должны быть оценены по пятибалльной шкале Ликерта. Исследование проводилось с участием студентов-медиков в Университете Хачеттепе ($n=547$). Турецкая форма шкалы была проверена пятью экспертами на достоверность. Альфа (α) Кронбаха рассчитывалась для вычисления надежности. Выводили итоговую корреляцию по всем пунктам, а баллы групп с низкой и высокой эффективностью сравнивали

с помощью t-критерия Стьюдента. Оценка факторной структуры была проведена для определения конструктивной достоверности. **Результаты и их обсуждение.** Валидность турецкого MASS была признана приемлемой. Достоверность шкалы была высокой (α Кронбаха=0,89). Суммарные коэффициенты корреляции для турецкого MASS варьировались от 0,53 до 0,70. Группы с низкими и высокими результатами сравнивались по показателю дискриминантной валидности. Все пункты значимо различались между студентами с низким и высоким уровнем успеваемости. Факторный анализ показал, что шкала имеет однофакторную структуру, которая объясняет 37,89% дисперсии. Коэффициент загрузки составлял от 0,56 до 0,73. **Заключение.** Исследование показало достоверность и предоставило доказательства валидности конструкции турецкой адаптированной версии MASS.

Ключевые слова: академическая самооэффективность, студенты-медики, разработка шкалы.

Для ссылки: Туран, С. Адаптация шкалы самооэффективности медицинских достижений (MASS) для Турции / С. Туран, М. Эльчин, А. Дересе // Вестник современной клинической медицины. — 2017. — Т. 10, вып. 2. — С.53—57. DOI: 10.20969/VSKM.2017.10(2).53-57.

Introduction

Besides being medical experts, physicians are expected to be good communicators, managers, collaborators, patient advocates, scholars and professionals [1—3]. As those aptitudes are much harder to measure than the classic knowledge and skills, we developed a self-efficacy scale (Medical Achievement Self-efficacy Scale-MASS) in an earlier study that the students could judge their own capability to meet those expectations [4].

Self-efficacy is defined as «beliefs in one's own capabilities to organize and execute the courses of action required to produce given attainments» and — as it is asserted — a mediator of behavioral change [5]. Many studies showed self-efficacy to be related with achievement [6—13]. Self-efficacy is expected to evolve over the study years as it is sensitive to changes in the personal context and becomes developed from educational experiences [14]. Therefore an evaluation of students' self-efficacy might reflect the impact of the entire medical curriculum.

In the earlier study, the MASS was studied with Flemish students enrolled in medical curricula [4]. Its content framework was based on the two most universal frameworks, the Five-star Doctor [1] and the CanMEDS roles [2, 3]. The MASS was reported to have a high internal consistency reliability (Cronbach's α =0,89) [4]. The discriminant validity and predictive validity of the MASS were examined and it was shown that the MASS scores differed between lowly and highly achieving student groups, increased over the study years and predicted an acceptable proportion (10%) of the variance in student performance on the Maastricht Progress Test [4].

In this study, our aim was to report the adaptation process of the MASS into Turkish, studying with medical students to initiate a broader study of medical curriculum innovations.

Material and methods

Instrument. The original MASS contained 18 items. It was rated on a five-point Likert scale. The scale score ranged from 18 to 90, a higher score reflecting greater self-efficacy [4]. In the first step of the adaptation process, two experts translated the scale, and then two other experts back-translated it. Three experts checked whether the original statement and the translation had the same meaning. Native Turkish speakers (five-experts) also checked the translated version for meaningfulness of items. The original structure was preserved when translating into Turkish to ensure content validity.

Subjects. The study was conducted with undergraduate medical students at Hacettepe University ($n=547$). Fifty percent (50,1%) of the participants were female and almost sixty-five percent (64,9%) of the participants were enrolled in the English stream of the medical curriculum (table 1).

Table 1

Percentages of gender, curriculum stream and grade of participants

	Frequency	Percent
Gender		
Female	274	50,1
Male	273	49,9
Curriculum stream		
English	355	64,9
Turkish	192	35,1
Year		
1	92	16,8
2	117	21,4
3	108	19,7
4	123	22,5
5	61	11,2
6	46	8,4
Total	547	100,0

Data Analysis. Cronbach's alpha was calculated for internal consistency reliability of the scale. Item-total correlation was calculated and the scores of lowly (27% undermost) and highly performing groups (27% upmost) were compared by means of a t-test. Exploratory factor analysis was conducted to determine the construct validity.

Ethical Considerations

Participation was voluntary. The instrument included a brief cover letter informing students about the purpose of the study. Students were asked to read and complete the informed consent form before answering the scale. The completed forms were anonymous.

Results

Content and face validity. During to the adaptation process of the MASS, we conformed to translation and back-translation procedure. The items of the MASS were based on the CanMEDS and the Five Stars Doctor. This structure was preserved when translating into Turkish to ensure content validity (table 2).

Item analysis and internal consistency reliability. Item-total correlation coefficients of the Turkish MASS ranged from 0,53 to 0,70 (table 3). The scores of lowly and highly performing groups scores were compared:

Description of CanMEDS roles and items of MASS

CanMEDS Roles	Description of CanMEDS Roles	Items	Items in Turkish scale
Medical Expert	As Medical Experts, physicians integrate all of the roles, applying medical knowledge, clinical skills, and professional attitudes in their provision of patient-centered care	1. I am able to perform the skills we learned thus far on a patient. 4. I am able to adequately apply the subsequent steps of diagnosis and treatment on a clinical problem. 7. I have adequate knowledge of basic medical sciences	1. Bu güne kadar öğrendiğim becerileri bir hasta üzerinde uygulayabiliyorum. 4. Klinik bir vakada uygun tanı ve tedavi basamaklarını yeterli şekilde uygulayabiliyorum. 7. Temel tıp bilimlerinde yeterli bilgiye sahibim
Communicator	As Communicators, physicians effectively facilitate the doctor-patient relationship and the dynamic exchanges that occur before, during, and after the medical encounter	5. I am able to react in a conflict situation with a patient in a communicatively adequate way. 15. In a consultation I am able to structure the information I obtain from a patient	5. Bir fikir uyuşmazlığı durumunda hastaya iletişim açısından yeterli biçimde tepki verebilirim. 15. Görüşme (konsültasyon) sırasında hastadan aldığım bilgiyi yapılandırabilirim.
Collaborator	As Collaborators, physicians effectively work within a healthcare team to achieve optimal patient care	8. I am able to analyze a health problem of a patient in a group. 12. I feel able to collaborate on a basis of equality with colleagues from other health care disciplines	8. Bir hastanın sağlık sorununu grup içinde analiz edebilirim. 12. Diğer sağlık alanlarından olan çalışma arkadaşlarımda eşit düzeyde işbirliği yapabilirim
Manager	As Managers, physicians are integral participants in healthcare organizations, organizing sustainable practices, making decisions about allocating resources, and contributing to the effectiveness of the healthcare system	16. I am able to make a cost-effective choice when using technical means for diagnosis or therapy. 18. I am able to deal with critical incidents (unexpected, stressful events) when providing health care	16. Tanı ve tedavi için teknik cihazların kullanımında maliyet etkin bir seçim yapabilirim. 18. Sağlık hizmeti verirken kritik durumlarla (beklenmedik, stresli olaylarla) başa çıkabilirim
Health Advocate	As Health Advocates, physicians responsibly use their expertise and influence to advance the health and well-being of individual patients, communities, and populations	2. I have sufficient insight in the social factors that influence the health problems of patients. 14. I am able to handle a health problem in society preventatively	2. Hastaların sağlık problemlerini etkileyen sosyal faktörler hakkında yeterli görüşe sahibim. 14. Toplumdaki bir sağlık sorununu önleyici (koruyucu) şekilde ele alabilirim
Scholar	As Scholars, physicians demonstrate a lifelong commitment to reflective learning, as well as the creation, dissemination, application and translation of medical knowledge	3. I am able to search literature relevant to a health problem electronically. 6. I master the medical aspects that have been dealt with in the Studium generale or Medical Humanities (e.g. philosophy, art, ...). 9. I am able to write a sound scientific paper on a health related subject. 10. I am able to choose/to draw a scientific set up for the solution of a medical research problem	3. Bir sağlık sorunu ile ilgili tıbbi literatürü elektronik olarak araştırabilirim. 6. Tıp fakültesi programında yer alan insan bilimlerinin (felsefe, sanat vb.) bana sunduğu tıbbi görüşe sahibim. 9. Bir sağlık konusu ile ilgili güvenilir bilimsel bir makale yazabilirim. 10. Tıbbi bir araştırma sorununun çözümü için bilimsel araştırma tasarımını seçebilirim
Professional	As Professionals, physicians are committed to the health and well-being of individuals and society through ethical practice, profession-led regulation, and high personal standards of behaviour	11. I am able to take an underpinned personal point of view related to the ethical aspects when a patient asks for euthanasia. 13. I am able to handle my feelings of anxiety when they appear in certain clinical situations. 17. I am able to recognize signs and symptoms of burnout in my professional functioning	11. Bir hasta ötenazi istediğinde etik açıdan desteklenen görüşlerimle bir duruş ortaya koyabilirim. 13. Belirli klinik durumlarda oluşan endişe duygularımın üstesinden gelebilirim. 17. Profesyonel hayatımda (işlevlerimde) tükenmişlik belirtilerini ve işaretlerini tanıyabilirim

it was found that all items discriminated significantly ($p < 0,001$) (table 4). The reliability of the scale was high (Cronbach's $\alpha = 0,89$).

Discriminant validity. Lower and upper score groups were compared as an indicator of discriminant validity. All items discriminated significantly between lowly and highly performing students ($p < 0,001$) (table 4).

Construct of the scale

Exploratory factor analysis was used to obtain information about the structure of the scale. The Kaiser-Meyer-Olkin coefficient (KMO) was 0,92 and Bartlett's test reached statistical significance ($p < 0,001$).

Factor analysis produced three factors. All items loaded on one factor, that explained 37,89% of the variance. Factor loadings ranged from 0,51 to 0,72.

Table 3

Item-Total Statistics of MASS

Item number	Original study (n=1060) (Turan et al., 2013)	Turkish students (n=547)
	Item-Total Correlation	Item-Total Correlation
1	0,40	0,53
2	0,52	0,56
3	0,41	0,53
4	0,63	0,66
5	0,57	0,59
6	0,39	0,55
7	0,56	0,59
8	0,64	0,69
9	0,55	0,57
10	0,60	0,66
11	0,45	0,53
12	0,43	0,62
13	0,49	0,65
14	0,63	0,70
15	0,61	0,69
16	0,57	0,60
17	0,51	0,63
18	0,58	0,67

Table 4

The comparison of lower and upper score groups of MASS

Item number	Lower Group		Upper Group		t-value	p<
	Mean	SS	Mean	SS		
1	3,11	0,92	4,25	0,78	-11,35	0,001
2	3,16	0,81	4,31	0,67	-12,99	0,001
3	3,43	0,91	4,51	0,64	-11,56	0,001
4	2,84	0,83	4,24	0,74	-15,19	0,001
5	3,48	0,86	4,67	0,54	-14,03	0,001
6	2,87	1,02	4,21	0,95	-11,69	0,001
7	2,81	0,89	4,19	0,69	-14,71	0,001
8	3,15	0,74	4,46	0,58	-16,85	0,001
9	1,92	0,91	3,66	0,99	-15,61	0,001
10	2,65	0,83	4,15	0,73	-16,30	0,001
11	3,13	1,03	4,33	0,73	-11,41	0,001
12	3,69	0,91	4,80	0,42	-13,19	0,001
13	3,15	0,88	4,50	0,62	-15,09	0,001
14	3,13	0,82	4,58	0,60	-17,08	0,001
15	3,47	0,82	4,72	0,45	-15,84	0,001
16	2,81	1,04	4,22	0,73	-13,31	0,001
17	3,09	0,96	4,46	0,60	-14,41	0,001
18	2,95	0,96	4,54	0,57	-16,89	0,001

The high loads and the high percentage of explained variance on one factor showed that all items of the instrument indicated the same dimension (table 5).

Table 5

Summary of Exploratory Factor Analysis Results

Item	Communalities	Component		
		1	2	3
Item 14	0,421	0,722	-0,253	-0,036
Item 15	0,561	0,714	-0,213	-0,156
Item 8	0,365	0,697	0,227	0,003
Item 18	0,536	0,691	-0,322	-0,215
Item 13	0,509	0,666	-0,378	0,020
Item 4	0,305	0,661	0,315	0,001
Item 10	0,556	0,651	0,218	-0,131
Item 12	0,537	0,638	-0,330	0,281
Item 17	0,532	0,629	-0,200	-0,270
Item 5	0,489	0,602	-0,142	0,356
Item 16	0,470	0,593	-0,214	-0,448
Item 7	0,595	0,570	0,463	-0,133
Item 2	0,587	0,560	0,246	0,432
Item 9	0,586	0,534	0,381	-0,319
Item 1	0,580	0,530	0,365	0,087
Item 3	0,598	0,519	0,265	0,161
Item 11	0,509	0,515	-0,277	0,358
Item 6	0,627	0,515	0,108	0,169
% of Total Variance Explained		37,886	8,221	5,916

Extraction Method: Principal Component Analysis.

Discussion and Conclusion

Validity refers to the degree to which the scale measures what it claims to measure [15]. Since items of the MASS were based on the CanMEDS and the Five Stars Doctor [4], and this structure was preserved during translation, Turkish MASS has a good content validity.

The Turkish MASS showed a high internal consistency reliability. The high item-total correlation coefficients of all items of the MASS revealed that they measured the same general construct. In the earlier study with Flemish students, the original MASS had also a good reliability value [4].

The significant difference of means of lowly and highly achieving student groups indicated the discriminant validity of the scale. The construct of the scale was investigated: it was found that the MASS has one dimension.

Our study has some limitations. Further studies are needed to provide evidence of the reliability and validity of the MASS. The study was conducted on medical students enrolled in an integrated medical curriculum. The MASS should be further tested in schools with other types of medical curricula. Internal consistency of the MASS should be examined with test-retest correlation.

Despite these limitations, this study reveals that the Turkish MASS has a good reliability. It has a one-

dimension structure and a good content validity since it has been developed based on a universal medical competency framework.

Transparency of the study. *The study did not have sponsorship. The authors are solely responsible for the provision of the final version of the manuscript for publication.*

Declaration of financial or other relationships. *All authors participated in the conception and design of the study and in the writing of the manuscript. The final version of the manuscript was approved by all the authors. The authors did not receive a fee for the study.*

REFERENCES

1. Boelen C. The Five-star Doctor: an asset to health care reform? Geneva: World Health Organization. 1997: http://www.who.int/hrh/en/HRDJ_1_1_02.pdf
2. Frank JR ed. The CanMEDS 2005 physician competency framework; Better standards. Better physicians; Better care. Ottawa: The Royal College of Physicians and Surgeons of Canada. 2005; 40 p.
3. Frank JR, Danoff D. The CanMEDS initiative: implementing an outcomes-based framework of physician competencies. *Medical Teacher*. 2007; 29: 642–647.
4. Turan S, Valcke M, De Maeseneer J, Aper L, Koole S, De Wispelaere C, Deketelaere A, Derese A. A novel Medical Achievement Self-efficacy Scale (MASS): A valid and reliable tool. *Medical Teacher*. 2013; 35 (7): 575-580.
5. Bandura A. Self-efficacy: The exercise of control. New York: Freeman. 1997; 604 p.
6. Allen R, Heard J, Savidge M, Bittengle J, Cantrell M, Huffmaster T. Surveying students' attitudes during the OSCE. *Advances in Health Sciences Education*. 1998; 3: 197–206.
7. Tresolini CP, Stritter FT. An analysis of learning experiences contributing to medical students' self-efficacy in conducting patient education for health promotion. *Teaching and Learning in Medicine: An International Journal*. 1994; 6 (4): 247-254.
8. Mann KV, Lindsay EA, Putnam RW, Davis DA. Increasing physician involvement in cholesterol-lowering practices: the role of knowledge, attitudes and perceptions. *Advances in Health Sciences Education*. 1997; 2: 237–253.
9. Kaufman DM, Laidlaw TA, Langille D, Sargeant J, MacLeod H. Differences in medical students' attitudes and self-efficacy regarding patient–doctor communication. *Academic Medicine*. 2001; 76 (2): 188.
10. Mavis B. Self-Efficacy and OSCE performance among second year medical students. *Advances in Health Sciences Education*. 2001; 6: 93–102.
11. Johnston M, O'Carroll R, Hart J, McGee HM. Experiencing the evidence' in behavioural sciences increases self-efficacy. *Medical Education*. 2004; 38: 563-564.
12. Katz S, Feigenbaum A, Pasternak S, Vinker S. An interactive course to enhance self-efficacy of family practitioners to treat obesity. *BMC Medical Education*. 2005; 5: 4.
13. Wright SW, Lindsell CJ, Hinckley WR, Williams A, Holland C, Lewis CH, Heimbürger G. High fidelity medical simulation in the difficult environment of a helicopter: feasibility, self-efficacy and cost. *BMC Medical Education*. 2006; 6: 49.
14. Bandura A. *Encyclopedia of human behavior*. New York: Academic Press. 1994; 4: 71-81.
15. Fraenkel JR, Wallen NE. *Validity and reliability. How to design and research in education*. New York: McGraw-Hill, INC. 1996; 3: 153-171.