Adaptation and validation of the Arabic version of self-efficacy scale for mammography

A report on psychometric properties

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ABSTRACT

الأهداف: ملاءمة وتوثيق مصداقية مقياس النجاعة الذاتية (MSSE) لفحص أشعة الثدي واختبار الخصائص السيكوميترية للنسخة العربية.

الطريقة: أجريت دراسة منهجية لترجمة وملاءمة مقياس النجاعة الذاتية أجريت في المراكز الصحية بالمدينة المنورة في الفترة من مارس إلى مايو 2016. تمت ترجمة وملاءمة المقياس إلى اللغة العربية باستخدام الطرق المعيارية. تم استخدام «تحليل العامل التوكيدي» و «تحليل المُعَوَّليّة» لتحديد الخصائص السيكوميترية للنسخة العربية من المقياس.

النتائج: أظهرت النتائج ثباتاً جيداً للمقياس (معامل كرونباخ=0.88). أما تحليل العامل التوكيدي فقد بين أن المقياس يقيس عاملاً واحداً وهو النجاعة الذاتية، كما أظهرت مؤشرات «حسن التلاؤم» تلاؤماً جيداً للمقياس (CFI=0.961، و RMSEA=0.076 TLI=0.943، وSRMR=0.045). كان متوسط مقياس النجاعة الذاتية لدى النساء اللاتي قمن بفحص أشعة الثدي خلال السنتين الأخيرتين أعلى من متوسط المقياس لدى النساء اللاتي لم يقمن بفحص أشعة الثدي (35.88±7.2; p=0.009).

الخاتمة: أكدت الدراسة جودة الخصائص السيكوميترية للنسخة العربية لمقياس النجاعة الذاتية لفحص أشعة الثدي. واستطاع المقياس التمييز بين النساء اللاتي قمن بفحص أشعة الثدي واللاتي لم يقمن بالفحص. يمكن أن يكون المقياس مفيدا للبرامج والدراسات التي تهدف إلى تحسين التزام النساء بإجراء الفحص.

Objectives: To culturally adapt and validate a mammography-specific self-efficacy (MSSE) scale into Arabic for the Saudi Arabian context.

Methods: A methodological study aimed at tool translation and adaptation conducted in primary healthcare centers in As Madinah, Saudi Arabia between March 2016 and May 2016. The MSSE scale was translated and adapted into Arabic using standard procedures. Content and face validity were investigated. Confirmatory factor analysis and reliability analysis were used to determine the scale's psychometric properties.

Results: The scale showed a good internal consistency (Cronbach's alpha=0.88). The confirmatory factor analysis supported the scale's single-factor structure and the goodness-of-fit indices confirmed the model's good fit (comparative fit index=0.961, Tucker-Lewis index=0.943, root-mean-square error of approximation=0.076, and standardized root-mean-square residual=0.045). Women who had a mammogram in the last 2 years scored significantly higher on the scale (39±6.2) than women who had never received a mammogram (35.88±7.2; p=0.009).

Conclusion: The study confirmed that the scale's Arabic version has good psychometric properties, using reliability analysis, confirmatory factor analysis, and extreme groups validation. The scale is likely to be useful for evaluating interventional studies aimed at improving mammography screening participation rates.

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Breast cancer is a major public health issue worldwide. It is the main cause of cancer-related deaths in women causing 14% of female deaths from cancer.[1] In Saudi Arabia, breast cancer has a major burden being the most common cancer among Saudi nationals, comprising 16.7% of all cancer cases[2] with a tenfold incidence increase between 1990 and 2016.[3,4]

Mammography screening has been employed for the early detection of breast cancer and has been shown to reduce the mortality from breast cancer.[5] A high participation rate is essential for the efficacy of breast cancer mammography screening programs. However, a cross-sectional survey conducted in Saudi Arabia found that only 40% of women aged ≥40 years in Saudi Arabia reported having had a mammogram.[6,7] The reasons for the low participation rate require investigation. Previous studies revealed several factors that can influence mammography behavior like health beliefs, physician recommendation, appointment system, and knowledge of the health system.[8,9]

Various theories in health education and health behavior have been advanced in an attempt to explain why people adopt certain behaviors (in relation to screening). Among these theories, the social cognitive theory and health belief model (HBM) are commonly used in practice.[10-13] Self-efficacy is the key construct in the social cognitive theory developed by Bandura in the 1970s.[14] Although it was not part of the HBM when first formulated, self-efficacy was later added to the model as a separate construct. Self-efficacy denotes an internal mental process defined as 'person's level of confidence in his capability to control his behavior'.[14] Bandura et al outlines 4 processes through which an individual's self-efficacy is shaped: previous experience, vicarious experience, social persuasion, and emotional arousal.[14] Self-efficacy plays a major role in changing and sustaining individuals' health behaviors. In a meta-analysis of experimental studies, Sheeran et al[15] found that interventions that changed self-efficacy yielded the largest changes in behavior. Self-efficacy was also reported to be associated with mammography behavior.[16] Therefore, the ability to measure self-efficacy is of paramount importance in designing interventions aimed at increasing mammography participation and adherence rates. In Saudi Arabia, various factors were associated with mammography behavior including education, beliefs, medical conditions, and family history.[6,7,17] However, the effect of self-efficacy was not reported. Although self-efficacy is thought to be a universal construct,[18] cross-cultural similarities or differences cannot be investigated without a validated measure.

A scale for measuring mammography-specific self-efficacy (MSSE) was developed and validated by Champion et al in English.[19] The MSSE scale was translated and culturally adapted into many languages and countries (Greece,[20] Turkey,[21] and Iran[18,22]) but has not previously been translated and adapted for Arabic contexts. While scales are available in Arabic to measure self-efficacy in other areas,[23] there is currently no scale in Arabic for measuring self-efficacy in relation to mammography. The objective of the present study is to translate and culturally adapt the MSSE scale for an Arabic-speaking context, and to validate the scale's efficacy for use in Saudi Arabia.

Methods. This is a methodological study aimed at tool translation and adaptation conducted in primary healthcare centers (PHCs) in Al-Madinah Al-Munawrah, Saudi Arabia between March 2016 and May 2016. The target population were women in the age group of 30 years or over living in Madinah. The study included 221 women were selected in PHCs using a cluster sampling with a probability-proportional-to-size approach according to the average number of patients attending each PHC based on the PHC records in the previous year. For each selected PHC, a systematic sampling approach, by selecting every third eligible woman, was used to select the required number of participants to be included in the study. The eligibility criteria were female, 30 years old or over, ability to speak Arabic, and attending the PHC at the time of the team's visit either as a patient or a as a patient's companion. Thirty was selected as the lower age limit, since women are usually referred to mammography screening programs from this age, based on the assumption that breast cancer begins from an early age in Saudi Arabia.[24]

The exclusion criteria included having a current or previous cancer diagnosis. The participants were interviewed by trained nurses using a structured questionnaire. Collected questionnaires were checked by the research team and then forwarded to data entry, followed by quality check and data cleaning. The sample size was estimated based on the recommendation of 5 to 10 subjects per parameter to be estimated in the confirmatory factor analysis (CFA).[25] Since the original MSSE scale has 20 parameters (including path coefficients and variances), 200 women were targeted to be included.

Data were collected using the MSSE scale and an interview questionnaire. The questionnaire included questions concerning sociodemographic information (age, education level, marital status, income level, and employment) in addition to questions regarding

the cancer-related practices (history of breast cancer, history of previous mammography, and intention to avail of screening). The intention to avail of screening had the following categories: a) within the next 6 months, b) within the next 1 year, c) within the next 2 years, d) never. The years-of-education variable was categorized into less than 7 years (primary school or lower), 7 to 12 years (middle or high school), and greater than 12 years (above high school). The history of mammography was categorized as a binary variable (having had a mammogram in the last 2 years versus never having had a mammogram). Stages of change in the women's adoption of mammography screening behavior were defined as follows: i) precontemplation, if the woman never had a mammogram and had no intention to have one; ii) contemplation, if the woman had never had mammogram but intended to have one in the next 2 years; and iii) action, if the woman had had a mammogram in the previous 2 years and intended to have another in the next 2 years.

The original English-language MSSE scale is composed of 10 items and aims to assess the perceived self-efficacy of women with regard to availing of mammography screening. Each item has 5 Likert-scale-type responses, ranging from values of one (strongly disagree) to 5 (strongly agree). The total possible score (the sum of the individual item scores) ranges from 10 to 50 points, with a higher total score indicating a higher level of self-efficacy. The original scale was validated among anglophone women and showed a good internal consistency and validity.[19]

Mammography-specific self-efficacy scale adaptation. The process of instrument translation is aimed at achieving an equivalence between the scale's original and translated and adapted versions. Various types of equivalence have been proposed, and the present study followed the recommendation of Streiner et al[26] to use 5 equivalences: 1) conceptual equivalence, the concept or construct measured by the instrument is perceived in similar ways by both cultures; 2) item equivalence, the items on the scale are applicable and acceptable to the target population; 3) semantic equivalence, the meanings of words and phrases within each item are appropriate, ensuring that the translation was not conducted literally such that it changed the intended meaning; 4) operational equivalence, the instructions, mode of administration, and scale format are suitable for use with the target population; and 5) measurement equivalence, the psychometric properties are equivalent in both the original and translated versions.

In the present study, the conceptual, item and semantic equivalences were examined using a standard translation process, pretesting, and consultation with a committee of experts (2 family physicians, one oncologist, one women's health consultant, and one epidemiology and public health consultant). The committee reviewed the translated scale to ensure the elements of the construct are relevant in the Saudi culture and will be comprehensible by the target population. Operational equivalence was ensured through pretesting and consultation with experts. The Likert scale format is widely used in health studies in Saudi Arabia and no issues have been reported with scales of this type. Although the literacy rate among the target population is high, the data were collected via interview rather than self-administered questionnaire, since the sample was expected to include a small number of elderly participants who may have experienced difficulty in reading printed materials. Finally, CFA and reliability analysis were conducted to verify the measurement equivalence.

The translation process began with 2 independent translations of the MSSE scale from English into Arabic created by a family physician and a public health physician, both of whom are native speakers of Arabic and English. The committee of experts reviewed both versions to ensure equivalence and resolve any discrepancies in the translations. Subsequently, another translator conducted a back-translation from Arabic into English, and again, the expert committee reviewed the back-translated version in comparison with the original to ensure consistency. When the translation process had been completed and the questionnaire formatted, a pretesting was conducted with a small sample of women from the same target age group. This group was selected from different PHCs to those from which the main sample was selected. On completion of the interview questionnaire, the participant commented on the clarity and appropriateness of the questions. Comments and other issues related to the questionnaire were reported to the expert committee for their review. The final Arabic version (MSSE-Ar) can be found in **Appendix A.**

Statistical analysis. Data analyses were carried out using Stata 13.1 (StataCorp LLC, TX, USA). Confirmatory factor analysis was used to verify the validity of the scale's hypothesized factor structure. The MSSE scale was originally developed and validated as a single-factor model,[19] so the single-factor structure was used for the hypothesized model. The CFA was run using the maximum likelihood estimation method. Modification indices (based on Lagrange multiplier tests) were used to preliminarily indicate potentially omitted paths in the fitted model, which were confirmed

or refuted based on their theoretical soundness. The model's overall fit was evaluated using various goodness-of-fit statistics, including the comparative fit index (CFI), the Tucker-Lewis index (TLI), the root-mean-square error of approximation (RMSEA), and the standardized root-mean-square residual (SRMR). Comparative fit index and TLI values that are greater than 0.90 indicate a good fit, while RMSEA values are between 0.05 and 0.08 and SRMR indicate goodness-of-fit less than 0.05.[25] Cronbach's alpha, alpha if item deleted, and the corrected item-total correlations (where the item was not included in the total) were used to assess the homogeneity and internal consistency of the scale's items. Cronbach's alpha level of 0.7 or above was considered acceptable. An item-total correlation value of less than 0.3 indicates a poorly functioning item,[26] and thus was considered the threshold to discard items. Known groups validation (also known as extreme groups validation) were carried out by comparing women with different screening behaviors and in different stages of change, using t-test and ANOVA test, as appropriate.

The ethics committee of the Directorate of Health in Madinah approved the study protocol. Study participants signed written informed consent. The study's conduct follows the principles of the Helsinki declaration. The study was reported according to the STROBE cross sectional reporting guidelines.[27]

Table 1 - The sample characteristics of 221 women from the primary health care in Al-Medinah Al Munawarah, Kingdom of Saudi Arabia.

Characteristic	n (%)
Age	
30 – 39	118 (53.4)
40 – 49	85 (38.5)
50 – 59	18 (8.1)
Marital status	
Married	155 (72.8)
Never married	20 (9.4)
Divorced/Widow	21 (9.9)
Separated	17 (7.9)
Education (years)	
<7	25 (11.6)
7-12	105 (48.6)
>12	86 (39.8)
Employment	
Employed	97 (51.1)
Unemployed	93 (48.9)
Income	
Low	25 (11.4)
Medium	168 (76.4)
High	27 (12.2)
Had mammogram in the past 2 years	
Yes	43 (19.6)
No	176 (80.4)
Stages of change category	
Pre-contemplation	117 (65.4)
Contemplation	26 (14.5)
Action	36 (20.1)

Results. The sample included 221 women, selected randomly from PHCs in Madinah city (**Table 1**). The mean age was 39.6±5.7 years. The participants were married (72.8%), single (9.4%), divorced/widowed (9.9%), or separated (7.9%). The majority had high/intermediate school degrees (48.6%), while 39.8% had university/college degrees or higher, and 11.6% had primary school degrees or less.

Conceptual, item and semantic equivalences. As mentioned above, the conceptual, item and semantic equivalences were examined using the standard translation process, pretesting among women from the target age group, and consultation with the committee. Comments from the pretesting process and from the committee of experts were incorporated in the final MSSE Arabic (MSSE-Ar) version. These equivalences ensure the content and face validity of the MSSE-Ar scale. The committee found the concepts of the scale to be relevant to the Saudi context and comprehensible during pretesting.

Internal consistency. The overall Cronbach's alpha was 0.88. The corrected item-total correlation ranged from 0.44 to 0.74, indicating good functioning items, and thus none were eliminated. **Table 2** presents the central tendency and dispersion (mean and SD), corrected item-total correlation, and alpha level if deleted for each item. It is noteworthy that the alpha level did not change significantly if any item was deleted, which also indicated that it was not necessary to eliminate any item.

Confirmatory factor analysis. The data from participants who responded to each item on the scale (n=221) were used. The model was tested and produced the following fit indices: Chi^2=182.2, CFI=0.855, TLI=0.814, RMSEA=0.138, and SRMR=0.067, indicating a mediocre goodness-of-fit. Therefore, the modification indices were reviewed and found to indicate that some error covariances should be incorporated into the model specification. Error covariances may result from item content overlap, and their incorporation into the model does not affect the scale's interpretation but should be based on theoretical rationale.[28] Thus, covariances were added to the model between the errors of items 2 and 3, items 3 and 4, items 8 and 9, and items 4 and 9. As shown in **Table 3**, the model was run after covariances had been incorporated, and the result indicated the model's improvement and good fit

Table 2 - Item summary and internal consistency of the Arabic version of the mammography-specific self-efficacy scale.

Item*	Mean±SD	Item-rest correlation	If item deleted
Can arrange transportation	3.76±1.07	0.46	0.88
Can arrange other things in your life	3.99±0.96	0.57	0.87
Can talk about your concerns	3.80±0.93	0.54	0.87
Can get a mammogram even if you are worried	3.73±0.95	0.69	0.86
Can get a mammogram even if you don't know what to expect	3.71±0.92	0.74	0.86
Can pay for a mammogram	3.11±1.21	0.44	0.88
Can make an appointment	3.57±1.04	0.72	0.86
Know you can get a mammogram if you really want to	3.62±0.99	0.64	0.87
Know how to go about getting a mammogram	3.51±1.01	0.72	0.86
Can find a place to have a mammogram	3.71±1.09	0.62	0.87

*Items were shortened. SD - standard deviation

Table 3 - The goodness-of-fit indices for the Arabic version of the mammography-specific self-efficacy scale.

Model	Chi² (df)	CFI	TLI	RMSEA	SRMR
Mammography-specific self-efficacy	182.2 (35)	0.855	0.814	0.138	0.067
Mammography-specific self-efficacy (after adding error covariances)	70.7 (31)	0.961	0.943	0.076	0.045

DF - degree of freedom, CFI - comparative fit index, TLI - Tucker-Lewis index
RMSEA - root-mean-square error of approximation, SRMR - standardized root-mean-square residual

(Chi²=70.7, CFI=0.961, TLI=0.943, RMSEA=0.076, and SRMR=0.045). The loading of items in the model ranged from 42 to 85, indicating a satisfactory association between each item and the scale score.

Theoretical relationship. The overall mean of the MSSE-Ar total score was 36.5±7.1. Known groups comparisons were carried out by comparing women who had had mammograms with those who had never had mammograms, and also by comparing women at various stages of change in their adoption of mammography screening behavior. The MSSE-Ar score was significantly higher among women who had a mammogram in the last 2 years (39±6.2) than it was among women who had never had mammograms (35.88±7.2; t=-2.61; df=217; p=0.009). The MSSE-Ar score was also higher among women at the action stage of change (39.6±6.4) than it was among women at the contemplation (37.4±5.9) and precontemplation (35.6±7.1) stages. The difference between these groups was statistically significant (F=4.9, p=0.008).

Discussion. The aim of the present study was to translate, culturally adapt, and validate the psychometric properties of the MSSE scale into Arabic for use in primary healthcare settings in Saudi Arabia. The results yielded evidence that supports the validity and reliability of the MSSE-Ar scale. The systematic translation and adaptation process maintained the conceptual, item and semantic equivalences of the individual items and the scale overall. Literal translation was avoided in favor of language that clearly captured the intended meaning and was more likely to be comprehended by the target audiences.

The MSSE-Ar scale used in this study exhibited good internal consistency. The Cronbach's alpha of the MSSE-Ar scale was 0.88, that is, above the recommended level of 0.70, thus indicating good reliability. The coefficient was similar to that of the original English-language scale (0.87)[19] and to the Cronbach's alpha coefficients reported in studies documenting the adaptation of the MSSE scale into other languages; for example, the Turkish[21] version has a Cronbach's alpha coefficient of 0.90 and Greek[20] version has a Cronbach's alpha coefficient of 0.88.

The CFA results revealed that all individual items were significantly correlated to the latent variable (self-efficacy). It also supported the scale's single-factor structure that was recommended on the basis of the original scale. Moshki et al[18] reported a 2-factor structure but the tested Farsi version had 14 items compared to the 10 items in the current study. Furthermore, similar to the original scale,[19] the CFI goodness-of-fit index in the current study was higher than 0.90.

The MSSE-Ar scale revealed a statistically significant difference between women who had had mammograms and those who had not. Additionally, the scores varied according to the stage of change the participants were at, with women who are in the early stages achieving lower scores than those at advanced stages. These differences in the known groups supported the construct and the

predictive validity of the MSSE-Ar scale. A similar pattern was reported in previous research on various language versions of the MSSE.[19,21] When tested, the original English MSSE found that adherent women achieved higher scores (45.35±0.24) than did non-adherent women (43.30±0.23).[19]

There are several strengths inherent in the present study. The analyses relied on a random sample of women from PHCs, thereby giving estimates of parameters in a community setting. The translation and adaptation processes were rigorous and followed the recommended steps to ensure equivalence and assess the scale's psychometric properties. However, the study also has some limitations: first, the sample was taken from Madinah city only, and, therefore, may not be representative of all women in Saudi Arabia. Second, the present study assessed mammography practices based on the participants' self-reported data. The mammography-related self-report method had not been validated in a Saudi Arabian primary healthcare setting.

Further studies can verify the applicability of the MSSE-Ar scale to women from different cultural backgrounds, in different healthcare settings, or in different regions of Saudi Arabia. Moreover, further research can investigate other varieties of validation studies like the instruments' sensitivity, discriminant validity, and responsiveness to change.

In conclusion, the current study presented an adapted and validated Arabic version of the MSSE scale for use in the context of primary healthcare in Saudi Arabia. It provided evidence of the Arabic version's good psychometric properties using reliability analysis, CFA, and extreme groups validation. The scale may be useful in evaluating interventional studies aimed at improving participation rates in mammography screening programs.

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