LEX LOCALIS-JOURNAL OF LOCAL SELF-GOVERNMENT
ISSN:1581-5374 E-ISSN:1855-363X
VOL. 24, NO. 1(2026)

VALIDITY AND RELIABILITY OF CHAMPION'S HBM SCALE FOR BREAST CANCER PREVENTION IN ALGERIAN WOMEN

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Received : 21/07/2025 ; Accepted : 23/12/2025

Abstract:
Breast cancer is the most common cancer among Algerian women and a major cause of cancer mortality. Despite free early detection services, screening uptake remains low. The Health Belief Model provides a framework for understanding preventive behavior. This study aimed to translate, adapt, and validate the Champion Health Belief Model Scale in Algeria, expand it to include physical activity and dietary behaviors, and examine cues to action for first-time screening. The scale was administered to 444 Algerian women. Exploratory and confirmatory factor analyses supported a coherent factor structure and good reliability, with Cronbach's alpha values ranging from 0.79 to 0.91.

Keywords: Champion's HBMS, Breast Cancer Prevention, Algerian Women.

Summary Box :

What is known?
Champion developed the Health Belief Model Scale (CHBMS) for breast cancer screening, validated in several cultures (Arabic, Turkish, Malaysian), but not yet tested in Algeria.

What is new?
This study adapted and validated the CHBMS among Algerian women, expanding it to include preventive health beliefs related to physical activity, diet, and screening behaviors (BSE, CBE, Mammography), and introduced the "Cues to Action" construct for the first time.

What is the impact?
This study broadens the CHBMS framework and supports awareness and early detection programs promoting a comprehensive preventive lifestyle.

Introduction:

Breast cancer is the leading cause for cancer death among women worldwide, and is associated with the so-called "Injured Femininity" due to its symbolic significance in femininity. It affects approximately 1.38 million women annually and caused the death of more than 586,000 women in 2016, according to the International Agency for Research on Cancer. In the Arab world, breast cancer ranks first among cancers in women (Al-Araby Al-Jadeed, 2018).

Breast cancer is one of the most common types of cancer among women in Algeria, with approximately 12,800 new cases recorded in 2018, compared to 300 cases in 1995. (El Khabar, 2017). Professor Mohsen Boubnider, Head of Breast Diseases Department at Pierre et Marie Curie Center in Algiers, confirmed that the number of new cases of breast cancer in Algeria is approximately 12,000 annually (El Khabar, 2018).

Statistics from the Global Cancer Observatory show that breast cancer represented 40.7 % of all cancers among women in Algeria in 2018 (Global Cancer Observatory, 2019).

As part of Algeria's efforts, like many countries around the world, to reduce health risks, it has established regional medical imaging centers, affiliated with the National Social Insurance Fund. These centers are distributed across several provinces, including Constantine, Laghouat, Jijel, and Maghnia. These centers are equipped with modern equipment that enables the early diagnosis and detection of incurable diseases, most notably breast cancer. These centers provide free screening

services and cover transportation costs for women from neighboring provinces affiliated with these centers, as part of a national program for early detection of breast cancer. Awareness campaigns are also organized to encourage women to undergo preventive examinations.

Field data collected from radiology centers in the provinces of Constantine and Laghouat revealed low response rates to calls for early detection of breast cancer, not exceeding 9.58 % in Constantine and 18.10 % in Laghouat.

This makes us wonder about the non-material reasons that hinder early screening. Field data and exploratory interviews with staff at breast cancer early detection centers and with some women revealed the presence of a number of health beliefs that hinder the practice of early detection behavior and the influence of social and cultural contexts on health decision-making, including: Beliefs about the disease being contagious and incurable, beliefs that radiological examinations may lead to the disease “expansion and spread”, that it is painful, in addition to religious and ideological beliefs such as embarrassment for the radiologist being male, not to mention the association between the disease and predestination and the preference for folk remedies over medical examination. Moreover, there is a lack of awareness and knowledge about prevention methods, including self-examination. These factors highlight the importance of health beliefs in explaining women's behavior toward early detection, as the Health Belief Model (HBM) is a comprehensive theoretical model for predicting health behaviors (Taylor, 2008).

Despite the widespread use of the HBM model in predicting health behaviors associated with breast cancer, and the reliance of many foreign and Arab studies on (CHBMS) scale in measuring the model’s components (Champion, 1984), being widely applied in a number of cultural environments (Champion, 1995), its validity and psychometric reliability have been proven in several international studies, such as: The Malaysian study (2008) by Parsa, P. et al., (Parsa et al., 2008), the Turkish study (2009) by Ceber, E. et al, (Ceber et al., 2009), and the Iranian study (2014) by Hashemian, M. (Sharaa and Hashemian, 2014) , the Saudi study (2015) by Abolfotouh, M. A. et al. (Abolfotouh et al., 2015) , the Jordanian study (2001) by Mikhail, B. I., & Petro-Nustas, W. I. (Mikhail and Petro-Nustas, 2001).

However, the Algerian environment still lacks studies that have directly applied this scale or tested its validity and cultural and sociological suitability. This absence represents a clear cognitive and methodological gap. Preliminary field data also indicate the presence of cultural and societal characteristics that influence the adoption of preventive behavior.

Thus, this study represents an important methodological step towards developing effective diagnostic and intervention tools tailored to the specific needs of Algerian women and supporting preventive efforts at both individual and societal levels.

Method:

A descriptive study was conducted on a sample of women in Algeria for the period from May 15, 2018 to September 10, 2018. The study was applied to a sample from different provinces: Constantine, Laghouat, Jijel, and Setif. It even got some colleagues to help with the application.

The scale was applied to the convenient sample in different places to cover all categories: Such as universities, mosques, and homes, taking into consideration that they are over 20 years old and do not have breast cancer. The number of forms distributed across these four provinces reached 560, 509 of which were returned, with 65 invalid, leaving 444 valid forms.

Table (1): Social and Demographic Characteristics of the Participants (N=444)

Variable	**Provinces**				**Educational Level**				
Category	Laghouat	Constantine	Jijel	Setif	No formal	Primary	Middle school	Secondary	University
Frequency	157	98	99	90	6	14	31	73	320

Percentage	35.4 %	22 %	22.3 %	20.3 %	1.4 %	3.2 %	7 %	16.4 %	72 %
Variable	Age Group				Employment Status			Family History of Breast Cancer	
Category	20–39 years	40–59 years	60 years and above		Home maker	Student	Employee	Absent	Present
Frequency	330	105	9		96	135	213	58	386
Percentage	74.3 %	23.6 %	2.0 %		21.6 %	30.4 %	48 %	13.1 %	86.9 %

The researcher prepared a questionnaire to collect social and demographic data for the study sample. She also relied on the Health Belief Model Scale (CHBMS) developed by Victoria L. Champion in its initial version of 1984 (Champion, 1984) which included five main dimensions: Perceived susceptibility, perceived severity, benefits and barriers of breast self-examination (BSE), and health motivation. In the 1995 (Champion, 1995) adjusted version, two additional dimensions were added that address the benefits and barriers associated with mammography.

The researcher obtained official permission to use the scale from its author, and it was translated into Arabic by specialists. After translation, adjustment was made to the scale based on a review of previous studies and exploratory interviews, which included the addition of a number of new phrases. Two phrases were added to the benefits dimension of mammography: “Early mammography reduces the mortality rate due to breast cancer,” and “If I have a mammogram, I will reduce the possibility of mastectomy and disfiguring surgery if I do develop breast cancer.” Two phrases were also added to the barriers dimension related to radiological examination: “I fear having a mammogram as I am afraid the radiation will negatively affect the health of my breasts and cause disease,” and “I fear having a mammogram as I do not understand what will be done.” In the health motivation dimension, two phrases were added: “I want to protect my health from diseases” and “I appreciate the importance of maintaining my health”

The scale was also expanded to include health beliefs related to other preventive behaviors, such as the benefits and barriers of clinical examination (CBE), based on Frankenfield (2009) (Frankenfield, 2009), as well as the benefits and barriers of dietary and physical activity behaviors that are preventive for breast cancer, along with items measuring cues to action. The adjusted scale consists of 111 items distributed across the following dimensions: Perceived susceptibility (11 items), perceived severity (11 items), benefits of self-examination (11 items), benefits of radiological examination (6 items), benefits of clinical examination (7 items), benefits of dietary behavior (5 items), benefits of exercise behavior (6 items), barriers to self-examination (9 items), barriers to radiological examination (7 items), barriers to clinical examination (7 items), barriers to dietary behavior (3 items), barriers to exercise behavior (5 items), health motivation (7 items), cues to action (5 items), and health self-efficacy (22 items). A four-point Likert scale was used (from 4 = strongly agree, to 1 = strongly disagree).

The adjusted version was also tested on a pilot sample of 30 Algerian female university students, to ensure the clarity and ease of understanding the items.

Exploratory Factor Analysis (EFA) was used on a sample of (N=222) to test the factor structure of all subscales of the CHBM scale, using the Principal Axis Factoring (PAF) method to extract the factors, with the factors rotated using Promax method. A correlation coefficient of 0.50 was adopted as the minimum for accepting items within the factor.

The normality of the data distribution was confirmed by calculating the skewness and kurtosis coefficients for each subscale, where the skewness values ranged between (-0.855) and (+0.66), while

the kurtosis values ranged between (-0.390) and (+0.720). Since all values fall within the statistically acceptable range (±3), the data were considered to be normally distributed.

The adequacy of the sample was examined using the Kaiser-Meyer-Olkin (KMO) test, where the values ranged between (0.76) and (0.89) for the various measures. Bartlett's Test of Sphericity also showed statistical significance for all scales. In addition, the determinant was calculated with values ranged between 0.001 and 0.217, all of which are greater than the recommended minimum of 0.00001, which indicates the suitability of the sample and enhances the validity of the data for factor analysis.

The number of factors being determined and the corresponding items distributed, confirmatory factor analysis (CFA) was conducted on a sample (N=444) using the AMOS program for the subscales. Model Fit was assessed using the following indicators:

CMIN (Chi-square), DF (Degrees of Freedom), P (Significance Level), CMIN/DF (Standardized Chi-square), RMR (Root Mean Square Residuals), SRMR (Standardized Root Mean Square Residuals), GFI (Goodness-of-Fit Index), AGFI (Adjusted Goodness-of-Fit Index), PGFI (Parsimony/Goodness Fit Index), TLI (Tucker Lewis Index), CFI (Comparative Fit Index), RMSEA (Root Mean Square Error of Approximation), AIC (Akaike Information Criterion).

Reliability: The reliability of the subscales of the health beliefs model was measured using Cronbach's alpha and stratified alpha via SPSS.

Results:

Results of the Exploratory Factor Analysis:

Table (2): Exploratory Factor Analysis Results for the Beliefs of Perceived Susceptibility, Severity, Health Motivation, and Cues to Action

Component	Susceptibility		Severity				Health Motivation		Cues to Action	
			Factor 1		Factor 2					
	suscep3	.800	sev1	.814	sev5	.530	Motiv1	.687	Cues 3	.769
	suscep4	.713	sev2	.555	sev7	.729	Motiv2	.750	Cues 1	.733
	suscep2	.692	sev3	.866	Sev8	.659	Motiv3	.771	Cues 2	.731
	suscep1	.650			sev9	.578	Motiv4	.671	Cues 4	.727
	suscep5	.545			sev10	.685	Motiv6	.708	Cues 5	.522
					sev11	.596	Motiv7	.706		
Eigenvalue	**2.856**		**5.005**		**1.091**		**3.696**		**2.951**	
Explained Variance	**46.928**		**40.696**		**5.445**		**45.669**		**49.314**	
Total Variance			**46.141**							

Table **2** presents the results of the exploratory factor analysis for four components of the scale: perceived susceptibility, perceived severity, health motivation, and cues to action. The results were as follows:

- **Perceived Susceptibility** was represented by a single factor, with an eigenvalue of **2.856** and an explained variance of **46.928%**. Five items loaded on this factor with values ranging from **0.545 to 0.800**, indicating good internal consistency.
- **Perceived Severity** revealed two distinct factors. The first had an eigenvalue of **5.005** and explained variance of **40.696%**, while the second had an eigenvalue of **1.091** and explained variance of **5.445%**, bringing the total explained variance to **46.141%**. Items with factor loadings above **0.50** were retained, while those with lower loadings were removed.
- **Health Motivation** was represented by a single factor with an eigenvalue of **3.696** and an explained variance of **45.669%**. Six items loaded strongly on this factor, with loadings ranging from **0.671 to 0.771**, reflecting a coherent factor structure. One item was excluded due to a low loading.

- **Cues to Action** emerged as a single factor with an eigenvalue of **2.951** and an explained variance of **49.314%**. Five items loaded on this factor with values between **0.522 and 0.769**, indicating good internal consistency and a well-defined factor structure.

Table (3): Exploratory Factor Analysis Results for Perceived Benefits

Component	General benefits				Specific benefits			
	Factor 1		Factor 2		Factor 1		Factor 2	
	A4Q1benef	.619	A5Q1benef	.615	A1Q2benef	.705	A2Q1benef	.576
	A4Q2benef	.762	A5Q2benef	.726	A1Q3benef	.706	A2Q2benef	.753
	A4Q3benef	.711	A5Q3benef	.872	A1Q4benef	.501	A2Q3benef	.700
	A4Q4benef	.652	A5Q5benef	.528	A1Q5benef	.591	A2Q4benef	.722
					A1Q6benef	.546	A2Q5benef	.592
							A3Q1benef	.620
							A3Q2benef	.617
							A3Q3benef	.551
							A3Q4benef	.694
							A3Q5benef	.664
							A3Q6benef	.662
							A3Q7benef	.730
Eigenvalue	**1.216**		**4.669**		**1.572**		**6.902**	
Explained Variance	**5.944**		**34.297**		**5.500**		**35.231**	
Total Variance	**40.241**				**40.732**			

Table **3** presents the results of the exploratory factor analysis for the "Benefits" component, summarized as follows:

General Benefits: The analysis revealed two distinct factors for general benefits, each with an eigenvalue greater than 1.0. Both factors had more than three items with sufficient theoretical significance to be retained. The first factor represented benefits related to healthy dietary behaviors, with high factor loadings ranging from 0.61 to 0.76. The second factor represented benefits related to healthy physical activity behaviors, with loadings ranging from 0.52 to 0.87. Items with loadings below 0.50 were excluded.

Specific Benefits: Two factors were also extracted, each exceeding the eigenvalue threshold of 1.0, and containing more than three items with theoretical relevance. The first factor included five items

representing benefits of breast self-examination, with loadings ranging from 0.54 to 0.70. The second factor reflected benefits related to mammographic and clinical examinations, and was labeled "Medical Screening Benefits", with item loadings ranging from 0.55 to 0.75. Items with loadings below 0.50 were removed.

Table (4): Exploratory Factor Analysis Results for Perceived Barriers

Component	**General Barriers**		**Specific Barriers**			
			Factor 1		**Factor 2**	
	A4Q2 barier	.648	A2Q1 barier	.613	A1Q3 barier	.558
	A4Q3 barier	.489	A2Q2 barier	.516	A1Q6 barier	.616
	A5Q1 barier	.602	A3Q1 barier	.504	A1Q7 barier	.543
	A5Q2 barier	.670	A3Q2 barier	.625	A1Q8 barier	.639
	A5Q3 barier	.536	A3Q3 barier	.558	A1Q9 barier	.507
	A5Q5 barier	.494	A3Q4 barier	.571		
			A3Q5 barier	.522		
Eigenvalue	2.969		6.098		1.605	
Explained Variance	**28.640**		**23.419**		**3.988**	
Total Variance			**27.407**			

Table (**4**) shows the results of the exploratory factor analysis for the barriers component, where the results were as follows:

General barriers: represented by one factor with an eigenvalue greater than one, including six items with high loadings ranging between 0.48 and 0.67, which reflects acceptable homogeneity and a clear factorial structure for this dimension. Items with loadings less than 0.40 were deleted.

Specific barriers: divided into two factors, each with an eigenvalue greater than one, and each factor included more than three items with high loadings and theoretical significance sufficient for adoption. The first factor represented barriers related to medical examinations (mammography and clinical examination by the doctor), including seven items with loadings ranging between 0.50 and 0.62. The second factor represented barriers related to breast self-examination, including items with loadings between 0.50 and 0.63. Items that did not exceed the minimum acceptable loading (< 0.50) were deleted.

Table (5): Exploratory Factor Analysis Results for Self-Efficacy Beliefs

Component	**Self-efficacy**					
	Factor 1		**Factor 2**		**Factor 3**	
	self-effic3	.571	self-effic19	.765	self-effic11	.632
	self-effic4	.632	self-effic20	.739	self-effic14	.720
	self-effic5	.712	self-effic21	.680	self-effic15	.565
	self-effic6	.728	self-effic22	.755		
	self-effic7	.675				
	self-effic19	.571				

Eigenvalue	**4.933**	**2.804**	**1.774**
Explained Variance	**20.078**	**10.501**	**5.956**
Total Variance	**36.535**		

Table (**5**) shows the results of the exploratory factor analysis for the self-efficacy component, with the results as follows:
It was divided into six factors with eigenvalues greater than one; however, three factors loaded on only two items each and thus cannot be retained. The remaining three factors, whose loadings are presented in Table (**5**), included the first and second factors with four items each, and the third factor with three items. All loadings were high, ranging between 0.56 and 0.76. Referring back to the theoretical framework and the scale items, the first factor included perceived performance efficacy in conducting breast self-examination, the second factor represented confidence and control in planning dietary behavior, and the third factor reflected knowledge and confidence that clinical breast examination, mammography, and physical activity contribute to breast cancer prevention.

Reliability of the Health Belief Model Scale (CHBMS) in its Modified Form:

Table (6): Shows reliability using Cronbach's alpha for the subscales of the CHBMS

Component	Variance	Reliability coefficient (Cronbach's α)
Susceptibility	11.11	0.79
Severity	60.9	0.88
Perceived Benefits	175.85	0.91
Perceived Barriers	201.35	0.89
Health Motivation	17.08	0.81
Cues to Action	14.63	0.81
Self-efficacy	95.75	0.84

Note: Based on the results of the previous table, it is observed that the reliability coefficients of the subscales used in the study are high, ranging from 0.79 as a minimum to 0.91 as a maximum. This indicates that the scale has a high level of reliability, and the instrument used is appropriate and trustworthy for measuring health beliefs related to early preventive behavior against breast cancer among Algerian women.

Results of the Confirmatory Factor Analysis (CFA):

CFA of the Perceived Susceptibility Scale:

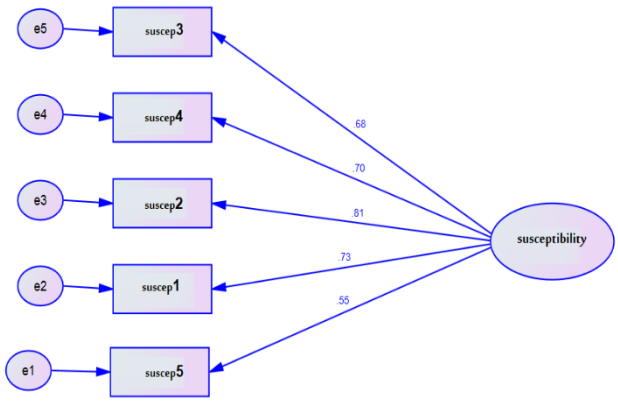

Figure (1): Illustrates the Factor Model of Perceived Susceptibility

Model Fit Indices: According to a set of goodness-of-fit indicators, the Susceptibility Model demonstrates a good fit with the data. The Chi-square (CMIN) value was 6.552, which is a positive indicator. The normed Chi-square (CMIN/DF) was 1.310, falling within the ideal range (< 5). The RMR was .0110, and the SRMR was 0.0173, both below 0.1. Additionally, the RMSEA value was .0260, indicating high model quality. The Goodness of Fit Index (GFI) was .9940, and the
Adjusted GFI (AGFI) was .9820, both exceeding 0.9. Comparative fit indices also showed excellent performance, with the CFI at .990 and the TLI at .9960, both surpassing the required threshold (≥ 0.90). Finally, the AIC value was 26.552, which is lower than that of the independent model (752.121), confirming the superiority of the current model.

CFA of the Perceived Severity Scale:

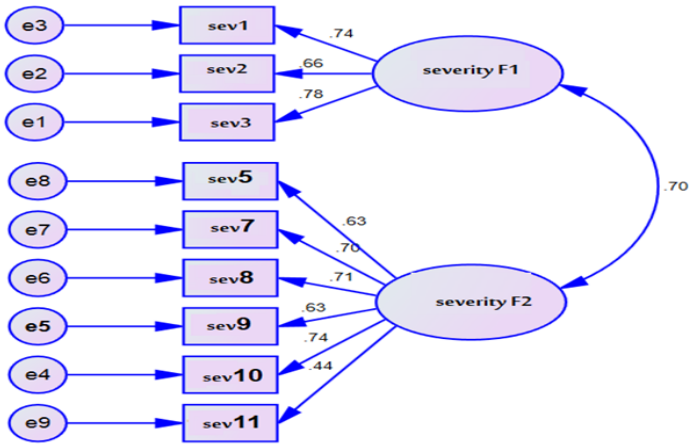

Figure (2): Illustrates the Factor Model of Perceived Severity

Model Fit Indices: The perceived severity model demonstrates a good fit to the data, based on a set of goodness-of-fit indices. The Chi-square value (CMIN) was (105.565), while the normed Chi-square (CMIN/DF) reached (4.060), which is within the acceptable range. The RMR index was (.0520), and the SRMR was (.05180), both below the maximum threshold (0.1). Additionally, the RMSEA value was (.0830), indicating an acceptable model fit.

As for the Goodness-of-Fit Index (GFI), it reached (.9510), and the Adjusted Goodness-of-Fit Index (AGFI) was (.9150). Comparative fit indices also showed positive results, with CFI at (.940) and TLI at (.910). Finally, the AIC value was (143.565), which is lower than that of the independent model (1371.145), confirming the model's adequacy.

CFA of the Perceived Benefits Scale:

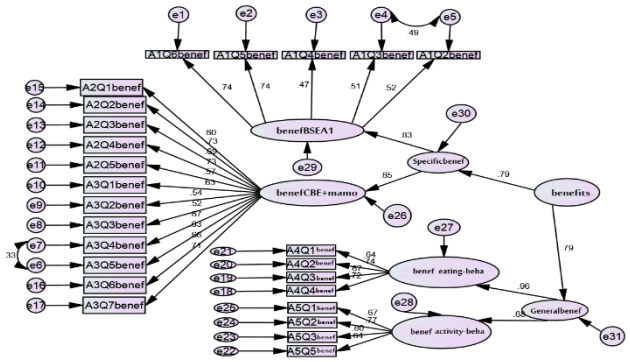

Figure (3): Illustrates the Factor Model of Perceived Benefits after the Second Modification

Model Fit Indices: The results indicate that the hierarchical benefits model demonstrates a good fit with the data, following some modifications aimed at improving the quality of the fit. According to several indicators, the Chi-square (CMIN) reached a value of (687.595), while the normed Chi-square (CMIN/DF) was (2.566), which falls within the acceptable range (< 5). Additionally, the values of RMR (0.0370) and SRMR (0.049) were both below 0.1. Furthermore, the RMSEA was recorded at (0.0590), indicating an acceptable model fit. The Goodness of Fit Index (GFI) reached (0.890), while the Adjusted Goodness of Fit Index (AGFI) was (0.866). Comparative fit indices also showed excellent performance, with the CFI at (0.9050) and the TLI at (0.8940). Regarding indicators of theoretical parsimony, the Akaike Information Criterion (AIC) value was (801.595), which is lower than that of the independent model (4769.778), thus supporting the preference for the model and confirming its adequacy.

CFA of the Perceived Barrier Scale:

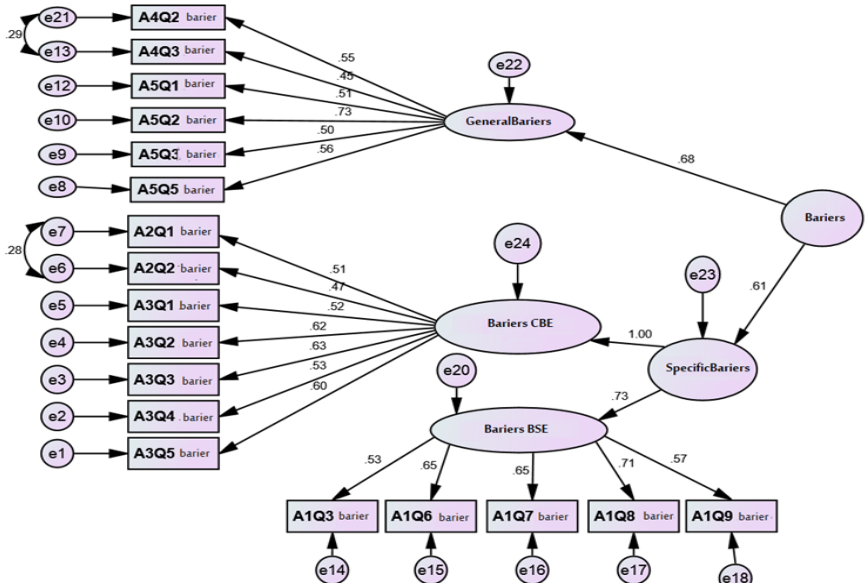

Figure (4): Illustrates the Factor Model of Perceived barriers after the second Modification

Model Fit Indices: The results of the fit indices indicate that the hierarchical factorial model of perceived barriers maintains good fit indicators sufficient for its adoption. Most of the model's fit quality indicators were satisfactory, especially after making some modifications to improve the model's fit quality. According to the quality indicators, the Chi-square (CMIN) value reached (311.930), while the normed Chi-square (CMIN/DF) was (2.399), which is less than (< 5). The values of RMR (0.0490) and SRMR (0.0554) were both below 0.1.

Additionally, the RMSEA value was (0.0560), reflecting a good model fit. The Goodness of Fit Index (GFI) reached (0.930), and the Adjusted Goodness of Fit Index (AGFI) was (0.866), both exceeding the standard value (≥ 0.90). The comparative fit indices also showed excellent performance, with a CFI of (0.9050) and a TLI of (0.90), both considered acceptable.

Regarding model parsimony, the Akaike Information Criterion (AIC) was (393.930), which is lower than that of the independent model (2062.311). Additionally, the Parsimony Goodness of Fit Index (PGFI) scored (0.7070), which is a good value that exceeds the standard threshold of 0.5.

CFA of the Health Motivation Scale:

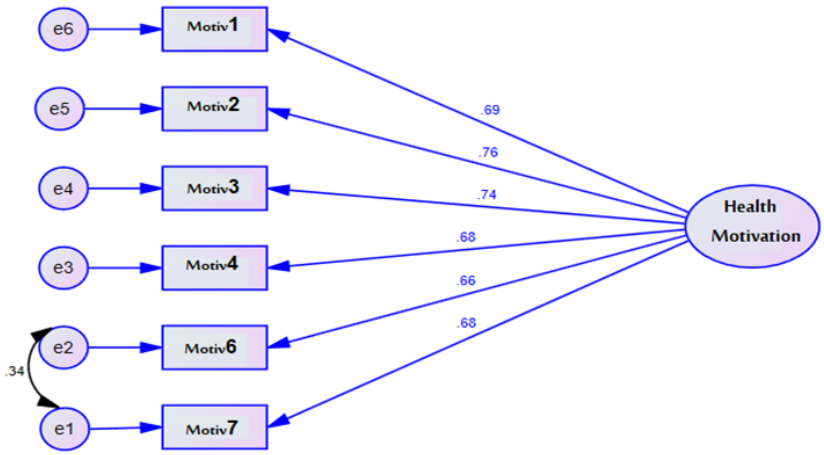

Figure (5): Illustrates the Factor Model of Health Motivation after the Modification

Model Fit Indices: The fit indices of the motivation model confirmed that it maintains good fit indicators, as most of the indices were favorable, especially after the modifications. It is noted that the Chi-square (CMIN) value reached (29.601), while the normed Chi-square (CMIN/DF) was (3.700), which is less than (< 5). The RMR was (.0180), and the SRMR was (0.0284), both of which are below 0.1.

In addition, the RMSEA value was (.0780), reflecting a good fit quality for the motivation model. As for the Goodness of Fit Index (GFI), it reached (.970), and the Adjusted GFI (AGFI) was (.9450), both of which are excellent values.
Regarding the indicators of theoretical parsimony, the Akaike Information Criterion (AIC) value was (55.601), which is lower than that of the independent model, which reached (1079.007).

CFA of the Cues to Action Scale:

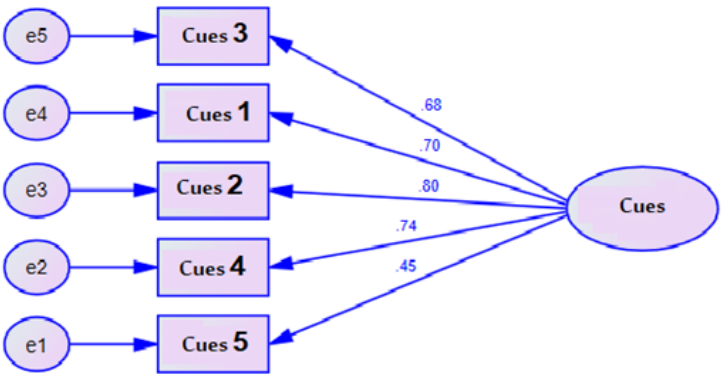

Figure (6): Illustrates the Factor Model of the Cues to Action

Model Fit Indices: The results showed that the guidance model maintains good fit indicators, making it suitable for adoption. The quality indicators were favorable, as the Chi-square (CMIN) value reached (23.069), and the normed Chi-square (CMIN/DF) was (4.614), which is less than (< 5). The RMR was (.0260), and the SRMR was (.029), both of which are below 0.1. In addition, the RMSEA value was (.0900), reflecting a good fit quality for the guidance model. The Goodness of Fit Index (GFI) was (.9800), the Adjusted GFI (AGFI) was (.9400), and the TLI was estimated at (.9490), all

of which are excellent values. As for the indicators of theoretical parsimony, the Akaike Information Criterion (AIC) value for this model was estimated at (43.069), which is lower than that of the independent model, which reached (724.406).

CFA of the Self-Efficacy Scale:

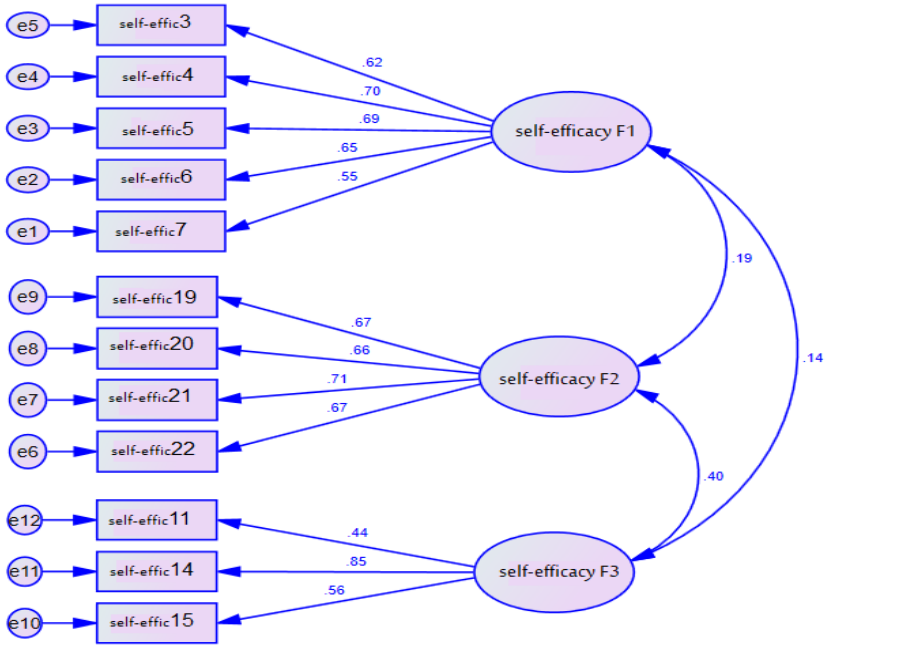

Figure (7): Illustrates the Factor Model of the Self-Efficacy

Model Fit Indices: The analysis results confirmed that the perceived self-efficacy model has good fit indicators, making it suitable for adoption. It is observed that the Chi-square (CMIN) value reached (179.788), while the normed Chi-square (CMIN/DF) was (3.525), which is less than (< 5). The RMR was (.0420), and the SRMR was (.0760).

Additionally, the RMSEA was estimated at (.0760), reflecting a good model fit for the self-efficacy model. The Goodness of Fit Index (GFI) reached (.9360), and the Adjusted GFI (AGFI) was (.9020), both of which are acceptable values. As for the Comparative Fit Index (CFI), its value was (.900), which is also considered good.

Regarding the indicators of theoretical parsimony, the Akaike Information Criterion (AIC) for this model was (233.788), which is lower than that of the independent model, which reached (1395.123).

Discussion:

The study aimed to adjust and test the psychometric properties of the Champion's Health Belief Model Scale (CHBMS) to examine women's beliefs about breast cancer prevention behaviors within the Algerian context. Data were collected from 444 Algerian women, the majority of whom were aged 20-39 years (74.3%), and had a university education level (72 %). In terms of professional status, the participants varied between working women (48 %), students (30.4 %), and housewives (21.6 %). The results showed that the majority of participants (86.9 %) had a family history of breast cancer.

The results of exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) showed a coherent factor structure for the adjusted health belief model (CHBMS) scale in the Algerian settings. While maintaining the classic dimensions of the model (susceptibility, severity, benefits, barriers, health motivation, self-efficacy, benefits and barriers of self-examination, medical examination, and radiological examination), new dimensions related to the benefits and barriers of breast cancer prevention behaviors, such as dietary behavior and physical activity, as well as cues to action, were

added, supporting the validity of the scale in the local context and expanding its theoretical applications.

Compared to previous studies such as (Champion, 1999) and (Parsa et al., 2008) , (Sharaa and Hashemian, 2014) , the adjusted version achieved higher reliability through Cronbach's alpha coefficients that ranged between 0.79 and 0.91, while in the original versions they ranged between 0.75 and 0.88, (0.77) and (0.93), (0.64) and (0.82) respectively. This indicates that the new dimensions did not weaken the homogeneity of the scale, but rather enhanced its explanatory power.

The study revealed a single factor with five items for perceived susceptibility, which is consistent with Champion scale, confirming the homogeneity of this concept across different cultural settings.

The perceived severity is composed of two factors. What enhances the accuracy of the results is that the belief in perceived severity is divided into two basic beliefs: perception of the severity of the injury (3 items), and perception of the psychological and social consequences (6 items), which is consistent with the conceptual framework.

Health motivation emerged as a single factor, which was consistent with the results of Champion's (1999) study (Champion, 2000) . The researcher also added two new items: “I want to protect my health from disease” and “I appreciate the importance of maintaining my health” that showed high factor loading of 0.708 and 0.706, respectively, reflecting their good integration within the health motivation dimension and supporting their validity as additional indicators within the adjusted version of the scale.

One factor was revealed regarding cues to action, including five items with loading ranging from 0.522 to 0.769. This dimension is considered a new addition, as the role of cues to action has not been studied experimentally (Glanz, Rimer and Viswanath, 2008).

The basic items of this factor were as follows:

- I received an invitation to have a mammogram.
- I attended awareness campaigns for early detection of breast cancer.
- Health professionals and those around me advised me to have breast exams.
- I was encouraged by my environment to exercise to prevent breast cancer.
- I received information from others and the media about foods that prevent breast cancer.

These findings support Rosenstock et al. (1988) (Taylor, 2008) suggestion that external stimuli, such as health education, media campaigns, and medical advice, are important in motivating individuals to adopt preventive behaviors. Therefore, the inclusion of “cues to action” as an independent component in the adjusted version enhances the scale’s ability to explain prevention behavior beliefs, especially in cultural contexts where external influences play a significant role.

The results for the perceived benefits associated with breast cancer prevention behaviors revealed four factors within this dimension, divided into specific benefits and general benefits. Two factors were extracted for the specific benefits: I- representing the benefits of breast self-examination, and includes five items with loading between 0.54 and 0.70. II- including benefits related to radiological and clinical examination (12 items) that the analysis included in one factor together. Its loading reached between 0.55 and 0.75. The phrases added by the researcher showed high loadings, which supports their adoption. Namely:

- Early mammography reduces the mortality rate from breast cancer.
- If I have a mammogram, I will reduce the possibility of mastectomy and disfiguring surgery in the event of breast cancer.

As for the general benefits, the results showed the presence of two distinct factors:

- I-The benefits of preventive dietary behavior are represented by loadings between 0.61 and 0.76.
- II-Representing the benefits of sporting behavior, with loadings ranging between 0.52 and 0.87.

The items of the first factor were as follows:

- I believe that adhering to a healthy diet makes my risk of developing breast cancer slim.
- I believe that maintaining an ideal weight can protect me from breast cancer.
- Reducing the use of hormonal medications reduces the risk of breast cancer.
- For me, reducing fat has a positive impact on my health and reduces my risk of breast cancer.

These results are consistent with previous studies on the connection between healthy diet beliefs and actual preventive behavior (Wardle et al., 1997) (Ogden, 2004).

The items of the second factor were as follows:

- Exercising at least 3 times a week reduces my risk of breast cancer..
- I won't get breast cancer if I exercise every day.
- When I do physical activity and movement, it will reduce my risk of developing breast cancer.
- Walking at least 30 minutes a day helps maintain my health and protect me from breast cancer.

As for the perceived barriers associated with these behaviors, the results showed that the specific barriers were distributed among two factors: The first is related to medical examination barriers, which constituted a single factor (radiological examination and examination by a doctor). This factor included 7 items and achieved loadings ranging between 0.50 and 0.62. The most prominent perceived barriers were: Time constraints, embarrassment, pain and cost. It should be noted that the two items added by the researcher did not achieve sufficient loading, so they were excluded. The second factor was related to barriers to breast self-examination and included 5 items with loading ranging from 0.50 to 0.63,, including: Discomfort, difficulty of adopting a new habit, lack of knowledge, time and privacy.

The specific barriers formed a single factor that included six items with high loadings ranging between 0.48 and 0.67

The items of this factor were as follows:

- I don't have enough time to take care of my diet.
- I don't have enough money to choose healthy foods.
- Exercising all the time tires me out.
- I don't have enough time to exercise.
- Social culture does not support my practice of sports as a woman.
- The nature of my daily activities and work prevents me from getting enough physical activity and exercise.

The inclusion of general dimensions related to dietary behavior and physical activity within the health beliefs scale is an important development that reflects our expanding understanding of the determinants of preventive behavior, particularly in local contexts.

These results are also consistent with the basic hypotheses of the health beliefs model, as previous studies have indicated that cost is one of the most significant barriers preventing individuals from changing their diet behaviors (Poikolainen, 1989; Buttriss, 1997). A large-scale study of European Union countries nationals showed that lack of time, unwillingness to give up favorite foods (23 %), and lack of willpower (18 %) are among the most significant obstacles to adopting a healthy diet (Lappalainen et al., 1997). In the same context, health professionals in Britain indicated that apathy represents the first barrier, followed by cost and difficulty adhering to the diet, while others saw lack of knowledge as the biggest obstacle (Buttriss, 1997). At the level of individual perceptions, perceived barriers included the belief that healthy food is more expensive, takes longer to prepare, lacks taste, and is considered “bland (E-Backa, 2003).

Perceived barriers that contribute to people not exercising include lack of time, cost, lack of access to appropriate facilities and structures, financial problems, lack of self-belief, and lack of companionship and support (Caltabiano and Ricciardelli, 2013).

Based on this study, which highlighted a set of barriers to adopting preventive behaviors, such as embarrassment, cost, and time constraints, we find that it is consistent with the aforementioned studies, which emphasizes the need to consider social and cultural contexts when designing awareness campaigns and health interventions.

The results of the factor analysis of self-efficacy showed the presence of three distinct factors representing the dimensions of self-efficacy. The first factor: It consists in the perception of the performance efficiency of breast self-examination. The Second factor: Confidence in planning preventive dietary behavior, while the third factor represented knowledge of how to prevent through medical examination and physical activity. Loading values ranged between (0.56) and (0.76). This result highlights that effectiveness is a multidimensional component and must be subjected to further studies, as the results of this study intersect with the findings of the Malaysian study (Parsa et al., 2008).

The results of the current study support the importance of incorporating self-efficacy as a key component in explanatory models of health behaviors. This is consistent with the adjustments made by Rosenstock and colleagues to the health belief model in the late 1980s, adding the concept of self-efficacy due to its ability to predict health behaviors (Glanz, Rimer and Viswanath, 2008).

Later research, such as Rimal study (2000), showed that self-efficacy is a crucial factor in converting nutritional knowledge into applied behavior, as it was found that the relation between knowledge and behavior was stronger among individuals with high self-efficacy, and weaker among those with low self-efficacy (E-Backa, 2003).

These findings confirm what Godin and other researchers have argued about the importance of incorporating self-efficacy into a more accurate understanding of preventive behavior, particularly in areas such as breast cancer prevention, where adopting preventive behavior requires confidence in one's ability to perform and follow through (Godin, 2012).

Self-efficacy helps regulate and control healthy behavior, giving individuals a high sense of ability to improve their health, which enhances their motivation to persevere in ongoing healthy practices. Successful implementation of these preventive behaviors, in turn, raises self-efficacy, creates a sense of emotional harmony and comfort, and renews the individual's belief in his ability to control and regulate his healthy behavior (Zarroug, 2015).

The importance of this study lies in its qualitative contribution to expanding the conceptual structure of the CHBMS scale by incorporating health beliefs linked to preventive behaviors such as: Benefits and barriers associated with dietary behavior, physical activity, and cues to action, along with the original components of the scale, which are: Susceptibility, perceived severity, health motivation, benefits, and barriers associated with screening, self-examination, and medical examination.

The study made an important scientific contribution that aligns with modern trends that see cancer prevention not as limited to medical examinations but as part of a comprehensive, healthy lifestyle. Therefore, the adjusted version of the CHBMS scale is a reliable and advanced tool suitable for use in Arab contexts, whether to study women's beliefs about breast cancer and its prevention behaviors, or in health education programs and to assess the effectiveness of preventive interventions.

The health beliefs model has been expanded in comparison with other theoretical models and used to support interventions aimed at changing health behavior (Glanz, Rimer and Viswanath, 2008).

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