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Research Article

Psychometric of the interpersonal communication skills scale: A confirmatory factor analysis

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Background: In order to improve patient outcomes, healthcare professionals' communication skills need to be evaluated. A valid, culturally appropriate, and endemic scale for assessing interpersonal communication skills among the staff of comprehensive health centers in Iran was examined to achieve such an objective.

Methods: A convenience sampling was used in November and December 2021 to collect information from 170 voluntary healthcare staff. The questionnaire had 30 items and seven factors. First- and second-order confirmatory factor analysis was used to validate the scale. Model fit was evaluated with GFI, AGFI, CFI, NFI, SRMR, RMSEA, and CN indices during confirmatory factor analysis. Discriminant validity was measured through Fronell-Larcker Criterion. Data were analyzed using Lisrel 8.8 & Smartpls 3.2.8 software.

Results: The predictive power of the model using the Q2-index based on the blindfolding test was equal to % 44. The first-order CFA results indicated that the indices had an acceptable value ($\chi2$= 767.17; DF=375; CFI=0.98; GFI=0.82; AGFI=0.80; NFI=0.97; SRMR=0.22; CN= 127.83; RMSEA=0.068). Also, the fit indices of the second-order measurement model demonstrated the the adequacy and their desirability. ($\chi2$= 797.24; DF=381; CFI=0.98; GFI=0.82; AGFI=0.78; NFI=0.97; SRMR=0.059; CN= 127.33; RMSEA=0.068). In terms of the importance-performance map analysis, the general and listening skills had the highest scores.

Conclusion: To develop interpersonal communication skills among healthcare staff, this scale could be useful. The results will need to be compared after further evaluation. It proposes to replicate skills training programs in other populations to determine their effectiveness.

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Introduction

Developing strong interpersonal communication skills (ICS) is crucial for success in the workplace[1]. Effective ICS are essential for communicating points, messages, feelings, and thoughts to others in the workplace. It is essential for navigating complexity and change, improving team collaboration, and increasing productivity. Effective communication (EC) is crucial in healthcare to ensure that messages are received and understood precisely. It requires dynamic sharing between clients and healthcare providers, with both parties actively participating in the exchange of information. Healthcare is focusing on culturally responsive measures to bridge the communication gap between stakeholders and providers. It requires ethically and responsibly delivering information while protecting the client's privacy. Studies have shown that communication skills (CS) can be improved through teaching and practice[2][3]. Communication is important because it helps individuals better understand others and navigate different situations. EC involves not only exchanging information but also understanding the emotions and intentions behind it. EC is a crucial component in maintaining a high-quality healthcare system. Without EC, healthcare costs and negative client outcomes would increase. Effective and sensible health communication is crucial, especially during the global spread of coronavirus[4]. Knowing how to communicate effectively regarding health is indispensable in order to stave off sickness, promote a healthy lifestyle, and heighten the general quality of life. According to the WHO Director-General, the world is at risk of an 'infodemic' alongside the ongoing pandemic, and it is essential that everyone takes action to combat it[5]. EC around health is one of the most important elements in the fight against COVID-19[6]. The COVID-19 pandemic has highlighted the critical importance of changing behavior[7]. Providing information is just the first step towards behavior change. It is necessary to strengthen the principles and rules of CS for people. Effective health communication is critical to promoting necessary and appropriate behavioral changes, alleviating people's fears, and strengthening hope in the face of societal crises [8]. It is the responsibility of health staff to facilitate concise and trustworthy information across health communication, client education, and health behavior change. EC requires an understanding that the perceptions, emotions, and participation of both the sender and receiver are interactive and affect the delivery of the message. By understanding the interactive nature of communication, we can improve our communication skills and build stronger relationships with others. An emphasis on healthcare communication is being

placed as a way to educate and persuade people, as well as groups, to make decisions that promote better health. It is essential for healthcare professionals to maintain a professional relationship with their clients. A healthy lifestyle contributes to the ability of those with health conditions to cope, as well as to their satisfaction with the care they receive. Poor communication among healthcare providers can lead to fragmented care and increase the risk of client care errors. Healthcare professionals should strive to create a relationship with their clients based on trust and good interpersonal skills in order to provide effective care[9]. Without a well-trained and capable health workforce, it will not be possible to provide effective health education[10]. Improving the educational ability of healthcare staff is an important issue. Investing in the education of healthcare staff is crucial for ensuring that they have the tools and resources they need to face future challenges with certainty. To ensure the impact of CS training programs, it is important to assess the CS of the target group based on their native culture to tailor their training program[11]. Healthcare professionals and scientists should carefully consider their needs and pick the best instrument for measuring their desired elements based on the device's capability. Instrument properties and psychometric characteristics are important considerations when selecting an appropriate instrument[12]. Those should choose instruments that accurately measure the experiences and problems of the population with individual differences and diverse identities, languages, abilities, and other characteristics. There are several tools available to measure the ability of healthcare providers to provide high-quality healthcare, but few are currently available. Also, we found that the sub-categories of the interpersonal communication skills scale (ICSS) (listening, ability to receive and send verbal and non-verbal messages, assertiveness, insight into the communication process, and emotional control) were less given attention. It is necessary to provide a comprehensive tool to address weaknesses in this area. Developing an ICSS has several benefits such as evaluating individuals' capabilities, identifying areas for improvement, contributing to efficient teamwork and business communications, building healthy relationships with colleagues, reducing stress levels, and increasing productivity[13]. Health professionals need to be able to identify clients with health literacy difficulties, assess their needs, and select interventions that create a supportive environment aimed at helping people with low health literacy skills. This highlights the need for further research to develop more sound assessment methods that can serve as a driver of learning and a diagnostic tool. Therefore, it is essential to continue researching and developing more reliable and valid assessment methods to ensure accurate and fair evaluations. There are different ICSSs that serve different purposes. Some are designed for

individuals to evaluate their own strengths and weaknesses in communicating with others while others are developed specifically for evaluating learners' ICSS in nursing education[14][15]. To the best of our knowledge, two studies have developed and validated the ICSS using exploratory factor analysis (EFA). The first study aimed to develop and assess the psychometric properties of this scale among Zanjan Health Volunteers[16]. The second study in a sample of 221 participants which generated three factors: social engagement, sociability, and social adaptability[17]. There is no evidence that a CFA has been conducted on this scale, to our knowledge. So far, less research has been conducted to examine the confirmatory status of the components of EC skills in the acceptance of preventive instructions against COVID-19 transmission among health staff. Since a CFA approach has not yet explored the psychometric properties of ICSS in Iran, it is important to evaluate this scale using various methods, including CFA, to ensure its reliability and validity.

Methods

Study design

This research was a cross-sectional study of an analytical nature.

Study participants

The subjects comprised 170 voluntary healthcare providers who were at the forefront of serving clients. We employed the inclusion criteria of one of the urban and rural comprehensive healthcare centers and at least three years of professional experience. The exclusion criteria were a level of education below a university degree and a lack of willingness to take part in the study, as well as people who did not answer any of the questions in the questionnaire. Decisive the least sample size essential to collect data associated with structural equation modeling is very vital. However, There has been no consensus on the sample size needed for conducting factor analysis and structural models. In CFA, the least sample size is determined based on latent rather than variables. According to the current study, 7 constructs (latent) were among the main components of CS. Here, we needed a maximum of 140 samples to confirm the causal structure of the variables in the model. Considering the nonresponses to completing the questionnaire (20%), we estimated the final sample size at 170 people.

Data collection method

We conducted the survey from November to December 2021. The research sampling frame was comprehensive urban and rural health centers covered by Ahvaz Jundishapur University of Medical Sciences (AJUMS). First, comprehensive urban and rural health centers were listed. Then the sample proportion of each center was selected according to the population it covered. The selection of research units was based on multi-level sampling criteria and was done accessibly. We made the selection of people with maximum diversity. Diversity means that employees from all areas of the healthcare system and with different jobs could join. We recruited four investigators to help disseminate the survey. Self-administered questionnaires were given to the participants and filled out individually.

Measurement data

The tool used in the study was a questionnaire measuring ICSS with 30 items. Vakili developed this questionnaire et al. in 2012 (16). In this study, ICSS was considered along seven dimensions: general (6 items), oral (4 items), listening (4 items), asking questions (4 items), the ability to clarify public speaking (4 items), the ability to encourage and praise (4 items) and the ability to give feedback (4 items) based on a 5-point Likert scale (very high to very low).

Methods of analysis

Descriptive statistics were calculated and performed. We substituted the missing values with the average of each item. Subsequently, the components were extracted by maximum likelihood estimation using the goodness-of-fit indices of the CFA in Lisrel 8.8 and Smartpls 3.2.8 software. In this study, first- and second-order CFA was used to validate the ICSS. Various fit indices were used to appraise the fit of the proposed model to the data: the goodness-of-fit index (GFI), adjusted goodness-of-fit index (AGFI), comparative fit index (CFI), relative/normed fit index (NFI), SRMR (Standardized Root Mean Square Residual), the root-mean-square error of approximation (RMSEA), CN (Consistent Akaike Information Criterion), and the relative chi-square statistic (χ2/DF)[18]. When evaluating model fit, it is imperative to consider several fit indices rather than rely on one single measure. By looking at multiple metrics, researchers can get a better understanding of how well their model fits the data. Additionally, reliance on fit indices alone is not a good approach when assessing the accuracy of a model. It's important to use them in conjunction with other criteria, and not to

interpret them in a rigid, yes/no fashion.We measured the discriminant Validity Assessment of the ICSS through the Fronell-Larcker Criterion[19]. According to this criterion, to determine discriminant validity, we should compare the AVE value with corresponding correlation values with other variables. Also, a correlation coefficient that is meaningfully higher between the item and one of its components is also considered satisfactory with the other component. Cronbach's alpha, construct reliability (CR) and intra-cluster correlation coefficients (ICC) were implemented to measure the internal credibility of ICSS.

Results

In this study, 170 health staff took part in the Ahvaz health center. They were in the age group of 22 to 61 years with an average age of 68.36 years and a standard deviation of 52.7 years. Table 1 shows the distribution of health staff in terms of gender, level of education, marital status, history of job, and place of residence (Table 1).

In this study, first- and second-order confirmatory factor analysis was used to validate the ICSS. We observed that the skewness values ranged from -3.323 to -0.600 and also the kurtosis values ranged from 0.109 to 16.408. The value of the critical ratio of the normalized kurtosis coefficient (Mardia) was less than 5. There deviated from multivariate normality. As a result, we used weighted least squares (WLS) estimation to reduce the influence of outliers and minimize the impact of non-normal data.

The first-order CFA results showed all indicators had an acceptable t-value and factor loading to measure these abilities (Table 3-a). All Goodness-of-Fit Index (GFI) and Comparative Fit Index (CFI) values were over 0.8, showing some good fit of the model. (χ2= 767.17; DF=375; P<0.001; CFI=0.98; GFI=0.82; AGFI=0.80; NFI=0.97; SRMR=0.22; CN= 127.83; RMSEA=0.068).

CR and ICC coefficients greater than 0.7 show confirmed. To discriminant validity of the model, the Fornell and Larcker matrix was used. Based on the extracted root values of AVE, as seen from the correlation of each component (latencies) with other components, this rather shows adequate divergent validity and confirmation of the first-order CFA model (Table 2-b).

Next, the second-order CFA model was examined. On this basis, a second-order CFA was performed to test the relationship of seven confirmed first-order CFA model correlations with the ultimate factor. In this phase, the accuracy of the measurement of the subscales of the ICSS was determined. The results of Table3-b showed that the second-order CFA model was suitable for measuring the ICSS and

that all parameters of the model had acceptable t-values and factor loadings and were significant at a significance level of less than 0.05. The values of the fit indices of the second-order measurement model showed the acceptability and adequacy of the fit indices and their desirability. (χ2= 797.24; DF=381; P<0.001; CFI=0.98; GFI=0.82; AGFI=0.78; NFI=0.97; SRMR=0.059; CN= 127.33; RMSEA=0.068)

The results showed that a seven-factor solution was suitable to recognize the components of ICSS. We also showed these components to have good internal consistency of the items within each of the seven aspects. These results suggest that the seven-factor, 30-item solution is acceptable for forthcoming research.

The importance-performance map analysis (IPMA) examined the influence of constructs on the designed conceptual model. We have used IPMA in PLS-SEM along with ICSS as the main variable in the current research. This study assessed the performance and the significance of the seven variables (Figure 1). In terms of the IPMA in PLS-SEM, general and listening skills had the highest scores. Also, asking and interpretation skills had the lowest score.

Discussion

We have considered the factor structure of EFA in past studies (16,17). CFA has not been used to examine the seven-factor model of the ICSS before, to our knowledge. In this study, the authors confirmed the factors, rotational type, and factorial solution found by CFA and not by designing a new tool. The present study attempted to design a valid and reliable scale for evaluating ICSS in healthcare staff. The results showed that the designed tool had the strength and reliability necessary to measure ICSS. It is not free of defects. For this reason, we propose to replicate it in other populations to get a valid tool to assess the effectiveness of skills training programs. In achieving such an important goal, the findings of this study may interest researchers.

EC should be treated as a significant prerequisite to training in educational processes. Healthcare staff interacts with their clients. CS are vital for all to succeed in their personal, educational, and professional lives. It could be a satisfactory tool for improving educational quality. Researchers used variant circumstances in countries to develop the ICSS questionnaires. From the articles[20][21][22], it can be inferred that when a scale is given to many cultures, there may be differences in how each culture interprets or responds to the items on the scale because of cultural differences such as power distance or individualism. These cultural dimensions can affect communication and behavior in

various ways. It is important to be aware of these cultural differences and adapt communication strategies accordingly to avoid misunderstandings and promote EC.

Measuring the ICSS is a way to evaluate the effectiveness of communication between employees. Therefore, measuring and improving ICSS is important for organizations to achieve their goals and maintain a healthy work environment. To find out the communication procedures in a target population, it is important to identify the segments that can benefit from a specific health behavior. In previous research, Ghasemi et al. (2014), identified six factors[23]. In this research, besides shortening the ICSS, one factor was also added. The predictive power of current model using the Q2-index based on the blindfold test was equal to 44% (Figure 2). Since we have shown the seven factors in ICSS as a fundamental and specific need for healthcare staff, it is necessary to consider the importance of learning and applying these skills in their retraining programs. The lack of the seven factors of the ICSS can disrupt EC.

A CFA was used to check the construct validity of the ICSS based on the t-values and the significance level of factor loadings. We found that all extracted factors had high reliability and validity. The results confirmed sufficient empirical support for the reliability and validity of ICSS. Also, it provided comprehensive and sufficient information about ICSS's creditworthiness. The values of the Goodness of Fit Index and the Comparative Fit Index as the most important fit and other indices showed the model had an acceptable and favorable fit.

ICSS can be influenced by various factors. Cultural factors such as language, belief systems, morality, and perspective. Also, personal and family characteristics can play a role in shaping it.

Based on these results, the ICSS–Iranian version was considered a suitable tool to assess comprehensive health center staff. ICSS will enable a more comprehensive approach to the validation process that started with this study and will not be completed by the end of this one. We suggested that this verification process was vigorous and that it allowed others in various contexts to assess it.

Because no studies have undertaken CFA and SEM to validate the ICSS among healthcare staff, we cannot compare our findings with previous studies. Further evaluations of the seven-factor model will be necessary in order to compare the results.

Limitations of the study

The concern that the findings derived from a single university of medical sciences in Iran may have limited generalizability is a valid one. However, it is worth noting that the generalizability of a study

depends on various factors, including the research design, sample size, and characteristics of the population studied. It is important to consider the context and limitations of a study when interpreting its findings. Although we wished to perform the test at another university of medical sciences, it was not practicable. However, we hope that Iranian universities will use CFA as well, as others use their own data sets to test the model. The current study highlights the limitations of self-report measures in accurately reflecting respondents' experiences with their ICSS. Social desirability bias and inaccurate recall can lead to unreliable data, emphasizing the need for alternative methods of data collection.

Conclusions

The ICSS was proven to be a valuable tool for healthcare staff when dealing with clients due to its reliability, brevity, and psychometric validity. Its psychometric validity ensures that it is an accurate measure of the construct it is intended to assess, making it a valuable tool for healthcare professionals. This, in turn, helps healthcare professionals make informed decisions about client care and treatment. This scale can yield paths for building up ICSS in healthcare staff education. Researchers could test this using the data sets of diverse universities of medical sciences throughout the world.

Abbreviations

- **ICS:** Interpersonal communication skills
- **EC:** Effective communication
- **CS:** Communication skills
- **ICSS:** Interpersonal communication skills scale
- **EFA:** Exploratory factor analysis
- **AJUMS:** Ahvaz Jundishapur University of Medical Sciences
- **GFI:** Goodness of fit index
- **CFI:** Comparative fit index
- **CR:** Construct reliability
- **ICC:** Intra-cluster correlation Coefficients
- **RMSEA:** Root mean square error of approximation
- **AVE:** Average extracted variable

- **IPMA:** Importance-performance map analysis

Declarations

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Authors' contributions

HM, AS, MJ, and SHF LR designed the study. HM & AS wrote the first draft. HM conducted the analyses. All authors reviewed the results and approved them.

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Availability of data and materials

Materials and data are available upon request to Dr. Hashem Mohamadian.

Ethics approval and consent to participate

We first got the toolmaker's approval, then we were granted ethical clearance from AJUMS Ethics Committee (IR.AJUMS.REC.1399.663). Afterward, the author identified himself to the inquiry team. We supplied each individual participant with informed consent documents, which they all signed. Data collection is conducted anonymously, and we comply with all ethics provisions of the Declaration of Helsinki.

Consent for publication

Not applicable.

Competing interests

There are no conflicts of interest among the authors.

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Declarations

Potential competing interests: No potential competing interests to declare.