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Validation of preparedness and willingness on early detection of autism spectrum disorder among healthcare providers in Jordan

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Abstract

In recent years, there have been significant advancements in the field of early detection and intervention for children with developmental and behavioural disorders, with significant in the context of Autism Spectrum Disorder (ASD). It highlights the advantages of early detection, such as reduced long-term costs and positive effects on a child's development. However, it also acknowledges the prevalent barriers to early ASD diagnosis and intervention. This study aims to develop and validate questionnaires on Preparedness and Willingness in early ASD detection among Al-Mafraq City, Jordan, healthcare providers.

The research in the Al-Mafraq region of Jordan employed a cross-sectional research design. The study first involved the development of a questionnaire, which underwent rigorous content validation by a panel of experts well-versed in ASD. Face validity was assessed utilizing the Face Validity Index (FVI). A random sample of 130 healthcare providers from one hospital answered the draft questionnaires online for the EFA analysis recommended. It resulted in satisfactory items' factor loadings (r>0.60) and internal reliability (Cronbach's alpha >0.8). Followed by CFA from a random sample of another 202 healthcare providers from another hospital and healthcare centres in Al-Mafraq showed that the instrument effectively met the validation criteria, demonstrating its reliability and validity in assessing healthcare providers' Preparedness and Willingness for early ASD detection. Notably, the participants in the study exhibit differing degrees of Preparedness and Willingness.

In conclusion, the study underscores the critical standing of developing a comprehensive instrument to evaluate the limitations associated with early ASD detection among healthcare providers.

Keywords: Autism Spectrum Disorder (ASD); Early Detection; Validity; Healthcare provider; Reliability; Exploratory Factor Analysis (EFA); Confirmatory Factor Analysis (CFA); Preparedness; Willingness

1. Introduction

The early detection and intervention for children with developmental and behavioural disorders in recent years has witnessed significant advancements (Lipkin et al.,2020). Early detection increases the chance for early intervention, which plays a crucial role in facilitating a broader range of skills and mitigating the severity of symptoms, particularly in children with Autism Spectrum Disorder (ASD), as underscored by Paynter et al. (2012). It presents a valuable opportunity to enrich the developmental environment during the critical early years, leading to significant positive effects on biological and behavioural aspects, as expounded by James and Smith (2020). These efforts in early detection reflect a growing commitment to recognising and addressing potential developmental concerns in various areas, including academic performance, social interactions, and adaptation to the educational environment (Van-Rooij et al., 2018; Bosa et al., 2016). Furthermore, early intervention offers the additional advantage of reducing future reliance on

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extensive healthcare services and reducing long-term costs (Cidav et al., 2017). However, ASD stands as one of the most prevalent neurodevelopmental disorders worldwide, with estimates suggesting a prevalence ranging from 0.19 to 11.6 per 1,000 individuals (Chiarotti & Venerosi, 2020). Despite this alarming concern, research on ASD in Arab countries is still limited and underdeveloped, making it vital for researchers in these countries to collaborate and catch up with global progress in the early detection and understanding of ASD causes, treatments, and prevention (Abualhoul & Amayrah., 2022). Five barriers prevent the early diagnosis and intervention of children with ASD. These barriers were lack of knowledge, social stigma, dismissal of first concerns by healthcare providers, barriers to ASD screening, and access to ASD services (Bivarchi et al., 2021). Fundamentally, practical strategies for addressing ASD should involve a comprehensive approach that includes improving awareness, diagnosis, and provision of services in line with scientifically proven methods and government health policy (Hussein & Taha,2013). However, the health guidelines on ASD screening are insufficient (Alallawi et al., 2020), and professionals in Arab countries such as Saudi Arabia have reported significant deficiencies and limited access to ASD services (Alanazi et al., 2022).

The gaps in healthcare provider involvement encompass the need for validated assessment tools and potential challenges in handling ASD-related screening and management issues. Therefore, the tool's focus should encompass assessing the potential influence of continuous education on these aspects to enhance care (Bakare, 2008). Validating questionnaires aids in understanding healthcare providers' readiness and commitment to early ASD detection, uncovering significant factors impacting this domain. This study aims to develop and validate custom questionnaires, bridge research gaps, and highlight healthcare professionals' crucial role in early ASD detection in Jordan.

2. Methodology

This study, conducted in Jordan's Al-Mafraq region, utilized a cross-sectional research design to collect data. It involves two phases after item generation and content and face validity, with phase one encompassing 130 participants for the exploratory factor analysis (EFA) and phase two involving 202 participants for the confirmatory factor analysis (CFA).

2.1. Item generation

The questionnaires were initially created based on an extensive literature review from previous studies on personal factors related to the early detection of ASD among healthcare providers. Two questionnaires on Preparedness and Willingness were newly developed in English.

2.2. Content and Face validity

The questionnaire underwent meticulous validation following an exhaustive literature review. Two critical validation phases, content and face validity, were conducted. For content validity, a panel of four autism experts (a paediatrician, a psychologist, a child psychiatrist, and a nurse with experience with ASD) meticulously evaluated each item and domain, guiding revisions for enhanced relevance and scope alignment based on their constructive feedback. Subsequently, face validity was assessed per Yusoff's (2019) recommendation. Ten respondents rigorously examined the logistics, formatting, readability, and language clarity of the questionnaire items, refining any items scoring below 3.0 on the Face Validity Index (FVI).

2.3. Construct validity: EFA & CFA

The EFA for 130 healthcare providers from Al Mafraq Gynecology and Pediatric Hospital who met the inclusion and exclusion criteria participated in the study. EFA was used to ensure the accuracy of the results, eliminating items with weak correlations (< 0.5-factor loading scores) from respective constructs. Measures for Preparedness and Willingness constructs were rigorously assessed, including convergence ($r > 0.3$), Kaiser-Meyer Olkin (KMO) values (>0.7), Bartlett's Test of Sphericity ($p<0.05$), factor loading ($r > 0.4$), and communalities (>0.3). Internal reliability was gauged through Cronbach's alpha.

The CFA was 202 healthcare providers from Al Mafraq Government Hospital and all primary healthcare centres in Al Mafraq. CFA Assesses construct validity through model fitness (factor loadings >0.5), convergent validity (Average Variance Explained ≥ 0.5), and discriminant validity ($r < 0.85$). Fitness indices included RMSEA < 0.10, CFI > 0.85, and Chi-Square/df < 5.0, confirming model fit. Composite Reliability (CR) ≥ 0.6 was also calculated to ensure reliability.

3. Results

3.1. Content and Face Validity

The instrument underwent evaluation by a panel comprising four experts: a paediatrician, a psychologist, a child psychiatrist, and a nurse experienced in ASD. Their comprehensive assessment and feedback on each item prompted revisions, including rephrasing, removal, splitting, and additions. Subsequently, face validity was determined through FVI calculation. Researchers revised the questionnaire, retaining all but two items scoring less than 3.0 on the FVI, which were accordingly amended and retained.

3.2. Exploratory Factor Analysis (EFA)

The EFA, based on 130 responses, indicated robust sampling adequacy with a KMO score of 0.907 and highly significant Bartlett's Test-of Sphericity ($p < 0.001$) for Preparedness and Willingness constructs. Factor loadings in Table 1 revealed strong relationships between items and their respective factors, categorizing them into 'Preparedness' and 'Willingness,' except for one intentionally excluded item ('willing to learn about ASD in a training session' - G1). These insights offer a foundational understanding of ASD-related readiness and Willingness. The EFA showed high internal consistency with Cronbach's Alpha coefficients of 0.896 for Preparedness and 0.941 for Willingness, indicating strong coherence within each construct.

Table 1 Factor loading of Preparedness & Willingness Construct factor analysis (n = 130)

Preparedness & Willingness Construct Item statement (I am ...)	**Factor**	
	1	**2**
F2. prepared to discuss the red flag signs of ASD.		0.843
F3. prepared to explain the impact of early detection of ASD to the families.		0.794
F4. prepared to use ASD screening instrument.		0.849
F5. prepared to refer a child suspected of having ASD for intensive assessment.		0.758
G1. willing to learn ASD in a training session.		
F1. prepared to discuss normal child developmental milestones.	0.391	
G2. willing to learn ASD independently by myself.	0.721	
G3. willing to explain ASD to others.	0.843	
G4. willing to promote other healthcare providers on early detection of ASD.	0.934	
G5. willing to promote the public on early detection of ASD.	0.898	
G6. willing to use ASD screening instrument.	0.809	
G7. willing to refer a child with suspected ASD for diagnosis.	0.925	

3.3. Confirmatory Factor Analysis (CFA)

The findings suggest that while the initial 2-factor model lacked overall fit, single-factor models for Willingness and Preparedness constructs exhibited superior goodness-of-fit indices. Notably, these single-factor models demonstrated non-significant chi-square values along with high GFI, TLI, and CFI values and low SRMR and RMSEA values, indicating a better fit compared to the initial Two-factor Model (Figures 1, 2, and 3; Table 2).

Convergent validity and composite reliability assessments for both constructs, Willingness and Preparedness, showcased robust performance in measuring the targeted factors. Factor loadings surpassed the 0.6 threshold, indicating strong convergent validity. Additionally, high composite reliability values of 0.904 for Willingness and 0.868 for Preparedness, although with AVE values slightly below the acceptable level (0.578 and 0.626, respectively), underscored their reliability and effectiveness in measuring the intended constructs.

Regarding discriminant validity, a notably strong correlation coefficient ($r = .888$, $p < .001$) between Preparedness and Willingness highlights a highly significant relationship.

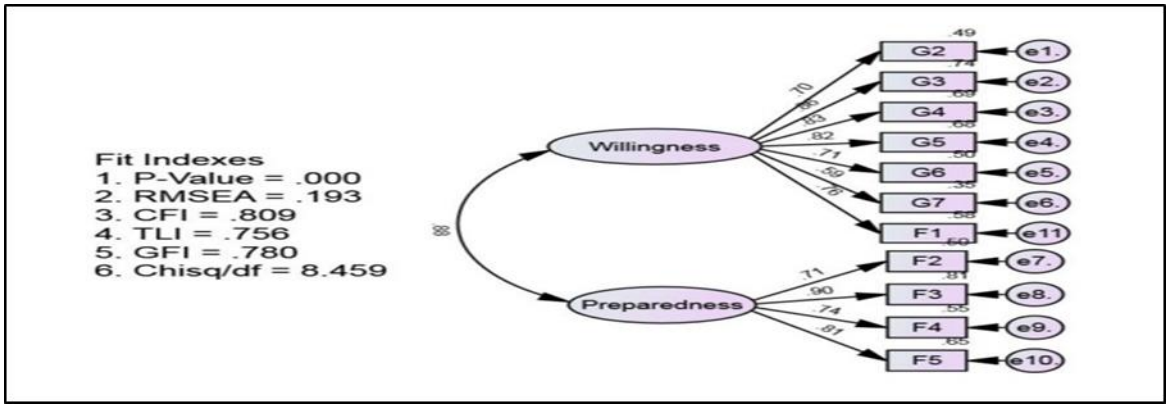

Figure 1 Initial Model (2-Factor Model) (n=202)

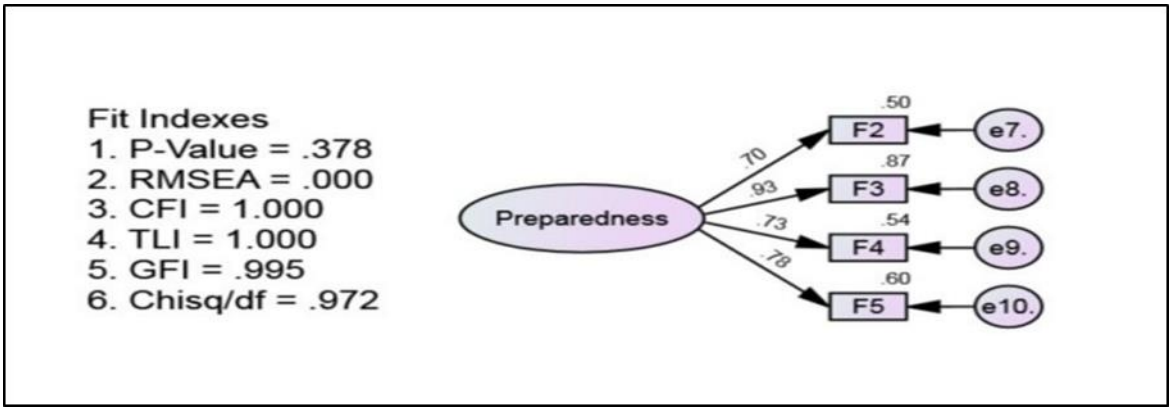

Figure 2 Single Factor Measurement Model for Preparedness Construct (n=202)

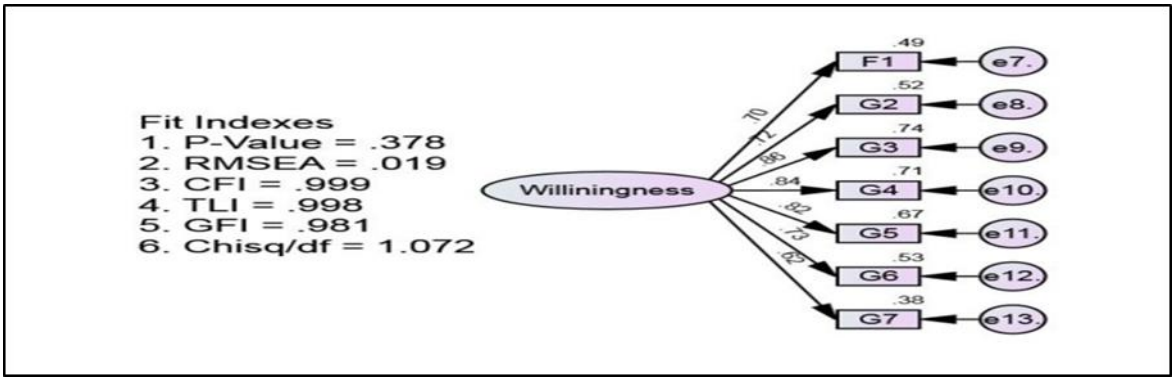

Figure 3 Single Factor Measurement Model for Willingness Construct (n=202)

Table 2 Summary of Goodness of Fit Test Preparedness and Willingness Constructs (n=202)

Model Fit Indices	Acceptable level	Initial model (2-factor model)[a]	Single factor measurement Model for Willingness constructs [a]	Single factor measurement Model for Preparedness constructs [a]
Chi-square(df), p-value	Non-significant value	363.727 (43), <0.001	15.004 (14), 0.377	1.944 (2), 0.378
Goodness-of-Fit (GFI)	0 (no fit) to 1 (perfect fit)	0.780	0.981	0.995
Tucker- Lewis Index (TLI)	0 (no fit) to 1 (perfect fit)	0.756	0.998	1.000
Comparative Fit Index (CFI)	0 (no fit) to 1 (perfect fit)	0.809	0.999	1.000
SRMR	< 0.08	0.0705	0.0214	0.0129
RMSEA	< 0.08	0.193	0.019	<0.001
Akaike Information Criterion (AIC)	Smaller value, better fitting	409.727	43.004	17.944
Expected cross-validation index (ECVI)	Smaller value, better fitting	2.038 (1.754, 2.360)	0.214 (0.209, 0.282)	0.089 (0.090, 0.128)
Bollen-Stine –value	-	0.002	-	-

Notes: [a] using Maximum likelihood estimates (ML)

4. Discussion

By evaluating measures assessing healthcare providers' Preparedness and Willingness towards ASD, this study highlights their critical role in shaping healthcare for individuals with ASD. The discussion explores the findings' impact on improving healthcare services and fostering inclusivity within healthcare settings.

4.1. Content Validity and Face Validity

The assessment of content and face validity in numerous existing outcome measures relies heavily on evaluations by researchers and healthcare professionals, often needing more substantial contributions or insights from service users (Wiering et al., 2017). As evidenced, content validity authenticates construct representation and elevates research credibility and result dependability (Rubio et al., 2003).

Extensive steps were taken to develop these questionnaires, starting with a rigorous literature review that synthesized insights from prior studies. This critical phase was pivotal in uncovering foundational concepts and themes for each variable. By synthesizing existing research, a comprehensive understanding of the nuanced aspects of preparedness and willingness for ASD was achieved. The participation of experts from various ASD fields is essential for refining the questionnaire's content validity. Each expert brings unique insights that collectively ensure the questionnaire covers medical, psychological, psychiatric, and practical aspects of ASD. This diverse collaboration enhances accuracy and relevance across different ASD populations, bolstering the questionnaire's effectiveness as a measurement tool.

Face validity plays a crucial role in questionnaire development, ensuring that the items are clear, relevant, and credible to respondents (Oluwatayo, 2012). Validating response processes is crucial for assessment integrity. In this study, we meticulously applied Yusoff's (2019) face validity method, ensuring assessment items are clear, relevant, and aligned with the intended construct. Adhering to these guidelines empowers researchers and practitioners to enhance assessment tool validity, ultimately ensuring more accurate data collection.

4.2. Construct validity

In validating and assessing the Preparedness and Willingness of healthcare providers for early ASD detection, several vital insights come to the forefront.

This study utilized EFA to assess Preparedness and Willingness constructs, essential for understanding questionnaire effectiveness in gauging specific areas (Awang, 2015). Cronbach's Alpha in EFA signifies how well questionnaire items collectively measure intended constructs, with a threshold of 0.6 indicating adequate internal reliability (Awang, 2012). The results affirmed construct validity, showcasing all items' ability to measure designated constructs with good internal consistency reliability ($\alpha > 0.70$). Factor analysis demonstrated acceptable loadings for items assessing Preparedness and Willingness variables, ensuring a significant level of internal reliability and aligning with recommended thresholds (Hair et al., 2010). The measurement model assessed the connections between items and factors within the questionnaire, a focal point of the CFA (Byrne, 2013). Additionally, CFA evaluated the extent to which items in the questionnaire measured predetermined variables (Hair et al., 2010).

Construct validity for Preparedness and Willingness constructs met standard cut-off points, evaluated through various goodness-of-fit indices like Chi-square (df), p-value, GFI, TLI, CFI, SRMR, RMSEA, AIC, and ECVI. Further, convergent validity and composite reliability were assessed for these constructs, examining factor loadings, composite reliability, and average variance extracted for each item. Findings indicated that the preparedness and willingness constructs were second-order, refined through serial models and adjustments to achieve a final fit model. The CFA results for Preparedness and Willingness constructs suggested good fit models.

5. Conclusion

The comprehensive validation process undertaken in this study robustly established the questionnaire's validity and reliability. Consequently, it establishes the questionnaire as a trustworthy and effective measurement tool for the assessed constructs, enhancing its credibility in research and practical applications.

Recommendation

This study highlights the significance of healthcare providers' ability to convey the importance of early detection of ASD, emphasizing the need for training in evidence-based screening tools, diagnostic criteria, developmental milestones, and ASD-related red flags in Jordan. In this regard, three essential methods have been recommended to enhance healthcare providers' Preparedness and Willingness for early ASD detection: gaining additional experience, actively seeking relevant resources, and committing to ongoing professional development specific to ASD.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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