Psychometric Properties of Persian Version of Autism-Spectrum Quotient (AQP-28): Evidence from Iranian Non-clinical Sample

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Research article

Keywords: Autism spectrum Quotient, confirmatory factor analyses Persian, Internal consistency reliability

Posted Date: September 15th, 2020

DOI: https://doi.org/10.21203/rs.3.rs-47383/v1

Abstract

Background: Recent evidence suggests that the autism spectrum is widespread among the general population. research has dimensionally moved towards the development of measurement tools with the introduction of autism spectrum disorder (ASD).

Methods: The short-form of the autistic spectrum quotient questionnaire (AQ-28) developed by Hoekstra et al is a valuable and friendly alternative to the full 50-item version of autism spectrum disorder (AQ-50) consider as a widely used tool for screening and epidemiological studies of autistic traits. The present study aimed at investigating the psychometric properties of the Persian version of the short-form of the autistic spectrum quotient questionnaire (AQP-28) in the Iranian population. A total of 560 individuals participated in this study and they were asked to fill out The Persian version of the autistic spectrum quotient questionnaire (AQ-28).

Results: confirmatory factor analysis (CFA) supported two higher-order factors models including ‘social behavior’ and numbers/patterns. Furthermore internal consistency of AQ-28-Persian indicate acceptable for social behavioral (α= .78), questionable for numbers/patterns (α= .65) and total (α= .62).

Conclusions: in summary, the AQ-28-Persian is a useful tool to assess social behavior parts of the autistic spectrum quotient.

Background

Autism Spectrum Disorders (ASDs) is a group of neurodevelopmental disorders characterized by impaired communication and social interaction in several areas throughout life, as well as patterns of limited and repetitive behaviors and interests [1]. Recent evidence suggests that the autism spectrum is widespread among the general population. There is a continuum of severe social, behavioral and communication deficits related to autism, so, both relatives of the autistic person and the general population are showing normal distribution of "autistic spectrum attributes” below the clinical threshold. In the general population, the etiology of the autistic spectrum attributes is similar to the etiology of autism spectrum disorder. Understanding autism dimensions recently raised in DSM-5 has led to more attention to studies on autism spectrum attributes in families, twins, brother, and sister of the autistic person and the general population [1–4].

The first important step in the study of psychological constructs is using precise measurement instruments. Historically, the development of psychological tests has had a significant contribution to clarifying the nature of psychological constructs by establishing strong foundations for research, such as group comparisons, along with external criteria and follow up over time [5].

Research has dimensionally moved towards the development of measurement tools With the introduction of autism spectrum disorder (ASD), One of the important measures of the Autism Spectrum Disorder is the AQ-50 constructed by Baron-Cohen [6]. The literature showed that many studies have cited AQ-50

having the exact psychometric indices of this questionnaire. Huckestra et al developed the AQ-28 derived from the AQ-50 to shorten the AQ-50, and easy use of it in research [7].

Because the short-form of autistic spectrum coefficient questionnaire is one of the most widely used questionnaires for measurement and use in research, and, it has been applied in different countries, it is important to examine it in the context of Iran where it has not been investigated. Furthermore, there is a dearth of available evidence regarding the psychometric properties of the AQ-28 questionnaire. The main aim of the present study was to evaluate the psychometric properties of the Persian version of the AQ-28 [7]. More specific objectives were to evaluate factor structure, an internal consistency, of the AQ-28 in Iranian non-clinical sample. Based on previous studies we expected that:

(1) The Persian version of the AQ-28 would be a two higher-order factors model,

(2) The Persian version of the AQ-28 would present internal consistency,

(3) The Autism spectrum is widespread among the general population,

Methods

Participants

A total of 560 individuals 51.2% female and 46.2% male (M_{age} = 23.4 SD= 4.86 age range= 18-35) 60.7% undergraduates, 22.89% for master and 17.03% for doctorates participated in this study and they were asked to fill out The Persian version of the autistic spectrum quotient questionnaire (AQ-28).

Measures

The AQ-28: The short-form of the autistic spectrum quotient questionnaire [7] consisted of 28 items. Items included statements about personal preferences and habits in the following five areas reflecting the autism phenotype: social skills, routine, switching, imagination, and numbers/patterns. Participants expressed their agreement or disagreement on a 4-point Likert scale with the score range between 28-112. The correlation of short-form (AQ-28) with the long form of Autism spectrum coefficient (AQ-50) was very high. Cronbach alpha showed a good and acceptable internal consistency (α = 0.77 to 0.86) of AQ-28. The internal consistency of the social behavior factor was (α = 0.79 to 0.86), the number/pattern factor was (α = between 0.67 to 0.73”), the routine factor was (α = 0.55 to 0.86), the switching factor was (α = between 0.56 to 0.59) and the imagination factor (α = between 0.68 to 0.75).

Procedure

In the first step the English version (source language) of the AQ-28 was received by Email from the Rosa A. Hoekstra [7], main constructor, then forward translation (English into Persian) done by two independent

bilingual translators. In stage 2, translators and researchers synthesized the translations. In the third step, the back translation from Persian to English was conducted by the blinded translator into the original version. In the next phase, the expert's committee assesses equivalence between the original and target versions. 30 pilot participants fill out the AQP-28 and examined the clarity and simplicity of all of the items that were clear and apprehensible for pilot participants. After the pilot phase, the AQP-28 fills out by the college students. This study was approved by the ethics committee of Iran University of Medical Sciences (code number IR.IUMS.REC 1395.95-03-121-29331) all participants provided informed consent after explaining the study purpose and assuring the confidentiality. All analysis was carried out by IBM SPSS v. 18.0 [8] and Mplus 5.1 [9].

Results

Confirmatory factor analysis (CFA)

based on previous Hoekstra et al. model [7] the hierarchical confirmatory factor analysis (CFA) was performed using Maximum likelihood to estimate the parameters of the model. Fit indices for model were acceptable fit including GFI [goodness-of-fit index] = 0.86, AGFI [Adjusted Goodness of Fit Index] = 0.84, CFI [comparative fit index] = 0.64, RMSEA [root means square error of approximation] = 0.06, SRMR [Standardized Root Mean Residual] = 0.05, CMIN/DF [Relative chi-square] = 3. 03, $p < .001$. (See Fig. 1).

Based on the results of confirmatory factor analysis, the correlation between social behavior and numbers / Patterns was − 0.78. Also, the standardized effects of social skills, routine, switching, and imagination on social behavior were 0.83, 0.01, .10, and 0.82, respectively.

Internal Consistency

To examine the internal consistency of social behavior were .78, number/pattern was .64 Cronbach's alpha for the whole questionnaire was 0.61. Moreover, the Cronbach's alpha values for subscales of social behavior including, social skill, routine, switching, imagination, were 0.63, 0.40, 0.52, and 0.59, respectively.

Mean and Std. Deviation of social behavior, social skill, routine, switching, imagination number/pattern were reported in Table 1. Mean and Standard Deviation of social behavior, social skill, routine, switching, imagination, number/pattern were reported in Table 1.

Table 1
Mean and (SD) AQP-28 items for all participant

Items	N	Minimum	Maximum	Mean
Social Behavior	574	31	87	63.17 (7.31)
Social Skill	574	9	28	19.67 (3.31)
Routine	574	5	16	10.22 (1.82)
Switching	574	4	15	10.39 (1.90)
Imagination	574	11	32	22.89 (3.65)
Numbers/Patterns	574	5	20	11.82 (2.70)
SD: Standard. Deviation				

Table 2 shows the Mean and Standard Deviation of social behavior, social skill, routine, switching, imagination number/pattern of AQP-28. Against all expectations, there were no significant differences according to sex. but analyzes showed that there were significant differences between men and women in numbers/patterns mean than women were significantly higher scored on numbers/patters than men.

Sex differences autistic spectrum quotient

Table 2
Mean and Standard Deviation AQP-28 items for all participant by sex

Items	sex	N	Mean (SD)
Social Behavior	female	294	63.14 (7.28)^{ns}
	Male	265	63.20 (7.40) ^{ns}
Social Skill	female	294	19.62 (3.17) ^{ns}
	Male	265	19.66 (3.48) ^{ns}
Routine	female	294	10.20 (1.77) ^{ns}
	Male	265	10.22 (1.90) ^{ns}
Switching	female	294	10.34 (1.93) ^{ns}
	Male	265	10.46 (1.84) ^{ns}
Imagination	female	294	22.98 (3.67) ^{ns}
	Male	265	22.85 (3.63) ^{ns}
Numbers/Patterns	female	294	12.06 (2.90) *
	Male	265	11.54 (2.40) *

$^{*}p < .05$; ns: non-significant

Discussion

Diagnostic measures with sound psychometrics are essential for accurate diagnosis of autistic traits. The present study was conducted to evaluate the factor structure, internal consistency of the Persian version of the short-form of the Autism Spectrum Questionnaire (AQP-28) in a non-clinical sample. The results of our study indicate that AQP-28 is a valid and reliable instrument to assess autistic traits. The AQP-28 comprising two higher-order factors assessing social behavior and number/pattern. The social behavior factor can be further separated into four second-order factors including Social skills, Routine, Switching, and Imagination. The factor structure of the AQP-28 is consist of the original version of the AQ-28 [7] But it seems that in the present study Social skills and Imagination have had a higher correlation (r between .83 and .82) with Social behavior in comparison with Routine, Switching was only the lowest (r between .01 and .10) respectively. In detail, and it seems that in Persian culture and language, items 19 (“I enjoy doing things spontaneously) and 26 (New situations make me anxious”) do not measure routine behavior as well as and maybe it's better to replace them with more appropriate ones. The same thing can be considered about switching domain especially items 8 (“in a social group, I

can easily keep track of several different people's conversations") and 21 ("If there is an interruption, I can switch back to what I was doing very quickly") consider social than switching Therefore, it is better to replace it with other statements. Furthermore compared with the original version of the AQ-28 [7] the correlation between the Social behavior and the Numbers/patterns factors weren't positive (r = − .78) This suggests they may considerer independent factor and it's consist with the original version of the AQ-28 (r = .20) [7].

Internal consistency coefficients for AQP-28 were: α = .78 for the social behavior domain, α = .64 for the number/pattern domain, and, the Cronbach's alpha for subscales of social behavior including, Social Skill, routine, switching, imagination, were 0.63, 0.40, 0.52, and 0.59, respectively. These findings are consistent with the internal consistency of the original version of the AQ-28 the Cronbach's alpha values of the broad Social behavior factor (a between .79 and .86) and the Numbers/patterns factor (a between .67 and .73) [7]. The internal consistency for the scales Routine (4 item) and Switching (4 item) is somewhat low, but this is probably due to the small number of items in both scales.

The study confirmed the Construct validity of the original version of the AQ-28 [7]. One of the surprising findings of this study was that there was no significant difference between the men and females in the Autism spectrum Quotient. This means that men and women were somewhat equal in elevation of the Autism spectrum Quotient, and in future research more attention should be paid to understanding the sex differences in the Autism spectrum Quotient. Of course, given that the current research sample is normal among people in the community, this difference seems to be justified. Future research should also select items that consider the cultural context of the individual. As emphasized by the AQ-28 original constructors, this instrument is not the gold standard for diagnostic purposes [7]. Therefore, this study also emphasized the same issue and proposed to use other tools such as clinical interviews for diagnostic purposes and clinical studies. As this instrument was short, it can be a valuable tool for screening and epidemiological studies of autistic traits. The present study has several limitations. First, as the research population included the general population, the generalizability to the clinical community is limited so it is necessary to use a clinical sample in future studies. Moreover, it is also recommended to use different measurement methods, and not just self-report scales.

Conclusion

According to our study, the Persian version of AQ-28 (AQP-28) is a reliable, applicable, and fast tool for evaluating autism traits, especially considering that it is very user-friendly and the percentage of responses to this instrument is high.

Abbreviations

AQP-28: Persian version of Autism-Spectrum Quotient; ASD: Autism spectrum disorder; AQ-28: The short-form of the autistic spectrum quotient questionnaire; AQ-50: The full 50-item version of autism spectrum disorder; CFA: Confirmatory factor analysis; DSM-5: Diagnostic and Statistical Manual of Mental

Disorders-5th Edition; α = alpha; GFI: goodness-of-fit index; AGFI: Adjusted Goodness of Fit Index; CFI: comparative fit index: RMSEA: root means square error of approximation; SRMR: Standardized Root Mean Residual; CMIN/DF: Relative chi-square; SD; standard Deviation.

Declarations

Ethics approval and consent to participate

This study was approved by the ethics committee of Iran University of Medical Sciences (code number IR.IUMS.REC 1395.95-03-121-29331) all participants provided informed written consent form after explaining the study purpose and assuring the confidentiality.

Consent for publication

Not applicable

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests

There was no conflict of interest in this study.

Funding

This study was financially supported by the Mental Health Research Center, Tehran Institute of Psychiatry School of Behavioral Sciences and Mental Health, Iran University of Medical Sciences (grant number 95-03-121-29331). Furthermore, the mental health research center, Tehran Institute of psychiatry school of behavioral sciences and mental health, Iran University of Medical Sciences helps to design the study. The funders had no role in the design of the study and collection, analysis, and interpretation of data and in writing the manuscript.

Authors' Contribution

AA: designed the study and editing. AE: gathered the data and drafted the manuscript. G: has done data analysis. AA: Supervised the research. AA: review the manuscript. All authors approved the manuscript.

Acknowledgments

The authors feel obliged to thank all the people, who helped in this research.

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Figures

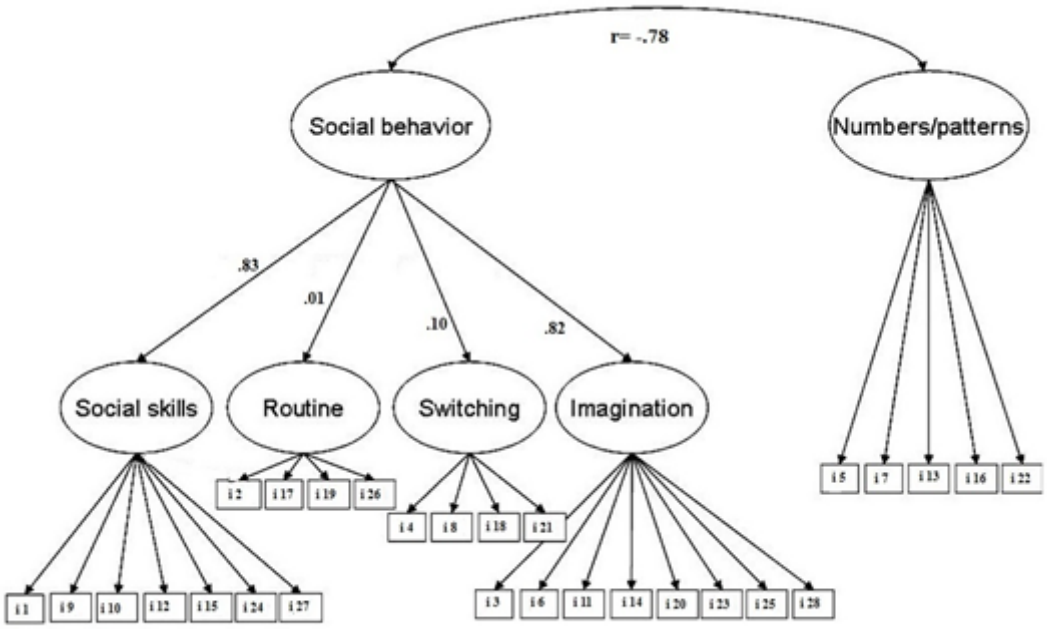

Figure 1

Factor structure of the Persian version of AQ-28, including factor correlation and factor loadings.