Comparison of Autistic Traits between Iranian Students with Different Ethnical Background: A Cross-Cultural Study

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Abstract

Background: Autistic traits (ATs) include symptoms associated with autism spectrum conditions (ASCs), which are assumed to be continuously distributed across the general population. Studies had indicated the cultural differences in the expression ATs. To our knowledge, this is the first study designed to compare the expression of autistic traits between different ethnicities from the same country.

Methods: Using the Autism-spectrum Quotient (AQ-28), we examined the possible cultural differences in the expression of autistic traits from four groups of students with different ethnicities backgrounds, including Turkish (n = 262), Persian (n = 290), Kurdish (n = 300), and Luri (n = 307) students.

Results: Behaviors associated with autistic traits were reported overall higher for males than females. Also, significant cultural differences in autistic traits were found that were different for males and females. Furthermore, while the medical sciences student group scored significantly than the humanities group in the Imagination dimension, the humanities group had significantly high scores in Number/Pattern dimensions than the engineering and medical sciences groups.

Limitations: First, other ethnicities (e.g., Arabs, Baloch) were not studied because of the lack of access. Second, for data gathering, we used only the self-report method. Third, our study included only a student sample but not the community and clinical samples from different ethnicities. Finally, our study sample included only students who are not representative of their entire ethnicity.

Conclusions: Altogether, our results provide further support for the idea that the expression of ATs is significantly influenced by culture.

Background

Autistic traits (ATs) include symptoms associated with autism spectrum conditions (ASCs), which are assumed to be continuously distributed in the general population. This extension into the general population suggests a dimensional approach and presence of a broad autism phenotype – a continuum ranging from individuals with no autistic traits to those diagnosed with severe impairments (1, 2). While core autistic traits are believed to be universal, evidence suggests that there are cultural differences in the expression, identification, and/or reporting of symptomatology (3–6). Unique cultural stigmas, norms, and preferences may conceal or highlight relative differences between autistic traits and typically developing behaviors (3, 7).

In recent years, many studies have been conducted in various countries and cultures to examine the cultural differences in the expression of ATs (e.g., 3, 4–6, 8–21). Taken together, the results of these studies indicate that the expression of autistic traits is influenced by the ethnicity and cultural context of individuals.
In addition, it has been indicated that the expression of ATs is influenced by gender differences. For instance, Baron Cohen et al. (22) reported that men had higher Autism-Spectrum Quotient (AQ) total score mean than women and scored higher on all AQ subscales, including social skills, attention switching, attention to detail, communication, and imagination, with noticeable elevation on the attention to detail subscale. These findings make a case for the speculation that altogether men have more ATs than women in the general population. Several subsequent studies supported these findings (2, 5, 23–26), though some researches failed to replicate such findings (e.g., 12, 27).

Further, Baron Cohen et al. (22) found that ATs differ significantly with respect to individuals’ fields of study. Accordingly, physics, engineering, and mathematics students had higher ATs scores than students in the humanities and social sciences. It is assumed that both the humanities and social sciences disciplines emphasize human interaction and are likely to be appealing for students who like social engagement and a high-level concentration on topics such as economics and political science. In contrast, individuals in science are fascinated by activities that include numbers and equations, which are completed individually rather than in a group (14, 22). These findings supported the idea that autistic traits are associated with areas of study (15).

**Iranian Context**

Iran is a country with various ethnic and linguistic groups, each with its own indigenous language and unique traditions or folklores unified through a shared Iranian nationality. The majority of the population speaks Persian, which is also the official language of the country. Besides, in northern Iran, mostly confined to Gilan and Mazandaran, the Gilaki and Mazandarani languages are widely spoken. Turkish comprise the largest minority ethnic group in Iran, extending from north to south of Iran, where the Turkish language is widely spoken. In addition, varieties of Kurdish are widely spoken in the province of Kurdistan and nearby areas. In Khuzestan, several distinct varieties of Persian are spoken, and Luri and Lari are also spoken in southern Iran. Also, Iran is a country with various religions. For instance, Twelver Shia Islam is the official state religion to which most of the population adhere. Other minorities include Sunni Muslims, mainly Kurds and Baloches, and non-Muslim religious minorities, including Christians, Zoroastrians, Jews, Bahá'ís, Mandeans, and Yarsanis. Therefore, it is highly probable that different cultural values and norms among ethnicities in Iran may cover or highlight differences between autistic traits and normal behaviors.

Our literature review indicated that studies on cross-cultural differences in the expression of ATs included samples from different countries. The current study is informative in that it contains samples of different ethnicities from the same country. This study aims to examine autistic traits among four ethnicities in Iran, including Turkish, Persian, Kurdish, and Luri ethnicities. Our first goal in this study is to examine the differences in the distribution of ATs among the four ethnicities. Second, we will explore gender differences in autistic traits for each ethnic group separately. Finally, the present study will examine whether there are differences in ATs based on the field of study.
Methods

Participants

Participants were 1159 (aged 18–60, \(M: 26.40, SD: 7.74; 44.1\% \) men) university students from Turkish (n = 262), Persian (n = 290), Kurdish (n = 300), and Luri (n = 307) ethnicities who were recruited in 2021 (See Table 1 for more information on demographic characteristics). Questionnaires were distributed to 1200 students and 1162 completed questionnaires were received (response rate: 96.58%).

Table 1
Demographic Information

| Variables       | Ethnicities |         |         |         |
|-----------------|-------------|---------|---------|---------|
|                 | Turkish     | Persian | Kurdish | Luri    |
| N               | 262         | 290     | 300     | 307     |
| Gender          |             |         |         |         |
| Male: female    | 102:159     | 105:185 | 138:165 | 168:137 |
| Age Mean (SD)   | 24.62 (6.78) | 24.67 (7.14) | 26.47 (7.88) | 29.42 (8.14) |
| Area of study   |             |         |         |         |
| Humanities/Social science | 109 | 153 | 144 | 100 |
| Medicine        | 101         | 79      | 111     | 138     |
| Science         | 48          | 48      | 44      | 65      |

Note: \(M = \) Mean; \(SD = \) Standard Deviation; \(AQ = \) Autism-spectrum Quotient

Procedure

At first, the ethics committee of the Iran University of Medical Sciences first approved this study (code number: IR.IUMS.REC 1395.95-04-185-29338). A demographic form (with four questions assessing age, gender, ethnicity, and field of study) and a twenty-eight-item Likert online survey were developed and administered using Google Forms. The researchers shared the online questionnaires in the social media groups. Participants provided online informed consent after reading the study purpose and being assured about the confidentiality data. Then they were asked to complete the questionnaires. Inclusion criteria included studying at undergraduate or graduate levels, the age range of < 18, and being interested in participating in the study.

Data Analysis

Descriptive information for all variables used in the present study is presented in Table 1. In the present study, for data entry and statistical analyses, SPSS 20 software was used. Data were analyzed using
Independent T-test and Univariate Variance Analysis (ANOVA). A \( p \) level of < .05 was considered as indicating statistically significant results.

**Measure**

**The Short-Form of the Autistic Spectrum Quotient Questionnaire (AQ-28)**

The short form of the autistic spectrum quotient questionnaire (AQ-28; 28) consisted of 28 statements about personal preferences and habits in the five areas reflecting the autism phenotype, including social skills, routine, switching, imagination, and numbers/patterns. Participants complete the questionnaire on a 4-point Likert scale. AQ-28 score ranges from 28 to 112. Ebrahimi et al. (29) supported the two higher-order factors models, including ‘social behavior’ and numbers/patterns for the Persian AQ-28. Furthermore, the internal consistency of Persian AQ-28 subscales scores ranged from .40 (Routine) to .78 (Social Behavior).

**Results**

**The Effect of Gender on AQ Scores**

A \( 2 \times 4 \) (gender \( \times \) ethnicity) between subjects ANOVA found a main effect of gender on Routine (areas reflecting the autism phenotype) \( F(1, 1138) = 8.08, p = .001 \) with men (\( M = 2.64, SD: 1.00 \)) scoring higher than females (mean = 2.61, SD: 1.06) overall. Similarly, there was a significant main effect of gender on Imagination (another indicator of AT) \( [F(1, 1123) = 10.22, p = .001] \), though women (\( M = 5.76, SD: 1.72 \)) had higher scores than men (\( M = 5.57, SD: 1.68 \)) totally. Finally, the results yielded a main effect of gender on the Number/Pattern dimension, such that men (\( M = 2.39, SD: 1.43 \)) scored significantly higher than women (\( M = 2.25, SD: 1.40 \)) overall. There was no significant gender \( \times \) ethnicity interaction on AQ Total and dimensions scores.

**Intra ethnic Gender Differences in AQ Scores**

A series of independent T-tests were conducted to examine the intra ethnic gender differences in AQ scores for each ethnicity (Table 2). The results indicated that in the Persian group, men (\( M = 2.96, SD: 1.32 \)) scored significantly higher (\( t(225): 2.67, p < .05 \)) in the Number/Pattern dimension than women (\( M = 2.63, SD: 1.41 \)). For the Turkish group, the results indicated a statistically significant difference in Routine (\( t(254): 2.98, p < .05 \)) and Imagination (\( t(246): -2.25, p < .05 \)) dimensions for men and women, that is, men (\( M = 2.55, SD: .96 \)) scored significantly higher than women (\( M = 2.11, SD: .96 \)) in Routine dimension; conversely, in the Imagination subscale, women (\( M = 5.67, SD: 1.76 \)) scored significantly higher than men (\( M = 5.08, SD: 1.78 \)). With respect to the Kurdish group, the results of the independent t-test showed that men scored significantly higher than women in Switching, \( t(352): 1.99, p < .05 \) (\( M = 2.66, SD: .94 \) / (\( M = 2.46, SD: 1.10 \))), Number/Pattern, \( t(355): 1.97, p < .05 \) (\( M = 2.41, SD: 1.35 \) / (\( M = 2.11, SD: 1.38 \))), and AQ Total score, \( t(337): 1.99, p < .05 \) (\( M = 18.42, SD: 3.64 \) / (\( M = 17.59, SD: 3.96 \))). Finally, in the Luri culture, men (\( M: \)
2.52, \(SD: .93\) scored significantly high in the Routine dimension \(t(303): 2.00, p < .05\) than women \((M: 2.29, SD: 1.03)\); however, women \((M: 6.27, SD: 1.58)\) had significantly higher scores in Imagination dimension \((t(300): -2.36, p < .05)\) than men \((M: 5.81, SD: 1.63)\). Given that there were significant intra ethnic gender differences in AQ scores, we decided to examine the cultural difference in AQ scores separately for both genders.

Table 2

| Variables                  | Ethnicities       | Turkish Male | Turkish Female | Persian Male | Persian Female | Kurdish Male | Kurdish Female | Luri Male    | Luri Female |
|----------------------------|-------------------|--------------|---------------|--------------|---------------|--------------|---------------|-------------|-------------|
|                            |                   | M (SD)       | M (SD)        | M (SD)       | M (SD)        | M (SD)       | M (SD)        | M (SD)      | M (SD)      |
| AQ Total Score             |                   | 17.15 (3.73) | 17.43 (4.08)  | 17.44 (3.43) | 17.50 (4.52)  | 18.42 (3.64) | 17.59 (3.96)  | 17.92 (3.49) | 18.20 (4.05) |
| Social skill               |                   | 4.31 (1.54)  | 4.73 (1.52)   | 4.36 (1.37)  | 4.36 (1.62)   | 4.82 (1.64)  | 4.79 (1.58)   | 5.03 (1.59)  | 5.01 (1.71)  |
| Routine                    |                   | 2.55 (0.96)  | 2.11 (0.97)   | 2.46 (1.08)  | 2.54 (1.05)   | 2.37 (0.97)  | 2.23 (0.99)   | 2.52 (0.93)  | 2.29 (1.03)  |
| Switching                  |                   | 2.78 (1.04)  | 2.73 (1.09)   | 2.65 (1.10)  | 2.66 (1.15)   | 2.66 (0.94)  | 2.46 (1.10)   | 2.56 (1.00)  | 2.57 (0.95)  |
| Imagination                |                   | 5.08 (1.78)  | 5.56 (1.79)   | 4.96 (1.58)  | 5.25 (1.76)   | 6.09 (1.56)  | 5.96 (1.61)   | 5.81 (1.63)  | 6.27 (1.58)  |
| Number_Pattern             |                   | 2.42 (1.31)  | 2.18 (1.38)   | 2.96 (1.32)  | 2.63 (1.41)   | 2.41 (1.35)  | 1.98 (1.33)   | 1.99 (1.51)  | 2.05 (1.38)  |

Note: \(M = \text{Mean}; SD = \text{Standard Deviation}; AQ = \text{Autism-spectrum Quotient}\)

### Cultural differences in AQ Scores for men and women

Results of one-way ANOVA indicated that scores of Social Skill \((F(3, 504) = 5.87, p < .001)\), Imagination \((F(3, 499) = 15.25, p < .001)\), and Number/Pattern \((F(3, 500) = 11.07, p < .001)\) dimensions differed between the ethnicities for men. Post-hoc Tukey test indicated that the Social Skill dimension score was significantly higher for Luri students \((M: 5.03, SD: 1.59)\) than Persian \((M: 4.36, SD: 1.37)\) and Turkish \((M: 4.31, SD: 1.54)\) students. In addition, Kurdish \((M: 6.09, SD: 1.56)\) and Luri \((M: 5.81, SD: 1.63)\) students had significantly higher Imagination scores than Persian \((M: 4.96, SD: 1.58)\) and Turkish \((M: 5.08, SD: 1.76)\) students. With regard to the Number/Pattern dimension, Persian \((M: 2.96, SD: 1.32)\) and Turkish \((M: 2.42, SD: 1.31)\) students scored significantly higher than Luri students \((M: 1.99, SD: 1.51)\); however, only Persian students had significantly higher Number/Pattern scores than Kurdish \((M: 2.41, SD: 1.35)\) students.

Likewise, a one-way ANOVA was conducted to examine the cultural differences in AQ scores for women. Results indicated that there are significant differences between groups in Social Skill \((F(3, 632) = 5.71, p\)
<.001), Routine ($F(3, 633) = 4.68, p < .001$), Imagination ($F(3, 626) = 14.42, p < .001$), and Number/Pattern ($F(3, 633) = 7.55, p < .001$) dimensions scores. The subsequent Post-hoc Tukey test results indicated that the Persian group ($M: 4.36, SD: 1.62$) had a significantly lower Social Skills score than Kurdish ($M: 4.79, SD: 1.58$) and Luri ($M: 5.01, SD: 1.71$) students. Conversely, Persian students ($M: 2.54, SD: 1.05$) scored higher in AQ Routine dimension than Turkish ($M: 2.11, SD: .97$) and Kurdish ($M: 2.23, SD: .99$) students. With regard to the Imagination subscale, Luri ($M: 6.27, SD: 1.58$) and Kurdish ($M: 5.96, SD: 1.61$) groups had significantly higher scores than Turkish ($M: 5.56, SD: 1.79$) and Persian ($M: 5.25, SD: 1.76$) groups, while there were no significant differences between the latter two groups. Finally, the results indicated that the Persian group ($M: 2.63, SD: 1.41$) had a significantly higher Number/Pattern scores than Turkish ($M: 2.18, SD: 1.38$), Kurdish ($M: 1.98, SD: 1.33$), and Luri ($M: 2.05, SD: 1.38$) groups.

**Effect of Areas of study differences on AQ scores**

Results of one-way ANOVA indicated significant differences across areas of study in scores of Social Skill ($F(2, 1120) = 3.26, p < .05$), Imagination ($F(2, 1110) = 3.26, p < .05$), and the Number/Pattern dimensions ($F(2, 1118) = 8.66, p < .001$). Post-hoc Tukey test showed that there were no significant differences in the Social Skill dimension between the groups. On the other hand, in the Imagination dimension, Medical Sciences students ($M: 5.84, SD: 1.68$) scored significantly higher than Humanities ($M: 5.55, SD: 1.71$) group. Also, in the Number/Pattern dimensions, the Humanity group ($M: 2.50, SD: 1.34$) had a significantly higher score than Engineering ($M: 2.14, SD: 1.43$) and Medical Sciences ($M: 2.15, SD: 1.46$) groups.

**Discussion**

The current study aimed to compare Autistic Traits between Iranian university students with a different ethnical backgrounds. We studied the ATs differences based on gender for each ethnicity separately; differences in ATs based on study fields were examined as well. Available data indicates cross-cultural differences in the expression of ATs ($3, 4, 6, 8, 9, 12–14, 17, 18, 20$). Similarly, gender differences ($2, 5, 23–26$) and the variations in ATs based on the field of study ($14, 22$) have been supported in previous studies.

Our results are discussed in regard to ATs differences according to gender, ethnicity, and the field of study, followed by a reflection upon the findings of previous studies.

**Gender Differences in ATs**

Our results indicated gender differences in Routine, Imagination, and Number/Pattern dimensions scores. While men had higher Routine and Number/Pattern scores, they scored lower than women in Imagination. Our analysis brought some interesting results with respect to sex differences in ATs across ethnicities. Consistent with previous studies ($2, 5, 23–26$), we found predominant autistic traits for men across different ethnicities. In the Persian group, men scored significantly higher in the Number/Pattern dimension than women. Similarly, Turkish men scored significantly higher than women in the Routine
dimension. With respect to the Kurdish group, men scored significantly higher than women in Switching, Number/Pattern, and AQ Total score. Finally, in the Luri culture, men scored significantly high in the Routine dimension. However, contrary to our expectation, Turkish and Luri women scored higher in the Imagination dimension than men. Notwithstanding, not all researchers have confirmed sex differences in AQ scores (11, 30). Even in Hurst et al. (11) study, females scored even slightly higher than males in the AQ Total score and most subscales, although the differences were not statistically significant. In support of higher imagination scores among Turkish and Luri women than men, evidence suggests that girls have better imagination capacity, more pretend play, and a very rich and elaborate fantasy world with imaginary friends; they escape into fiction, and some live in another world with, for example, fairies and witches (31). All in all, our results suggest that while men had predominant ATs than women, gender differences in ATs were not in the same pattern across Iranian ethnicities. Future studies are recommended to examine the underlying cultural differences that are likely to result in these incongruences.

Cultural differences in AQ Scores

With respect to cultural differences in AQ scores, which we analyzed separately for both genders, the results indicated significant cultural differences in AQ dimensions. Concerning men groups, Luri students had significantly higher Social Skills dimension scores than Persian and Turkish students, while the mean Number/Pattern dimension score was significantly lower for the Luri group than Persian and Turkish students. In addition, Kurdish and Luri students had significantly higher Imagination scores than Persian and Turkish students. Only Persian students had significantly higher Number/Pattern scores than Kurdish students. With respect to the women sample, the Persian group had a significantly lower Social Skills score than Kurdish and Luri students but scored higher in AQ Routine dimension than Turkish and Kurdish students. In the Imagination subscale, Luri and Kurdish groups had significantly higher scores than Turkish and Persian groups. Finally, for the Number/Pattern subscale, our results indicated that the Persian group had a significantly higher score than the Turkish, Kurdish, and Luri groups. Unfortunately, since no study has examined the cultural differences of psychological constructs among Iranian ethnicities, our ability to discuss the results is too limited. Notwithstanding, the influence of socioeconomic status on the expression of ATs has been approved in previous studies (32, 33). For instance, Suzuki et al. (32) indicated that in Japan, except for the numbers/patterns dimension, individuals with lower socioeconomic status had significantly higher AQ total and dimension scores than their respective counterparts (i.e., those with high socioeconomic status). Significant SES differences exist among Iranian ethnicities, too. For instance, Tehran (where most of the Persians live) has resulted in a wide socioeconomic gap between the center and the peripheries (e.g., Kurdistan and Lorestan) due to a highly centralized development strategy (34). In addition, Turkish resident cities such as Tabriz and Urmia have been developed to a high SES rank in the recent decade. In this concern, our results align with Suzuki et al. (32) in that the participants from low SES ethnicities (in our study Kurdish and Luri participants) had overall higher AQ scores, while the Persian group that enjoys high SES had significantly higher Number/Pattern scores than the rest of the groups.

Effect of Areas of study differences on AQ scores
Our results indicated that while there were no significant differences in the Social Skill dimension between the groups, Medical Sciences students scored significantly more than the Humanities group in the Imagination dimension. On the other hand, the Humanity group had significantly high scores in Number/Pattern dimensions than Engineering and Medical Sciences groups. Our result failed to replicate the previously proposed finding that students in Science majors (e.g., engineering) have significantly higher ATs than non-science students (3, 14, 22). However, in line with our results, Pisula et al. (12) found that humanities students had higher ATs than social sciences and/or medical students. They hypothesized that the results were influenced by the large presence of students of classical studies and applied linguistics among the humanities students who might demonstrate some traits common for autism conditions, e.g., the tendency for in-depth, detailed analysis of the material (in their case text). The propensity for systemizing typical of autism conditions (35) can also be pronounced in some students of applied linguistics, who may be interested in language as a system.

Limitations

Our results should be interpreted considering the following limitations. First, besides the ethnicities examined in the current study, there are other ethnicities (e.g., Arabs, Baloch) that we did not study because of the lack of access. Future studies are recommended to include and study ATs in these ethnicities as well. Second, for data gathering, we used only the self-report method; using other assessment methods is recommended for future studies. Third, our study included only a student sample, and we did not examine cross-cultural differences of ATs among the community and clinical samples from different ethnicities. Finally, our study sample included only students who are not representative of their entire ethnicity, so future studies are recommended to examine and compare ATs across ethnicities with community or other samples.

Conclusion

To our knowledge, the current study is the first to examine the cultural differences in ATs within various cultures in the same country. Our results indicated that the expression of autistic traits is influenced by culture and that while there are gender differences in ATs across Iranian ethnicities (high ATs for men), the pattern of differences was not the same among the ethnicities. Also, contrary to our hypothesis, our results did not support the idea that students of the science field have more ATs than humanities and social sciences. The current study had a couple of strengths. First, our study included a large study sample size consisting of different Iranian ethnicities. Second, we examined the cross-cultural differences in ATs separately for men and women, which provided fruitful information, indicating that the cross-cultural differences in ATs are not the same for men and women.

Abbreviations

AT
Autistic Traits; AQ-28: The Short-Form of the Autistic Spectrum Quotient Questionnaire; SES: Socioeconomic Status

Declarations

Ethics approval and consent to participate

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Written informed consent was obtained from all individual participants included in the study. This study was approved by the ethics committee of the Iran University of Medical Sciences (code number IR.IUMS.REC 1395.95-04-193-29860). All participants provided informed consent after explaining the study purpose and assuring confidentiality.

Consent to publish

Not applicable

Data Availability Statement

The datasets generated during 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.

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Authors’ contributions

MEA and AE: prepared the manuscript and performed the data analysis; SK, RE, EMA, MA, SH, ES, AM, EAJ, and ARF: gathered data.

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Figures
Figure 1

Distribution of AQ scores across ethnicities for men
Figure 2

Distribution of AQ scores across ethnicities for women