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ORIGINAL ARTICLE

Autistic traits among college students and its impact on academic performance at a government university in Egypt

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Background Autism spectrum disorder sufferers are now thought to be at the extreme end of a continuum of autistic-related social, communicative, and behavioral traits that have been found to be more pronounced, even though they fall below the clinical threshold, in their relatives and to be normally distributed in the general population.

Aim The study aimed to detect autistic traits among different college students as well as its relation to their academic performance, which will be reflected on their achievement in case of proper and early management

Patients and Methods A total of 4000 students from practical and theoretical faculties were assessed using the autism spectrum quotient questionnaire.

Results There is statistically significant difference in the degree of autistic traits as regards the type of college. Practical students represent the majority of sample in group A [group with low total autistic spectrum quotient (AQ) score], while theoretical students scored the majority of the sample in groups B (groups with a high total AQ score).There is also statistically significant difference in the degree of autistic traits as regards academic achievement. Approximately 65.4% of students of group A (low AQ score) scored excellent, while 41.2% of students in group B (high AQ score) scored excellent.

Conclusions Autistic traits are distributed among the general college students in various degrees and are higher in theoretical students than practical students. Female sex was found to be significantly related to low AQ scores.

Keywords Academic performance, Autistic traits, Vollege students.
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INTRODUCTION

The complex lifelong neurodevelopmental impairment known as autism spectrum disorder (ASD) is characterized by challenges with reciprocal social interaction and communication as well as a pattern of constrained and limited activities and interests (American Psychiatric Association, 2013). In addition, there is growing evidence that autistic traits share the same etiology as ASD in the general population and at the quantitative extremes, and that the hereditary influence of autistic traits (80%) is equivalent to that of ASD (Bölte and Hallmayer, 2011; Lundstrom *et al.,* 2012).

In the absence of intellectual disability in ASD patients, high-functioning autism spectrum disorder is defined as meeting the diagnostic criteria for ASD and having a full-scale IQ of 70 or higher (Honda *et al.,* 2005). Despite having severely impaired social interaction skills, peculiar, eccentric, and occasionally passionate hobbies, and a high degree of rigidity in their daily lives, people with high-functioning ASD are frequently verbally proficient and can have particular intellectual capabilities in comparison to their peers (Hayashi *et al.,* 2008; White *et al.,* 2011).

Because it helps us better understand how mildly severe autistic features affect social functioning, it is crucial to examine how autism-like social deficits affect the general population. A more thorough understanding of autistic characteristics and the corresponding impairment will be possible with the help of assessments of autistic traits using dimensional and category approaches (Hsiao e*t al.,* 2013).

According to a growing body of research, ASDs are not primarily clinical events but rather the extreme end of a range of characteristics that over time reflect consistently persistent social, behavioral, and emotional patterns.

These characteristics are present in variable degrees in all people. In other words, autistic features can be continuously dispersed in the general population if they do not match the criteria for a clinical diagnosis (Bölte and Hallmayer, 2011). These characteristics include having trouble conversing, as well as odd or eccentric behavior.

Adolescents who have autistic-like social deficits may be at a higher risk of social and academic maladjustment, poor academic achievement, unfavorable attitudes toward school and teachers, more social and behavioral issues, negative peer relationships, and more problematic peer interactions (Micali *et al.,* 2004; Chien *et al.,* 2017; Liu *et al.,* 2017). This study aimed to detect the prevalence of autistic traits among college students and its relation to their academic performance and sociodemographic characteristics.

PATIENTS AND METHODS

A sample of 4000 students of all grades of randomly chosen faculties had been included. The study was performed at the Faculty of Medicine, Engineering, Law, and Commerce at Zagazig University, Zagazig City, Sharkia, Egypt. An approval from the dean of each faculty was obtained. This sample had been collected during the period from February 2022 till April 2022.

The study is a stratified random one. The sample size is estimated according to the power of study, which is equal to 80%, confidence interval 95%, the estimated sample size is 4000 students calculated according to the population size which is 100 000 (according to the information from students affair, Zagazig University and the prevalence of autistic traits in United States in a college-based sample for year 2011 is 2%).

Inclusion criteria included both sexes of students of the first 4 years of faculties of Medicine, Engineering, Law, and Commerce, who agree to be included in the study. Exclusion criteria included students who have a history of psychiatric, neurological disorders, surgical or medical conditions, family history of neurological or psychiatric disorders, and students who did not answer the whole questionnaire questions (dropout cases).

Measures

All participants were subjected to the following:

Sociodemographic structured questionnaire

Which include questions about residence and total score of the past academic years. Participants were divided into groups according to their grades (excellent, very good, good, accepted, failed).

Autistic spectrum quotient

It comprises 50 questions, divided into five subscales of 10 questions each. The five subscales are social skill, attention switching, attention to details, communication, and imagination. The respondent was asked to agree or disagree with statements about personal habits and preferences; the response of each item receives one point. Items are summed together to produce a total score. Higher scores imply replies that are more in line with the characteristics of autism. A total score of 29 or higher indicates the presence of clinically relevant autistic characteristics. We translated autistic spectrum quotient (AQ) at first into Arabic by an expert in English and then presented to three professors of psychiatry who accepted it as face validity, then it was translated back to English by an expert following which we compared between the original one and the one translated back to English. The Cronbach's α of the translated scale for the current sample is 0.89 (Baron-Cohen *et al.,* 2001).

Ethics approval and consent to participate

The Zagazig University Institutional Review Board (IRB) approved the current study (IRB no. 9910/9-1-2022). This study was conducted within the ethical guidelines as outlined in the Declaration of Helsinki and its later amendments. Written informed consent was obtained from all participants after discussing the study objectives, and confirming confidentiality.

Statistical Analysis

Data were checked, entered, and analyzed using SPSS, version 20. Data were expressed as mean and SD for qualitative variables and as numbers and percentage for categorical variables, which was done by a professional statistician. The results were considered significant when the probability of error is less than 5% ($P< 0.05$). Nonsignificant when the probability of error is more than 5% ($P> 0.05$). The following tests were done when appropriate: descriptive analysis, mean, range, χ^2 test, and *t* test.

RESULTS

The age for both males and females ranged from 18 to 21 years with a mean value of 19.7±1.2 SD for practical students and 19.9±1 SD for theoretical students. There is statistically significant difference between students of practical and theoretical colleges as regards marital status. About 0.3% of studied practical students are married compared with 1.9% of studied theoretical students. There is also statistically significant difference as regards residence as shown in Table 1.

The prevalence of autistic traits in college students is shown in Table 2, where AQ divided students into two groups according to their total score: group A of low AQ (0–28) which represented 81.3%, and group B of high AQ (29–50) and represented 18.7% as shown in Table 2.

There is statistically significant difference in the degree of autistic traits as regards the type of college. Practical students represent the majority of sample (58.6%) in group A (group with low total AQ score), while theoretical students scored the majority of the sample (87.5%) in groups B (with high total AQ score). There is also statistically significant difference in academic achievement where about 65.4% of students of low AQ score excellent, while only 41.2% of high AQ score excellent. There is also statistically significant difference as regards sex (Table 3).

There is also statistically significant difference as regards the type of college and social skills subscale, where 51% of practical students scored higher than the theoretical students (49%). There is also statistically significant difference as regards the type of college and attention to detail subscale, where 85.1% of theoretical students scored higher than practical students (14.9%) (Table 4).

There is statistically significant difference in the mean of total AQ between the two groups (practical and theoretical) as regards the type of college, where theoretical students scored higher (19.1±5.6) than practical students (16.3±4.5), and there is statistically significant difference in total AQ as regards sex, where the mean of total AQ in females is 21.5±4.1, while in males is 22.5±4.3 (Tables 5 and 6).

Table 2: Prevalence of autistic trait in university students according to total scores:

	***n* (%)**
Group A (0–28)	
Low AQ	3252 (81.3)
Group B (29–50)	
High AQ	748 (18.7)
Total	4000 (100.0)

AQ, Autistic spectrum quotient.

DISCUSSION

Faculty of Engineering) and theoretical faculties (Faculty of Law and Faculty of Commerce). As regards their sex, females were 62.6% compared with 37.4% of males in the total sample. The mean age of students was: 19.7±1.2 years (House *et al.,* 2004; Dworzynski *et al.,* 2012; Lai *et al.,* 2017, 2015). This could be explained by the fact that the sample was from the first till the fourth year of the different college students.

The mean of AQ total score is 17.7 (SD= 5.3) which followed normal distribution and is comparable with the Baron-Cohen study as the mean total score of AQ among the Cambridge students was 17.6 (SD= 6.4). It is also comparable to a mean AQ score of 20.7 (SD= 6.38) in a Japanese study (Baron-Cohen *et al.,* 2001; Wakabayashi *et al.,* 2006).

Table 1: Sociodemographic characteristics and mean of age of the studied students:

	Practical (*N*=2000)	**Theoretical (*N*=2000)**	**Test**	
	Mean±SD		***t***	***P***
Age	19.7±1.2	19.9±1	1.366	0.173
	n (%)	*n* (%)	χ^2	
Sex				
Male	739 (36.4)	756 (37.7)	0.31	0.578
Female	1261 (63.6)	1244 (62.3)		
Marital				
Unmarried	1994 (99.7)	1961 (98.1)	24.48	<0.001
Status				
Married	6 (0.3)	39 (1.9)		
Residence				
Rural	767 (38.4)	654 (32.7)	13.94	<0.001
Urban	1233 (61.6)	1346 (67.3)		

Table 3: Association between autistic spectrum quotient and type of college, sex, and academic achievements of studied students:

			Test	
	Low AQ (0–28) (*N*=3252) [*n* (%)]	**High AQ (29–50) (*N*=748) [*n* (%)]**	χ^2	***P***
College				
Practical	1907 (58.6)	93 (12.5)	519.37	<0.001
Theoretical	1345 (41.4)	655 (87.5)		
Sex				
Females	2122 (65.3)	383 (51.4)	51.28	<0.001
Males	1130 (34.7)	365 (48.6)		
Failed	14 (0.4)	2 (0.3)		
Academic				
Acceptable	119 (3.7)	25 (3.3)		
Achievement				
Good	296 (9.1)	238 (31.8)	295.23	<0.001
Very good	697 (21.4)	175 (23.4)		
Excellent	2126 (65.4)	308 (41.2)		

AQ, autistic spectrum quotient.

Table 4: Association between autistic spectrum quotient subscales and type of college:

			Test	
	Practical [*n* (%)]	**Theoretical [*n* (%)]**	χ^2	***P***
Social skills subscale (*N*=4000)				
Normal <º (*N*=2588)	893 (34.5)	1695 (65.587)	103.18	<0.001
Defects ³5 (*N*=1412)	720 (51.0)	692 (49.0)		
Attention switch subscale (*N*=4000)				
Normal <º (*N.*=840)	320 (38.1)	520 (61.9)	3.84	0.05
Defects ³5 (*N*=3160)	1322 (41.8)	1838 (58.2)		
Attention to detail subscale (*N*=4000)				
Normal <º (*N*=872)	264 (30.3)	608 (69.7)	51.28	0.045
Defects ³5 (*N*=3128)	1060 (14.9)	2068 (85.1)		
Communication subscale (*N*=4000)				
Normal <º (*N*=1440)	104 (7.2)	1336 (92.8)	0.17	0.679
Defects ³5 (*N*=2560)	176 (6.9)	2384 (93.1)		
Imagination subscale (*N*=4000)				
Normal <º (*N*=2632)	176 (6.7)	2456 (93.3)	1.16	0.282
Defects ³5 (N=1368)	104 (7.6)	1264 (92.4)		

Table 5: Mean of autistic spectrum quotient and association between sex and total autistic spectrum quotient:

	Practical	**Theoretical**	**Test**	
	Mean±SD		***t***	***P***
Total AQ	16.3±4.5	19.1±5.6	17.559	<0.001â °â °
Sex				
Female	21.5±4.1		2.713	0.007*
Male	22.5±4.3			

AQ, autistic spectrum quotient.

Table 6: Reliability (intertest reliability):

AQ index item	Cronbach's a if item deleted	*r*	*P*
Social skill	0.76	0.97	<0.001
Attention to detail	0.81	0.92	<0.001
Attention switch	0.82	0.87	<0.001
Communication	0.71	0.95	<0.001
Imagination	0.78	0.95	<0.001
Total scale	0.9	1	<0.001

AQ, autistic spectrum quotient. This table shows Cronbach's α if item deleted. Cronbach's α was found to be high in all items especially as regards attention switch (0.82) and for total scale it reached 0.9. Also the correlations between AQ index item scores on the initial (T1) and the 1-week later (T2) administrations. The test–retest reliabilities for all index items were highly significant.

In the current study, the mean of total AQ scores in the Egyptian sample has been found to be different in the two different student groups. AQ total score in practical colleges is equal to 16.3 (SD= 4.5), while in theoretical colleges it is equal to 19.1 (SD= 5.6) compared with an Egyptian students mean 22.72 (SD= 4.44) (Daoud *et al.,* 2006).

The relationship between the severity of autistic trait and area of study was also in agreement with the findings of Ewa *et al.,* (2013), where science students scored lower than students of social sciences in total AQ. It also consistent with the Baron-Cohen study where most of the students with the highest AQ scores majored in engineering and computer science (Baron-Cohen *et al.,* 2001; White *et al.,* 2011). This relationship had also been established in a study by Hoekstra *et al.,* (2008), where science students scored significantly higher than students engaged in humanities or social sciences degree (t= 8.64, P< 0.001). It is probably accurate to argue that the two groups differ in terms of academic performance, the degree of stress associated with learning environments, socioeconomic background, and likely overall life stress levels. This result is different from that in a study by Daoud *et al.,* (2006), which enrolled a small sample size (202 students), where the AQ total score in science college of 22.72 (SD= 4.6), while in theoretical colleges of 22.75 (SD= 3.2); this means that the two sample groups are similar.

As regards sex our results show that males scored higher AQ score (22.5±4.3) than females (21.5±4.1). These results are similar to the results of a study by Baron-Cohen *et al.,* (2001),which reported sex differences as the mean total AQ score was higher in male students than in female students. A research conducted in the Netherlands in a study by Hoekstra *et al.,* (2007) also reported that males scored higher in the total AQ than females. In addition, the effect of sex was confirmed on a large sample of Japanese students by Kunihira *et al.*, (2006) where males scored higher than females in all of the AQ subscales excepting attention to detail. This is confirmed also by the findings of the Ewa *et al.,* (2013) study, where autistic traits were expressed more clearly in males. Many other previous reports on autistic traits in the general population have implied the presence of sex differences (House *et al.,* 2004; Dworzynski *et al.,* 2012; Lai *et al.,* 2017, 2015; Liu *et al.,* 2017; Lai and Szatmari, 2020). The authors interpreted these findings as evidence for the hypothesis that significantly more males than females in the general population demonstrate autistic traits of moderate severity.

In this study, there is statistically significant difference as regards the type of college and social skills subscale where 51% of practical students scored higher than theoretical students (49%). There is also statistically significant difference as regards the type of college and attention to detail subscale, where 85.1% of theoretical students scored higher than practical students (14.9%). These results are consistent with the results of a study by Ewa *et al.,* (2013), where science students scored higher than students of humanities in attention to detail.

Results in this study showed that the degree of autistic traits is associated with defects in academic achievement. These results are consistent with the results in other studies (Skuse, 2010; Chien *et al.,* 2017; Liu *et al.,* 2017) among children and adolescents. These studies reported that children and adolescents, who have autistic traits may be at a higher risk of social and academic maladjustment, poor academic achievement, and negative attitudes toward school and teachers (Hsiao *et al.,* 2013).

As regards internal consistency, Chronbach's was 0.82 which is within the acceptable range for internal consistency (>0.60). This result is consistent with the results of Baron-Cohen (Wakabayashi *et al.,* 2006), where the internal consistency of items in each of the five domains was also calculated, and Cronbach's α coefficients were all high (communication=0.82, social=0.88, imagination=0.81, attention to detail=0.66, attention switching=0.76). Cronbach's α coefficient for the AQ as a whole was also high (=0.79). It is also consistent with the results of Ewa *et al.,* (2013) study, where the internal consistency of the AQ was calculated using Cronbach's α coefficient; it was 0.66 for total AQ score. The internal consistencies for the subscale were also estimated α=0.70 (social skill), α=0.62 (communication), α=0.57 (attention to detail), α=0.53 (attention switching), and α=0.55 (imagination).

The AQ test–retest results from the present study suggest high reliability of the Arabic version of the AQ and are congruent with normative literature of other AQ versions (Baron-Cohen *et al.,* 2001; Wakabayashi *et al.,* 2006; Ewa *et al.,* 2013).

CONCLUSION

Autistic traits are distributed among general college students in various degrees. Autistic traits were lower in students with high academic achievement. Autistic traits are higher in theoretical students than practical students. Female sex was found to be significantly related to low AQ scores.

Limitations

A limitation of this study is the cross-sectional pattern that does not allow causal association between study variables; however, it still provide important information about mental health in students nearly to be graduated. Other limitation could be encountered on that students were drawn from a single university. It is recommended to start for national investigation in such important student category.

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CONFLICTS OF INTEREST

There are no conflicts of interest.

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