PŮVODNÍ PRÁCE

DO 'AUTISTIC TRAITS' DETERMINE OUR CAREER CHOICE?

Determinujú „autistické črty" voľbu povolania?

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Abstract

Objectives: Autistic traits may display a continuous distribution throughout the population. The aim of the present study was to assess the prevalence of autistic traits in university students and look for possible cognitive or behavioral differences between students of humanities and sciences in the context of the extreme male brain theoryy.

Participants and setting: The AQ-10 was used as a quick screening tool in a sample of 369 individuals enrolled in four programs: Medicine (N = 107), Psychology (N = 136), Biology (N = 89) and Management (N = 37).

Hypotheses: In accordance with the extreme male brain theory, we expected students of sciences to report more autistic traits than students of humanities, as well as males in general, when compared to females.

Statistical analysis: For the statistical analysis, GraphPad PRISM was used. To assess intersexual differences and differences between the study groups in the reached AQ-10 scores, a two way ANOVA was used.

Results: Sex differences in autistic traits and a relationship between autistic traits and area of study were found. Male students reached higher scores than females ($p = 0.0016$). Male psychology students reported less autistic traits than medicine students ($p = 0.0413$) or management students ($p = 0.0292$), while female psychology students reported less autistic traits than biology students ($p = 0.0425$). The AQ-10 tool was sensitive enough to capture differences in the occurrence of autistic traits between neurotypical students of humanities and scientific programs. Our findings raise the question whether ones admission to different programs and future career pathing is determined by traits that are associated with autism spectrum disorders.

Study limitations: There are certain limitations due to the high female: male ratio (267 : 102), caused by the current decrease of interest of males to study psychology and biology, where this ratio was notably uneven.

Introduction

Recent epidemiological studies have indicated that at least one in every 100 people has some form of autism (Baird et al. 2006; Kim et al. 2011). This led to a shift away from understanding autism as a narrowly defined, categorical disorder to understanding it as a spectrum of conditions that affect individuals differently (Walsh, Elsabbagh, Bolton & Singh, 2011). The hypothesis that autistic traits may display a continuous distribution throughout the population was tested in a number of previous studies (Constantino & Todd, 2003; Constantino & Todd, 2005; Hoekstra, Bartels, Verwij & Boomsma, 2007). Autistic traits can occur even in neurotypical individuals, differing in intensity of expression. In the present study, we were looking for autistic traits in university students of normal intellect, as autism is a condition that is located somewhere on a broad spectrum including even high functioning individuals. ASD are represented by different profiles of people, including people with social difficulties but gifted in other areas (such as art, music or mathematics).

In 2001, the AQ-50 (Autism Spectrum Quotient, 50-item questionnaire) was developed for the assessment of autistic traits in adults with normal intellectual abilities (in the general population). The AQ-50 identifies key traits of five subscales clinically proven important dimensions of ASD (Autism Spectrum Disorders): social interaction, communication, attention to detail, attention switch and imagination (Baron-Cohen et al. 2001). The AQ-10 (10-item questionnaire) by Baron-Cohen and co-authors, used in the presented study, is a short version of the original 50-question AQ screening test. It is considered a brief screening instrument for autistic spectrum disorders (ASD) that can be used by frontline healthcare professionals to aid in the decision as to whether the tested person should be referred for a diagnostic assessment (Allison, Auyeung & Baron-Cohen, 2012). It is recommended in 'Autism: recognition, referral, diagnosis and management of adults on the autism spectrum' (NICE clinical guideline CG142). The ability of the AQ-10 to discriminate between individuals with and without a confirmed diagnosis of ASD was tested and proved by Booth et al. in 2013 (Booth et al. 2013), but since then there is no further proof or information about this screening tool to be used in studies, nor to examine the cognitive differences of individuals. Further, the authors discuss whether this tool would be discriminative enough when used for larger samples and advise to conduct more research. From the biological perspective, autism may be described as an extreme manifestation of certain sexually dimorphic traits as a consequence of an "extreme male brain". It was the strikingly higher incidence of autistic conditions in males, which lead to the suggestion that ASD have a strong neurobiological and genetic component associated with male sex hormones (testosterone in particular). Analogies can also be drawn between sex differences in brain development and neuroanatomical characteristics found in people with ASD.

Aim

One of the aims of the presented study was to explore the reliability or discriminative power of the AQ-10 not only as a brief screening tool but also to study possible differences in certain traits among university students based on possible

neurobiological differences pointed out in the extreme male brain theory. The research was aimed on finding intersexual differences in accordance with the "extreme male brain" (EMB) theory suggested by Baron-Cohen (2002). Assuming that students enrolled in study programs based on natural sciences (Biology and Medicine) where a more structured way of thinking (systemizing, or understanding of systems) is expected would display more autistic traits than students of humanities (Psychology, Management). Based on the EMB theory we expected a greater prevalence of autistic traits in males than in females.

Methodology

Students Sample

The tested sample was restricted to university students of normal intelligence without learning disability as the AQ-10 was designed for use in this group only. Conclusions on its discriminative power are therefore not necessarily applicable to individuals with low intellectual functioning or ASD. This group was composed of 369 students from four higher education institutions aged 17–42 years (M = 21.46, SD =2.01). In this group there was a high female: male ratio (267:102), the males were aged 18-31 years (M = 21.56, SD = 2.14), the females 17–42 years (M = 21.41, SD = 1.96). The participating first and second grade students were divided into four subgroups based on their area of study (Table 1): Medicine students (107 in total), students of humanities – students from the Faculty of Arts (mainly Psychology students, 136 in total), students of Natural Sciences – Biology students (89 in total) and Management students (students of social sciences) – this group comprised 37 participants. The students were recruited during regular classes at the Faculty of Medicine, Faculty of Arts, Faculty of Natural Sciences and Faculty of Management of the Comenius University in Bratislava (Slovakia). One of the major criteria for the enrollment into the study was that they had to be locals of Slovak origin.

Table 1   Students sample enrolled in the AQ-10 study

University affiliation / program	Males (N)	Males age M (SD)	Females (N)	Females age M (SD)	Total (N)	Sample age M (SD)
Faculty of Medicine / General Medicine	35	21.67 (1.77)	72	21.39 (1.05)	**107**	21.49 (1.33)
Faculty of Arts / Psychology	29	21.85 (2.98)	107	21.03 (2.52)	**136**	21.21 (2.64)
Faculty of Natural Sciences / Biology	17	21.71 (1.98)	72	22.16 (1.67)	**89**	22.07 (1.73)
Faculty of Management/ Management	21	20.82 (1.15)	16	20.84 (1.07)	**37**	20.83 (1.10)
Total	102	21.56 (2.14)	267	21.41 (1.96)	**369**	21.46 (2.01)

N – number of participants, M – mean, SD – standard deviation

AQ-10

The students were asked to fill out the AQ-10 questionnaire, which is a brief self-administered 10-item questionnaire used to classify individuals as being or not being in risk of having ASD. Subjects respond on a 4-point Likert scale to indicate to what extent they agree or disagree with each statement. Each of the questions represents an autistic trait. The overall score is between 0 and 10 points. A score above 6 would be indicative of the need to undertake a full diagnostic assessment with the individual.

Statistical Methods

For the statistical analysis, GraphPad PRISM was used. To assess intersexual differences in the reached AQ-10 scores, a two way ANOVA was used (confidence interval Alpha = 0.05). To assess differences between groups – based on different study programs, a two way ANOVA was used as well (Tukey´s multiple comparison test, confidence interval Alpha = 0.05). For the assessment of intersexual differences in the frequency of individuals at risk and for the assessment of differences in the number of individuals at risk between different specializations, Fishers exact test was used.

Results

A total of 369 Slovak university students (mean age 21.46 years) was tested for the presence of autistic traits using the AQ-10 screening tool. The studied group consisted of students of different university programs (Table 1).

Eleven (N = 11; 2.98%) out of the 369 students enrolled in the study scored 6 or more points in the AQ-10 questionnaire and should according to the authors of the questionnaire be referred to a specialist for a diagnostic assessment. The distribution of individuals with a score of 6 and higher (individuals that should according to the AQ-10 be considered as individuals displaying autistic traits to a greater degree than the neurotypical population; and be possibly on the autism spectrum), was as follows: 3 females (4.17 % out of 72 females) and 1 male student (2.86 % out of 35 males) at the Faculty of Medicine, 2 females (1.87 % out of 107 females) at the Faculty of Arts, 1 female (1.39 % out of 72 females) and 1 male student (5.9 % out of 17 males) at the Faculty of Natural Sciences and 3 males (14.29 % out of 21 males) at the Faculty of Management. No significant intersexual differences in the frequency of these 'students at risk of being on the spectrum ' within different study programs were assessed. Nor did gender play a role in the frequency of 'students at risk' when evaluating the whole sample (N = 369, 4.9 % out of 102 males and 2.25 % out of 267 females; *p* = 0.1850). Contrary to our expectations, the students' enrollments in a preferred program at the university didn´t play a role in the frequency of students possibly ´on the spectrum of autism´. There were no statistically significant differences in the frequency of female ´students at risk of being on the spectrum of autism´ between the faculties (colleges), nor were there any differences between male students of different faculties.

The students enrolled in the study (N = 369) reached scores from 0 to 10 points (the maximum) when answering the AQ-10. On average, a Slovak university student scored 2.4 points (Table 2). The most frequently reached score in the AQ-10 was 3 (mode = 3 for the whole group), which would indicate the presence of three different autistic traits (without taking into account the severity or intensity of expressing these habits). The number

of reported autistic traits differed between the students depending on the gender – while males reached a maximum of 10 points on the AQ-10, female students claimed to display a maximum of 7 autistic traits. The most frequently reported number of autistic traits based on the students self-assessment was 3 in females and 2 in males (with an average of 2.2 autistic traits per one female student and 3 per one male student; see Table 2). Despite of no differences in the number of 'students at risk´ between the programs, there were differences in the maximum score reached by students enrolled in different university programs. The highest scores (10 points) were reached by male Medicine students, where the mode reached 4 positively answered autistic traits, with an average of 2.7 autistic traits per one male medical student which is higher than the overall average of 2.4 per one Slovak university student. There was a statistically significant difference between scores reached by male medicine students and male psychology students ($p = 0.0413$). Besides the fact that male medicine students reached by far higher scores than male psychology students, there were no statistically significant differences in scores of male medicine students when compared to scores of male biology students ($p = 0.5777$) or male management students ($p = 0.9653$). Female medical students scored between 0 and 6 points, where most of them reported one autistic trait, with an average of 2.3 autistic traits per one female medical student. Female Biology students reached the same scores – from 0 to 6, but most of them reported 2 autistic traits, with an average of 2.6 per one female Biology student. No significant differences in the scores of female medicine students and female biology students could be assessed ($p = 0.7291$). These results may offer supportive evidence to the EMB theory regarding systemizing and the occurrence of autistic traits where both students of medicine and biology dealing with programs of natural sciences that put a greater emphasis on systemizing and system thinking show no statistically significant differences when compared (in terms of the reached AQ-10 scores). Male Biology students reached from 0 to 7 points on the AQ-10, with a higher mode of 3 and with a higher average of 2.7 autistic traits per one male Biology student. Contrary to our expectations, there were no statistically significant differences between male biology students and students of humanity subjects such as Psychology and Management.

This finding could be explained by the small size of the two samples (the male psychology students sample comprised 29 individuals and the male management students sample included only 21 individuals due to the rather moderate interest of males in studying the mentioned programs). No differences could be seen in the scores of male Biology students and male management students ($p = 0.4049$) nor male psychology students ($p = 0.7810$). Female Faculty of Arts (psychology) students scored 0 to 7 points, a majority of them positively responding to just one autistic trait, but with an average of 1.94 autistic traits per one female student. Statistically was a difference in the scores of female psychology students and female biology students ($p = 0.0425$), but no differences in the scores of female psychology students and female medicine students ($p = 0.4318$) and female management students ($p = 0.8176$). Male students enrolled at the Faculty of Arts scored fewer points than females, from 0 to 5 points, most of them with a positive respond to 2 autistic traits, with an average of 2.24 autistic traits per one male student. Differences were in the scores reached by male psychology students and male management students ($p = 0.0292$). The highest rate of autistic traits in female students was reported by female management students, displaying as many as 4 autistic traits. Despite of that, this group scored just between 0 and 4 points on the AQ-10, with an average of 2.3 autistic traits per one female, which is not very different from the overall average score of a random Slovak university student. There were no differences in the scores of female management students and female Biology students ($p = 0.9294$) or female medicine students ($p > 0.9999$). The males at the Faculty of management scored between 0 and 7 points, most frequently leaving a positive respond to 2 autistic traits (on average 3.5 autistic traits per one male student). These results may indicate slight intersexual differences in the frequency of the number of declared autistic traits – in all university programs (Figure 1), males claimed to display more autistic traits than females of the same program, with an exception of Management students. These intersexual differences in the reported scores were significant ($p = 0.0016$), with males reaching higher scores. Either this might be caused by subjectivity in one's self-assessment or a real prevalence of habits considered autistic traits in males.

Table 2   *AQ-10 scores reached by Slovak university students*

University affiliation/program	AQ-10 scores males	AQ-10 scores females	Average score per male student	Average score per female student	AQ-10 mode in males	AQ-10 mode in females
Faculty of Medicine/ General medicine	0 – 10	0 – 6	2.7	2.3	4	1
Faculty of Arts/ Psychology	0 – 5	0 – 7	2.24	1.94	2	1
Faculty of Natural Sciences/ Biology	0 – 7	0 – 6	2.7	2.6	3	2
Faculty of Management	0 – 7	0 – 4	3.5	2.3	2	4
Total (all faculties)	0 – 10	0 – 7	3	2.2	2	3

AQ-10 – 10-item Autism Quotient Questionnaire

Figure 1   AQ-10 scores reached by Slovak university students
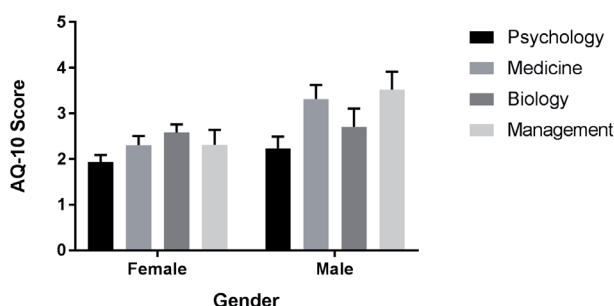
Among the most frequently occurring autistic traits are traits behind question No. 2, 3, 1 and 8, having a great prevalence in students of both genders (see Table 3 and 4). Despite of that, in male students these traits seem to have a slightly stronger prevalence (with regard to the assessed frequency). Intersexual differences in the frequency of reported autistic traits reflected difficulties or lack of skill in the social sphere as well as in attention to tasks, reported by males. More than a half (52.94 %) of male students claimed to concentrate more on the small details rather than on the whole picture. In female students this attention to detail was reported by 39.70 % ($p = 0.0256$). Regarding social skills, 24.51 % of males claimed to have difficulties

´reading between the lines´ when someone is talking to them, which was reported by only 11.24 % of the females (*p* = 0.0029); and 20.59 % of males found it hard to work out what some-one is thinking or feeling just by looking at their face, while this lack of understanding non-verbal communication was re-ported by only 12.36 % of females (*p* = 0.0497). The greatest

difference between male and female students was observed in the frequency of reported trait regarding having the ability of multitasking, which was in males very weak. Almost one half (49.10 %) of male students reported to have difficulties doing more than one thing at once, while in females this was reported by 24.34 % (*p* = 0.0001).

Table 3 *The most frequently occurring autistic traits in male Slovak university students*

%	N	Question No.	Autistic traits
52.94	54	2	They usually concentrate more on the small details rather than on the whole picture
49.02	50	3	They find it difficult to do more than one thing at once
36.27	37	1	They often notice small sounds when others do not
36.27	37	8	They like to collect information about categories of things (e.g. types of car, types of bird, types of train, types of plant etc.)
27.45	28	4	If there is an interruption they can´t switch back to what they were doing very quickly
24.51	25	5	They find it difficult to , read between the lines , when someone is talking to them
21.57	22	10	They find it difficult to work out people´s intentions
20.59	21	9	They find it difficult to work out what someone is thinking
15.69	16	7	When reading a story they find it difficult to work out the characters' intentions
10.78	11	6	They don´t know how to tell if someone listening to them is getting bored

Table 4 *The most frequently occurring autistic traits in female Slovak university students*

%	N	Question No.	Autistic trait
39.70	106	2	They usually concentrate more on the small details rather than on the whole picture
28.84	77	1	They often notice small sounds when others do not
27.72	74	8	They like to collect information about categories of things (e.g. types of car, types of bird, types of train, types of plant etc.)
24.34	65	3	They find it difficult to do more than one thing at once
23.60	63	4	If there is an interruption they can´t switch back to what they were doing very quickly
22.10	59	10	They find it difficult to work out people´s intentions
20.22	54	7	When reading a story they find it difficult to work out the characters' intentions
14.23	38	6	They don´t know how to tell if someone listening to them is getting bored
12.36	33	9	They find it difficult to work out what someone is thinking
11.24	30	5	They find it difficult to , read between the lines , when someone is talking to them

The greatest differences in the frequency of self-assessed au-tistic traits were between Psychology (Faculty of Arts) and Biol-ogy students (Faculty of Natural Sciences). In Biology students, the traits No. 9 and 10 seemed to occur significantly more often than in Psychology students. About 17.98 % of Biology students claimed to find it difficult to work out what someone is thinking or feeling just by looking at their face, in contrary to Psychology students where only about 8.09 % claimed to have these difficul-ties. 26.97 % of the enrolled Biology students claimed to have difficulties to work out people´s intentions, while about 15.44 % of Psychology students responded to this positively. Differences in responses to question No. 4 between Biology and Psycholo-gy students were even of greater significance (very significant *p* = 0.0031) – about 32.58 % of Biology students claimed that if there is an interruption, they can´t switch back to what they were doing very quickly. Only about 15.44 % of Psychology stu-dents seemed to have these difficulties. Differences of extreme statistical significance (*p* < 0.0001) were between students of Biology and Psychology in their responses to question No 7 – 34.83 % of Biology students find it difficult to work out the characters' intentions when reading a story, but only 8.09 % of Psychology students responded to this positively. On the con-trary, autistic trait No. 1 occurred statistically significantly more

frequently (*p* = 0.0238) in Psychology students than in Biolo-gy students – About 41.9 % of students enrolled in Psychology claimed to notice small sounds when others do not, in Biology students this trait occurred in 26 %. Based on these statistical-ly significant differences, Biology students seem to have some kind of disadvantage regarding social interactions and reading non-verbal communication which may predetermine them for a choice of a scientific career, which is rather system oriented.

Similar differences in the frequency of autistic traits detected between Biology and Psychology students were also observed between Medicine and Psychology students… thus underlining the scientific basis and analytical character of Medicine and Bi-ology in contrary to Psychology. In medical students traits No. 4 and 9 occurred significantly more frequent (*p* = 0.0370, *p* = 0.0121) than in Psychology students – 27.1% students enrolled in General Medicine claimed to have difficulties switching back to what they were doing after an interruption. In the group of Psychology students, 15.44 % reported these difficulties regard-ing their attention to work. Similar to Biology students, 19.63% of GM (General Medicine) students reported to have difficulties to work out what someone is thinking or feeling in a non-verbal context (just by looking at their face), which according to our expectations occurred in Psychology students significantly less

frequent (8.09%, *p* = 0.0121). About 20.56 % of GM students reported to have difficulties to figure out the characters' intentions when reading a story. This trait occurred in Psychology students significantly less frequent (8.09%, *p* = 0.0076). The greatest difference (*p* = 0.0009) could be observed (similar as in Biology students) in the frequency of positively answered question No. 1 – regarding small sounds. About 41.9% of Psychology students claimed to notice small sounds when others do not, while in Medicine students this feature was reported by 21.5 % of the students.

Differences in the frequency of reported autistic traits could also be observed between Psychology and Management students, however not as many as when compared to Medicine and Biology students. A majority of Management students (62.16%) reported to concentrate rather on small details than on the whole picture, while in Psychology students this was reported by 38.97% (*p* = 0.0150). This trait reported in management students was also significant (*p* = 0.0113) compared to the occurrence in Biology students (37.08%). Significant (*p* = 0.0137) were also the differences regarding attention to tasks – 32.43% of Management students reported to have difficulties switching back to a task after an interruption, in the group of Psychology students these difficulties were reported by 15.44%. We suggest that these differences might be due to differences in the number of enrolled Psychology and Management students, where there is a great prevalence of Psychology students. Significant differences (*p* = 0.0073) were found in the frequency of collecting behavior between these two groups. Almost one half (45.95%) of Slovak Management students claimed to collect information about categories of things (e.g. types of car, types of bird, types of train, types of plant etc). In Psychology students, this behavior was reported by 22.79% of students.

When comparing the frequency of autistic traits reported by Biology and Medicine students, differences could be assessed regarding the occurrence of only two autistic traits. The difficulty to understand the characters intentions when reading a story was reported to occur more often in Biology students (34.83%) than in Medicine students (20.56%). A great difference was observed in understanding or reading between the lines´ when talking to someone. This skill was more often (*p* = 0.0094) developed in Biology than in Medicine students. 21.5% of Slovak Medicine students reported to have difficulties reading between the lines when someone is talking to them, while only about 7.87% of Biology students reported to have this social disability.

There were no differences in the frequency of any of the reported traits between Medicine and Management students, which again might be due to the small size of the male management students sample (N = 21) when compared to the male medicine students sample (N = 35). In the here presented study intersexual differences within particular study programs were not observed due to the great prevalence of female students.

Discussion

For the purpose of discovering abnormalities and cognitive differences in university students, we decided to use the AQ-10 which is a short self-administered scale for identifying the degree to which any individual adult of normal IQ may have "autistic traits" or what has been called the "broader phenotype" (Bailey et al. 1995). We assume that since the AQ-10 is a shortened version of the AQ (a 50 item questionnaire), this tool might be discriminative enough to identify individuals with a broader phenotype (somewhere on the spectrum of autism). It´s ability to discriminate between healthy individuals and individuals with ASD was already tested by Booth et al. (Booth et al. 2013), but since then there is no further proof of the discriminative power of this 10-item questionnaire in other populations. The purpose of this study was to test its discriminative power in

relationship to the students preferred study program (i.e. their predetermined ability to systemize or empathize, and thus differences in cognition and possibly neurodevelopment as well). The AQ-10 score reached by individuals divided into 4 groups based on their enrollment in the university program and second based on gender, assesses their overall prevalence of autistic traits. Significant differences were assessed between groups of students enrolled in different study programs. According to our analysis, students of medicine and biology seemed reported a greater prevalence of autistic traits when compared to psychology students. Surprisingly, medicine students reported to have difficulties regarding non-verbal communication and social skills (as well as Biology students did). Based on these findings, we assume that this might be because both Biology and Medicine are scientific fields based on system thinking, logic and a structured way of thinking, which might be an important criterion of the selection of successful candidates when applying for this university program. Among the main characteristics of autism spectrum disorders are socio-communication difficulties, including problems in establishing social relations and the lack of understanding non-verbal communication. These features are often accompanied by restricted patterns of behavior, interests and activities (Pisula et al. 2013).

The frequency with which particular traits occurred in the studied group describes the differences between students of different specializations, focusing on particular skills and difficulties such as poor social skills, poor communication skills, exceptional attention to detail, poor attention-switching/strong focus of attention etc. The AQ-10 doesn´t measure the extent or severity of particular traits, nor does the occurrence of these traits itself replace a full diagnostic assessment. Despite of this, notably intersexual significant differences were assessed when analyzing the AQ-10 score reached by the male and female students group. Males reported more autistic traits, and this was reported by males of all study programs. Thus it seems that the chosen/ or preferred study program isn´t related to the number of displayed autistic traits (especially in males) – statistically males display more autistic traits than females, regardless of their area of interest or pursued future career. Our results are consistent with the extreme male brain theory of autism (Baron-Cohen & Hammer, 1997; Baron-Cohen et al. 1999). Which suggests a much greater prevalence of this disorder in males than in females (regardless of population background), based on intersexual differences in neurodevelopment and functioning.

While in Booth et al's study which tested the discriminative power and sensitivity of the AQ-10 comparing the results achieved by the full version of the AQ-50 with the results of AQ-10 with a positive outcome, our study is indicative of the fact that the AQ-10 might not be a reliable screening tool for ASD. Based on the reached AQ-10 score, individuals who scored 6 and more points should be referred to a diagnostics and might be considered being on the spectrum of autism – but according to our results, there were no statistically significant differences in the prevalence of these individuals between different study programs. This result is not in accordance with the expected outcome – that the prevalence of individuals being on the spectrum would be greater in the group of students enrolled in programs which require a more systematic way of thinking (Medicine, Biology) in comparison with programs that are more creative and less structured (Psychology, Management). This might be either because of subjective assessment of one's personality traits while filling out the test, or because of little sensitivity or discriminative power of the offered questions. Another limitation might be represented by the sample size – the female: male ratio was quite uneven – in all of the studied programs, there were less male students enrolled than female students. If the male students group in the four studied programs were larger,

we cannot exclude that the discriminative power of the AQ-10 would be stronger in terms of a statistically significant prevalence of male 'students at risk'.

Given that ASD traits tend to manifest more often and largely in males than in females (Mandy et al. 2011), it is likely that the discriminative power and reliability of the AQ-10 would be higher if a more numerous male non-ASD sample were used. Another possible explanation for the fact that there were no statistically significant differences between male and female students 'at risk of being on the spectrum' is that the AQ-10 might not have equivalent measurement properties in both sexes and should be more gender specific. The present AQ-10 screening test might induce a systematic over-estimation of the scores of one sex relative to the other sex (Booth et al. 2013).

When comparing our results to Baron-Cohen´s study on the use of the AQ questionnaire (Baron-Cohen, Wheelwright, Stone & Rutherford, 1999) reported sex-differences: mean total AQ score was higher in male students than in female students. 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.

When comparing our results to the study by Pisula et al. (2013) looking for autistic traits in Polish university students (but again using the 50 point AQ questionnaire). In this study, students of science scored higher than humanities, which is similar as in our study. Their results confirmed the hypothesis that autistic traits may be associated with scientific skills, which is underlined even more by our study. Moreover, studies of the AQ in different populations prove that the AQ score is in general higher in male individuals regardless of nationality or ethnicity.

Austin (2005) stated in his study that in general population sample, males scored higher than females in total AQ, social skill, communication and imagination. Thus, sex differences in AQ scores appear to be cross-cultural independent, which is in accordance with the intersexual differences in the AQ-10 scores reached by Slovak university students. This might be a supportive argument for the use of the AQ-10 as a quick screening tool even for cognitive differences (in different populations of adults).

Conclusion

According to our results, the AQ-10, which was created as a brief screening tool, might not be used to establish who is affected and who is not nor is it suitable to establish the degree of caseness of an individual. The AQ-10 might be used in scientific comparisons between groups and in rough estimates of ones self-reported habits/traits or "autistic traits" due to its discriminative power as shown in our study when comparing different groups. Exploration of sex differences in the severity of autistic traits in various groups may contribute to a better understanding of the relationship between sex and autism and between autism and cognitive differences. This research should be followed by research aimed on the correlation between autistic traits and a successful admission to different programs.

Acknowledgement

Súhrn

Predložená štúdia sa zaoberá stanovením prevalencie autistických čŕt u študentov rôznych študijných odborov, v závislosti od toho, či študujú prírodné vedy alebo humanitné vedy. Študenti, ktorí úspešne absolvovali prijímacie pohovory a následne sú zapísaní na denné štúdium, uvádzajú nie len odlišné zastúpenie, ale aj charakter autistických čŕt. Na základe výsledkov danej štúdie predpokladáme, že je 10-položkový dotazník na stanovenie kvocientu autizmu (AQ) dostatočne senzitívny na to, aby mohol byť použitý na zistenie odlišností jednotlivých čŕt medzi neurotypickými študentmi humanitných a prírodovedných odborov. Zároveň naše výsledky podporujú Baron-Cohenovú teóriu systemizácie vs. empatizácie, ktorá zdôrazňuje, že sa autistické črty vo vyššej miere vyskytujú u študentov prírodovedných odborov. Ďalej predpokladáme, že schopnosť systemizácie a prítomnosť niektorých „autistických" čŕt jedinca predisponujú na úspešné absolvovanie daného prírodovedného odboru. Taktiež sme potvrdili všeobecné známy predpoklad, že sa autistické črty vo vyššej miere vyskytujú u študentov mužského pohlavia ako u žien. Aj Baron-Cohen vo viacerých svojich štúdiách vychádza z hypotézy, že je „autistický" mozog istou extrémnou formou mužského mozgu a nazýva ho hyper-mužský mozog (tzv. EMB. Theory – Extreme Male Brain Theory). Predložená štúdia ponúka nový a odlišný pohľad na faktory, ktoré daného jedinca predisponujú na výber vysokoškolského štúdia a pravdepodobne aj pre voľbu kariéry.

Kľúčové slová: *PAS (poruchy autistického spektra), AQ (kvocient autizmu), systemizácia, autistické črty, extrémna forma mužského mozgu*

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