

Original Paper

## The Autism-Spectrum Quotient Score of students who failed clinical training

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### Abstract

There are similar features between students who have failed clinical training and persons with Asperger's syndrome, which is one of the developmental disorders. In this study, we investigated whether failure in the clinical training could be caused by developmental disorders or a autistic tendency in students. We examined 44 physical therapy students using the Autism-Spectrum Quotient (AQ). The results of the AQ score showed significant differences between the students who had failed clinical training and those who had passed the clinical training session. This indicates that a student who shows autistic tendencies has a higher risk of failing clinical training. Furthermore, discriminant analysis showed that communication skills are the most important variable to assess whether a student will pass or fail clinical training. The AQ may be a useful test to predict students' ability to cope with matters and problems associated with clinical training.

**Key words :** developmental disorder, AQ score, clinical training

### Introduction

It takes three or four years for physical therapy students to obtain their license. During this period, students have to study not only at school, but also at hospitals or at other medical institutes as part of their clinical training. Such clinical training is a very important part of the curriculum. Students can learn a great variety of things, such as the way to evaluate and treat patients, in this clinical training. All students have to undergo clinical training from the first school year through to the third and final year. In our school, students spend more than 1100 hours undergoing clinical training. Every year, five or six out of forty students fail the clinical training or have some trouble during training. Nishimoto (1997) investigated clinical training for physical therapy in Japan, and reported on the problems of students who fail. The students who failed were egocentric and could not form good relationships and effectively communicate with others. Murase (2005) emphasized the importance of having an adequate knowledge, level

of practice, and attitude for students to pass the clinical training. He said that the cause of failure in the clinical training frequently originates from the inadequate communication skills of students.

Sato (2002) reported that a lot of students with a possibility of developmental disorders enter institutions of higher education. In most cases, the teaching staff notice something unusual in these students' way of talking and behavior (Yamamoto, 2003). Since the late 1990's, the number of people diagnosed with Asperger's syndrome after they have entered adulthood has been increasing. It has become a serious problem in the field of the welfare (Sugiyama, 2005).

Asperger's syndrome is one of the Pervasive Developmental Disorders (PDD). This is defined as a group of PDD which exhibits a slighter disorder of communication compared to autism using the international diagnostic criteria. Three signs of autism are social, communication, and imagination disorder. People with Asperger's syndrome have social interactive problems. They can't look in to the eyes

of people when speaking or exchange opinions.

Recently, the autism spectrum hypothesis has been focused on. This hypothesis views autism and Asperger's syndrome as part of the same continuum. Asperger's syndrome shows intermediate features between a normal person and a person with autism (Baron-Cohen, 1995). According to the autism spectrum hypothesis, students who have failed clinical training may have potential PDD or an autistic tendency. Former studies in medical education showed that the mental stress of students is related to their failure in the clinical training (Hirose et al., 1998; Aoyama et al., 1998). However, there is no research investigating if students who failed clinical training have developmental disorders or an autistic tendency. If students who have PDD or an autistic tendency are identified before clinical training is started, teaching staff and clinical supervisors will have enough time to prepare to give them proper assistance.

To elucidate if the degree of an autistic tendency is related to failure in clinical training, we measured the Autism-Spectrum Quotient (AQ) developed by Baron-Cohen et al. (Baron-Cohen et al., 2001).

**Methods**

**Subjects and Research Design**

Forty-four physical therapy students (22 male, 22 female) were enrolled in this study. Their mean age was 23.1 years (SD=5.3, range =20-42). After explaining the purposes of this study, all subjects signed an informed consent form. After finishing the clinical training of the first term, all subjects answered the Japanese version of the AQ questionnaire (Wakabayashi, 2004). When they answered, they were instructed to complete the questionnaire as quickly as possible and not to think about it too long. Then, we divided all students into two groups, a failure group and a non-failure group. Statistical analysis was performed using SPSS 14.0 for Windows. The t-test was adopted to compare the AQ score between the two groups. Discriminant analysis was used to clearly distinguish the failure group from the non-failure group using 5 different items of the AQ.

**Autism-Spectrum Quotient (AQ)**

The AQ is a valuable instrument for mea-

suring the degree of autistic tendency. The AQ was designed to be short, easy to use, and simple to score. It comprises 50 questions, made up of 10 questions assessing 5 different areas: *social skills* (item 1, 11, 13, 15, 22, 36, 44, 45, 47, and 48); *attention switching* (item 2, 24, 10, 16, 25, 32, 34, 37, 43, and 46); *attention to detail* (item 5, 6, 9, 12, 19, 23, 28, 29, 30, and 49); *communication* (item 7, 17, 18, 26, 27, 31, 33, 35, 38, and 39); and *imagination* (item 3, 8, 14, 20, 20, 21, 24, 40, 41, 42, and 50). Each is scored as 1 point if the respondent records the abnormal or autistic-like behavior either mildly or strongly (see below for scoring each item; Abnormality=poor social skills, poor communication skills, poor imagination, exceptional attention to detail, poor attention-switching/strong focus of attention). Approximately half the items were worded to elicit a "disagree" response, and half an "agree" response in a high-scoring person with Asperger's syndrome/High function autism (HFA). As the way of scoring, "definitely agree" or "slightly agree" responses were scored with 1 point for the following items: 1, 2, 4, 5, 6, 7, 9, 12, 13, 16, 18, 19, 20, 21, 22, 23, 26, 33, 35, 39, 41, 42, 43, 45, and 46. "Definitely disagree" or "slightly disagree" responses were scored with 1 point for the following items: 3, 8, 10, 11, 14, 15, 17, 24, 25, 27, 28, 29, 30, 31, 32, 34, 36, 37, 38, 40, 44, 47, 48, 49, and 50.

A score of more than 32 points appear to be a useful cut off point for distinguishing individuals who have clinically significant levels of autistic traits. If an adult scores above 32 on the AQ, and is suffering some distress, we suggest this merits a referral to an expert clinician for a full diagnostic assessment (Baron-Cohen et al., 2001).

**Results**

The number of score stages are shown in Table 1. The mean total score, subcategory scores, non-failure group scores, and failure

Table 1 Number of score stages (n=44)

AQ score	Failure group (n=8)	Non-failure group (n=36)
More than 32	1	0
31-26	3	1
25-20	1	11
19-15	2	12
14-10	1	8
9- 5	0	4
4- 0	0	0

Table 2 Mean AQ and subscale scores (and SDs)

	Total AQ	Social skills	Attention switching	Local detail	Communication	Imagination
Male (N=22)	18.9 (4.75)	2.9 (2.18)	5.0 (1.46)	4.4 (2.21)	3.4 (1.97)	3.3 (1.80)
Female (N=22)	7.5 (7.73)	2.9 (2.67)	4.6 (2.04)	3.7 (1.86)	3.6 (2.56)	2.7 (1.52)
Total (N=44)	18.2 (6.38)	2.9 (2.41)	4.7 (1.77)	4.1 (2.04)	3.5 (2.26)	3.0 (1.67)
Failure group (N=8)	23.0 (7.86)	4.6 (2.86)	5.0 (2.88)	3.8 (2.36)	5.3 (2.60)	4.9 (1.64)
Non-failure group (N=36)	17.1 (5.59)	2.5 (2.16)	4.7 (1.85)	4.2 (1.71)	3.1 (2.04)	2.7 (1.06)

Table 3 Standardized discriminant function coefficient of 5 areas

Variable	Discriminant coefficient
Social skills	0.286
Attention switching	-0.532
Attention to detail	-0.076
Communication	0.717
Imagination	0.687

group scores are shown in Table 2.

The difference in the AQ score between the failure group and non-failure group was significant at the 0.02 level ( $p=0.017$ ).

The standardized discriminant function coefficients for the 5 areas are shown in Table 3. Examination of the standardized discriminant function indicated that subjects who showed a higher score in communication could pass the clinical training. We tried to identify eight persons who failed the clinical training using discriminating scores. As a result, we could identify seven persons out of the eight persons correctly. On the other hand, twenty-eight out of thirty-six persons who passed the clinical training were classified in to the non-failure group correctly. Overall, thirty-five out of forty-four persons (79.5%) were correctly classified in the appropriate group.

## Discussion

We investigated AQ scores for physical therapy students. As a result, there was a significant difference in the AQ score between students who did and did not experience failure in clinical training. The results suggest that students with a high autistic tendency have a greater risk of failing clinical training. However, not all students who failed clinical training have a developmental disorder. In previous research on AQ, more than 32 points in the AQ score were found to be useful cut-off points for distinguishing individuals who have clinically significant levels of autistic tendency. Judging from these cut-off points, AQ scores of seven out of eight persons who

failed the clinical training were in the normal range. Therefore, AQ cut-off points can't be used for predicting failure in clinical training.

The results of discriminant analysis showed that 79.5% of subjects were correctly classified. These results indicated that AQ is a useful self-assessment screening instrument to predict whether a student would pass or fail clinical training. Actually, a high AQ score does not prove Asperger's syndrome or HFA, because a diagnosis is merited if the individual is suffering a clinical level of distress as a result of their autistic tendency. Judgments regarding the presence of Asperger's syndrome and HFA are not important for us as teaching staff. The most important thing is to identify students who may fail clinical training before its commencement.

Discriminant analysis shows that communication is the most important variable to decide whether a student may pass or fail clinical training. This result suggests that high communication skills are needed in clinical training.

There are too many universities in Japan, and, on the other hand, the number of young people is decreasing. Therefore, numbers of university students with developmental disorders will increase. Teaching staff of universities need to have proper knowledge of developmental disorders, and be prepared to cope with them.

Ohta et al. (2001) reported that the most important things in order to treat students with developmental disorders like PDD or Asperger's syndrome are to inform them using accurate knowledge of the disorders, and give them novel and effective ways to cope. Communication skills and sociality required of persons with PDD and autistic tendency should be eliminated (Sasaki, 2005). Therefore, we have to confirm if students with PDD or an autistic tendency are able to work as physical therapists by conducting further research.

## Conclusion

In this study, we measured the degree of 44 students' autistic tendencies using the AQ. The results suggested that students with an autistic tendency had a high risk of failing the clinical training. It was also clarified that the AQ is one of the useful screening tests which can predict success or failure in clinical training. Furthermore, examination of the standardized discriminant function indicated that subjects who showed a higher score for communication could pass the clinical training. We need to think of how to support students who have failed clinical training, considering the possibility of developmental disorder and an autistic tendency.

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APPENDIX

The Autistic-Spectrum Quotient (1)

1. I prefer to do things with others rather than on my own.	definitely agree	slightly agree	slightly disagree	definitely disagree
2. I prefer to do things the same way over and over again.	definitely agree	slightly agree	slightly disagree	definitely disagree
3. If I try to imagine something, I find it very easy to create a picture in my mind.	definitely agree	slightly agree	slightly disagree	definitely disagree
4. I frequently get so strongly absorbed in one thing that I lose sight of other things.	definitely agree	slightly agree	slightly disagree	definitely disagree
5. I often notice small sounds when others do not.	definitely agree	slightly agree	slightly disagree	definitely disagree
6. I usually notice car number plates or similar strings of information.	definitely agree	slightly agree	slightly disagree	definitely disagree
7. Other people frequently tell me that what I've said is impolite, even though I think it is polite.	definitely agree	slightly agree	slightly disagree	definitely disagree
8. When I'm reading a story, I can easily imagine what the characters might look like.	definitely agree	slightly agree	slightly disagree	definitely disagree
9. I am fascinated by dates.				
10. In a social group, I can easily keep track of several different people's conversations.	definitely agree	slightly agree	slightly disagree	definitely disagree
11. I find social situations easy.	definitely agree	slightly agree	slightly disagree	definitely disagree
12. I tend to notice details that others do not.	definitely agree	slightly agree	slightly disagree	definitely disagree
13. I would rather go to a library than a party.	definitely agree	slightly agree	slightly disagree	definitely disagree
14. I find making up stories easy.	definitely agree	slightly agree	slightly disagree	definitely disagree
15. I find myself drawn more strongly to people than to things.	definitely agree	slightly agree	slightly disagree	definitely disagree
16. I tend to have very strong interests, which I get upset about if I can't pursue.	definitely agree	slightly agree	slightly disagree	definitely disagree
17. I enjoy social chit-chat.	definitely agree	slightly agree	slightly disagree	definitely disagree
18. When I talk, it isn't always easy for others to get a word in edgeways.	definitely agree	slightly agree	slightly disagree	definitely disagree
19. I am fascinated by numbers.	definitely agree	slightly agree	slightly disagree	definitely disagree
20. When I'm reading a story, I find it difficult to work out the characters' intentions.	definitely agree	slightly agree	slightly disagree	definitely disagree
21. I don't particularly enjoy reading fiction.	definitely agree	slightly agree	slightly disagree	definitely disagree
22. I find it hard to make new friends.	definitely agree	slightly agree	slightly disagree	definitely disagree
23. I notice patterns in things all the time.	definitely agree	slightly agree	slightly disagree	definitely disagree
24. I would rather go to the theatre than a museum.	definitely agree	slightly agree	slightly disagree	definitely disagree
25. It does not upset me if my daily routine is disturbed.	definitely agree	slightly agree	slightly disagree	definitely disagree
26. I frequently find that I don't know how to keep a conversation going.	definitely agree	slightly agree	slightly disagree	definitely disagree
27. I find it easy to "read between the lines" when someone is talking to me.	definitely agree	slightly agree	slightly disagree	definitely disagree
28. I usually concentrate more on the whole picture, rather than the small details.	definitely agree	slightly agree	slightly disagree	definitely disagree
29. I am not very good at remembering phone numbers.	definitely agree	slightly agree	slightly disagree	definitely disagree

APPENDIX

The Autistic-Spectrum Quotient (2)

30. I don't usually notice small changes in a situation, or a person's appearance.	definitely agree	slightly agree	slightly disagree	definitely disagree
31. I know how to tell if someone listening to me is getting bored.	definitely agree	slightly agree	slightly disagree	definitely disagree
32. I find it easy to do more than one thing at once.	definitely agree	slightly agree	slightly disagree	definitely disagree
33. When I talk on the phone, I'm not sure when it's my turn to speak.	definitely agree	slightly agree	slightly disagree	definitely disagree
34. I enjoy doing things spontaneously.	definitely agree	slightly agree	slightly disagree	definitely disagree
35. I am often the last to understand the point of a joke.	definitely agree	slightly agree	slightly disagree	definitely disagree
36. I find it easy to work out what someone is thinking or feeling just by looking at their face.	definitely agree	slightly agree	slightly disagree	definitely disagree
37. If there is an interruption, I can switch back to what I was doing very quickly.	definitely agree	slightly agree	slightly disagree	definitely disagree
38. I am good at social chit-chat.	definitely agree	slightly agree	slightly disagree	definitely disagree
39. People often tell me that I keep going on and on about the same thing.	definitely agree	slightly agree	slightly disagree	definitely disagree
40. When I was young, I used to enjoy playing games involving pretending with other children.	definitely agree	slightly agree	slightly disagree	definitely disagree
41. I like to collect information about categories of things (e. g. types of car, types of bird, types of train, types of plant, etc.).	definitely agree	slightly agree	slightly disagree	definitely disagree
42. I find it difficult to imagine what it would be like to be someone else.	definitely agree	slightly agree	slightly disagree	definitely disagree
43. I like to plan any activities I participate in carefully.	definitely agree	slightly agree	slightly disagree	definitely disagree
44. I enjoy social occasions.	definitely agree	slightly agree	slightly disagree	definitely disagree
45. I find it difficult to work out people's intentions.	definitely agree	slightly agree	slightly disagree	definitely disagree
46. New situations make me anxious.	definitely agree	slightly agree	slightly disagree	definitely disagree
47. I enjoy meeting new people.	definitely agree	slightly agree	slightly disagree	definitely disagree
48. I am a good diplomat.	definitely agree	slightly agree	slightly disagree	definitely disagree
49. I am not very good at remembering people's birthday.	definitely agree	slightly agree	slightly disagree	definitely disagree
50. I find it very easy to play games with children that involve pretending.	definitely agree	slightly agree	slightly disagree	definitely disagree

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