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SHORT PAPER

## Examining the Relationship between Selective Mutism and Autism Spectrum Disorder

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### ABSTRACT

The purpose of this study is to examine the relationship between Selective Mutism (SM) and Autism Spectrum Disorder (ASD). We conducted an individual questionnaire survey of kindergarten and elementary school teachers about the children with SM (n=17), children with ASD (n=12) and children with Typical Development (TD) (n=12) in their classes. The questionnaire included screening tests for SM, using the Selective Mutism Questionnaire-Revised (SMQ-R), and ASD, using the Autism-Spectrum Quotient (AQ). The results showed that in the SMQ-R, the scores for children with SM were significantly higher than those for other children. Meanwhile, in the AQ, the children with SM and ASD scored significantly higher than the children with TD, but no difference was observed between the two. This suggests that many children with SM are likely to show ASD traits. In future, to support children with SM, we need to find effective approaches to both the SM and ASD aspects of their condition.

<Key-words>

Selective Mutism, Autism Spectrum Disorder, Communication Problems, Relationship

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## I. Introduction

Selective Mutism (SM) refers to a difficulty speaking in social situations, despite having no problem in speaking ability generally. The problem first appears when children start to lead a social life, such as starting kindergarten or elementary school. There is a wide range of presentations of SM, from being able to speak to certain classmates, to only being able to communicate through facial expressions, or even having no means of expression at all. SM is thought to appear through a complex interaction between personality factors such as extreme anxiety and nervousness, and environmental factors such as home situations.<sup>1)</sup> In the Diagnostic and Statistical Manual of Mental Disorders, Fifth edition (DSM-5), SM is classified as an anxiety disorder. In the past, comorbid developmental disorders and SM were not diagnosed together<sup>2)</sup>; however, in the updated edition, the DSM-5 had allowed for multiple diagnoses.

It has been suggested that SM may be related to Autism Spectrum Disorder (ASD). Kristensen reports that 68.5% of children with SM are suspected of having some kind of developmental disorder/delay, of which 7.4% show characteristics of Asperger Syndrome.<sup>3)</sup> Wintgens refers to children with SM showing ASD tendencies as “Complex Selective Mutism,” suggesting this is a subtype of SM.<sup>4)</sup> These previous studies provide new perspectives to understand the issues children with SM have in social situations. However, the discussion in Kristensen focuses only on the presence or absence of characteristics of other disorders/delays coexisting with SM<sup>3)</sup>, and does not mention what effect these characteristics have on daily life, or how they are related to SM. In recent years, Steffenburg et al. have pointed out that 63% of children with SM show ASD tendencies<sup>5)</sup>, but the relationship with the degree of SM has not been explored.

In this study, we conducted a questionnaire survey of kindergarten and elementary school teachers in city B about the behavioral characteristics of children with SM, children with ASD and children with Typical Development (TD) in their classes, with the purpose of examining the relationship between SM and ASD.

## II. Subjects and Methods

### 1. Selection of subjects

A written survey request was distributed to kindergartens (n=17) and elementary schools (n=41) in B city. First, we investigate the number of children with SM attending these schools. Illustrative examples, based on the diagnostic criteria of the DSM-5 were provided to gauge the teachers' level of understanding regarding SM. These examples explained that SM refers to social situations in which a child is consistently unable to speak or move, such as during kindergarten or school, despite being able to speak naturally at home. The identification of children with SM was based solely on the views

of the school personnel, regardless of the presence or absence of a formal SM diagnosis. In cases in which a child had been given this diagnosis, survey respondents were asked to provide this information. For classes where there were applicable children, we asked the class teacher to answer an individual questionnaire (see below). We received responses from 51 schools or kindergartens (response rate 87.9%) and confirmed that there were 20 children with SM in 13 schools or kindergartens.

Subsequently, the previous questionnaire was sent again to the classroom teachers of children with SM, and they were asked to evaluate children with TD and ASD in the same class. Then, one typically developing child of similar age was randomly chosen, irrespective of gender. Additionally, children with a formal ASD diagnosis from a medical facility were selected, irrespective of gender. Ultimately, responses were received from ten kindergartens and elementary schools (76.9% response rate) regarding 17 children with SM (including two with formal diagnoses). Responses regarding 12 children with TD and 12 children with ASD were also received. There were no omissions or missing values in the teachers' responses to either questionnaire (Table 1).

In the survey request document, we made it clear that 1) the responses received would be processed statistically, and 2) the privacy of children and teachers would be respected. The respondents participated in the survey voluntarily.

<Table 1> Characteristics of Participants

	SM Group (n=17)	ASD Group (n=12)	TD Group (n=12)
Age Median (min-max)	7.3 (4.1-10.8)	8.1 (4.7-11.4)	6.8 (4.6-11.7)
Sex M/F	7/10	10/2	4/8

## 2. Questionnaire

Cover sheet: Age, gender

Degree of SM: We conducted the Selective Mutism Questionnaire-Revised (SMQ-R). This is a screening test designed to ascertain the degree of SM.<sup>6)</sup> We used the version translated into Japanese.<sup>7)</sup> This test is made up of three areas: School, Home/Family and Public/Social. In this study, we asked the six questions in the "School" area. The responses were on a four-point scale (Never: three points; Seldom: two points; Often: one point; Always: no points) making a total of 18 points (a higher score indicating a more severe degree of SM).

Tendency to ASD: We conducted the Autism-Spectrum Quotient (AQ) Japanese Children's Version.<sup>8)</sup> The AQ is a screening test designed to ascertain ASD traits.<sup>9)</sup> It is

made up of five areas (Social Skill, Attention Switching, Local Details, Communication and Imagination), with ten questions in each area (total 50 questions, 50 points). In this study, we asked 40 questions, excluding the ten questions in the Communication area. These were excluded because many of the questions in the Communication area are based on the assumption that the subject speaks. The responses were on a four-point scale (definitely agree, slightly agree, slightly disagree, definitely disagree), scored based on the instructions, making a total of 40 points (a higher score indicating a higher tendency to ASD).

### 3. Statistical tests

Comparisons between two groups were done using the Mann-Whitney U test. The three groups were compared using the Kruskal-Wallis test, and where a significant difference was found between groups, the Bonferroni method was applied. Spearman's correlation analysis was performed to examine the correlations. Statistical significance was defined as a  $p$  value of less than 0.05 in all cases.

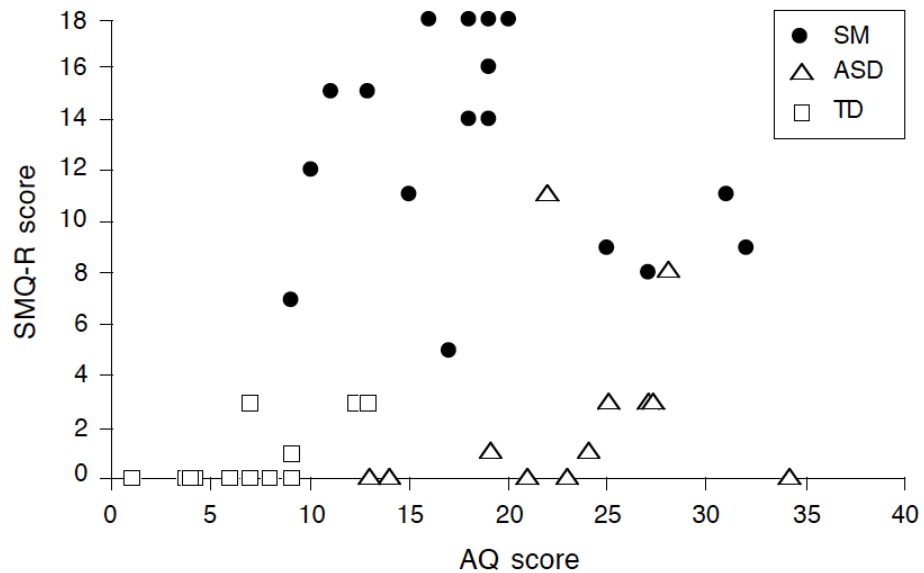
## III. Results

Figure 1 shows the distribution of the SMQ-R score and AQ score for the three groups. The distribution shows general patterns for each of the three groups. For the SM group, the SMQ-R score and AQ score are both distributed at the high end (upper right of the graph). For the ASD group, the SMQ-R score is distributed at the low end, and the AQ score is distributed at the high end (lower right of the graph). For the TD group, the SMQ-R score and AQ score are both distributed at the low end (lower left of the graph).

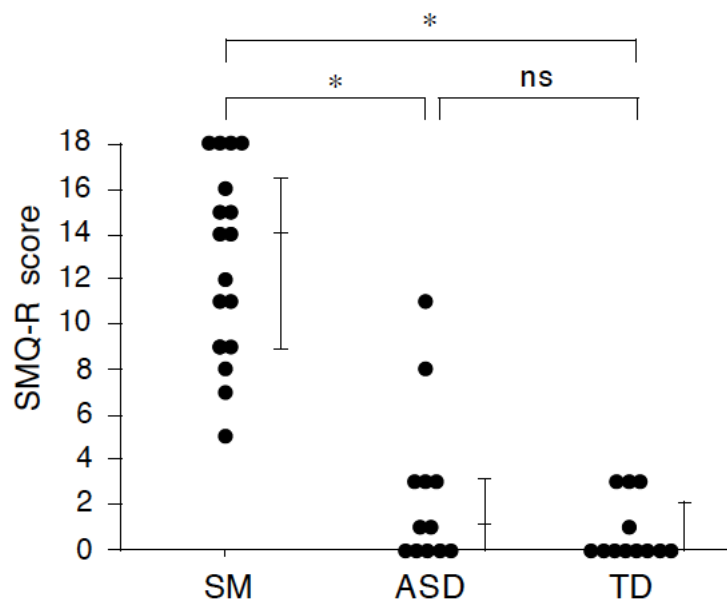
The median value (minimum-maximum) of the SMQ-R score was 14.0 (5.0-18.0) for the SM group, 1.0 (0-11.0) for the ASD group and 0 (0-3.0) for the TD group. Because a significant difference was observed between the groups ( $p < 0.01$ ), we performed a multiple comparison. The result showed that the SM group scored significantly higher than the ASD group ( $p < 0.01$ ) and the TD group ( $p < 0.01$ ), but no significant difference was found between the ASD group and TD group (Figure 2).

The median value (minimum-maximum) of the AQ score was 18.0 (9.0-32.0) for the SM group, 23.5 (13.0-34.1) for the ASD group and 7.0 (1.0-13.0) for the TD group. Because a significant difference was observed between the groups ( $p < 0.01$ ), we performed a multiple comparison. The result showed that the SM group and ASD group both scored significantly higher than the TD group ( $p < 0.01$ ), but no significant difference was found between the SM group and ASD group (Figure 3). In terms of differences between the SM group and ASD group in the four areas of the AQ, for Attention Switching only, the ASD group scored significantly higher than the SM group ( $p < 0.01$ ), but for the other areas, no significant difference was observed (Figure 4).

When we examined the correlation between the SMQ-R score and AQ score for the SM group, we did not find any correlation between the two scores ( $r=-0.20$ ).

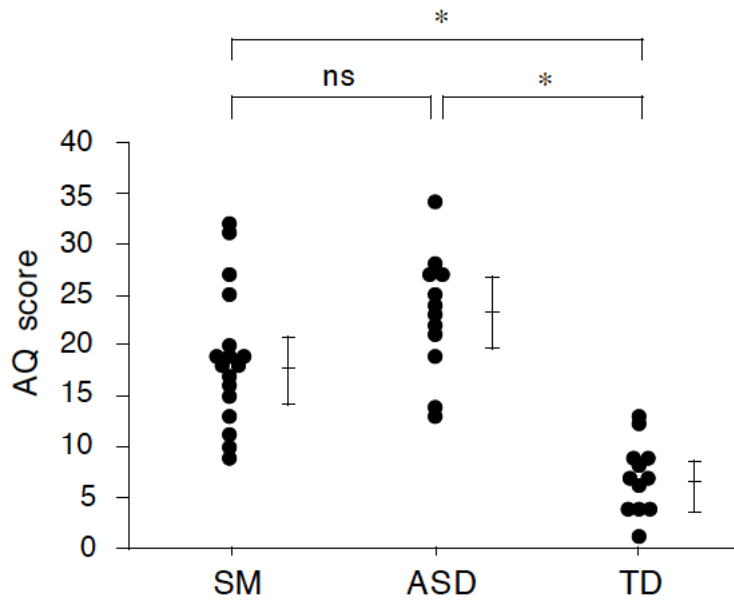


< Figure 1 > Distribution of SMQ-R and AQ score in SM, ASD, and TD groups



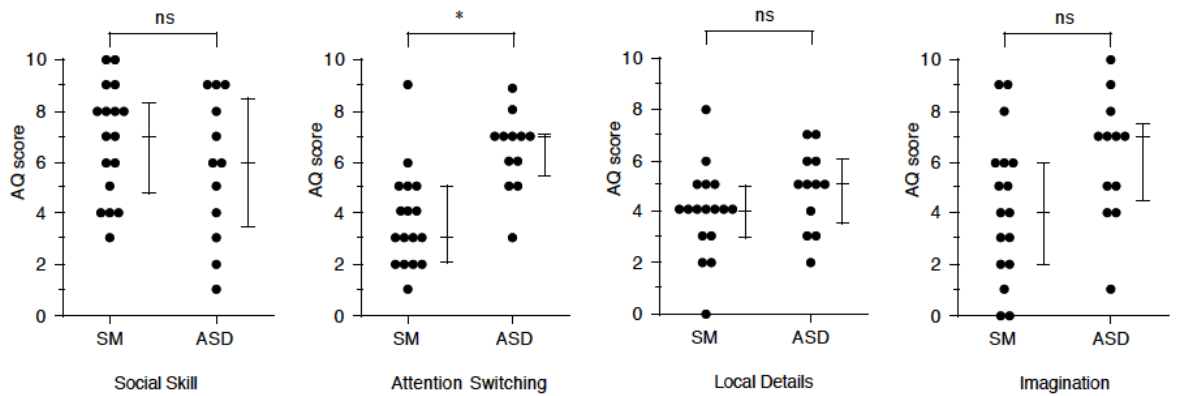
< Figure 2 > SMQ-R score in SM, ASD, and TD groups Each bar indicates the median with range from the 25th to 75th percentiles.

\* , $p < 0.01$ ; ns, not significant



<Figure 3> AQ score in SM, ASD, and TD groups Each bar indicates the median with range from the 25th to 75th percentiles.

\* , $p < 0.01$ ; ns, not significant



<Figure 4> AQ subscale score in SM and ASD groups Each bar indicates the median with range from the 25th to 75th percentiles.

\* , $p < 0.01$ ; ns, not significant

#### IV. Discussion

The purpose of this study was to examine the relationship between SM and ASD. We asked kindergarten and elementary school teachers to evaluate the degree of SM (SMQ-R) and tendency to ASD (AQ) for children with SM, children with ASD and children with TD in the same class.

Comparing the SMQ-R scores, the SM group had a significantly high score, and there was no difference between the ASD group and TD group. This shows that children in the SM group have difficulty communicating verbally in social situations, in other words, have a severe degree of SM. Meanwhile, comparing the AQ scores, the SM group and ASD group both scored significantly higher than the TD group, but no difference was found between the SM group and ASD group.

In the AQ, the cut-off point for ASD is set as 25 points (out of a maximum 50 points).<sup>8)</sup> In this study, although we excluded the questions in the Communication area (maximum 40 points), the median values were 18.0 for the SM group and 23.5 for the ASD group, so both values were close to the cut-off point. It has previously been suggested that SM and ASD are related, and Steffenburg et al. pointed out that 63% of children with SM show characteristics of ASD.<sup>5)</sup> Similar results were obtained in this study.

Since we did not find any correlation between the SMQ-R score and AQ score for the SM group, it cannot be said that a higher (or lower) degree of SM is linked to a higher (or lower) tendency to ASD. Furthermore, in the comparison of AQ scores for each area for the SM group and ASD group, no difference was found between the two groups in the three areas, except for Attention Switching. Baron-Cohen points out that there are individual differences in AQ scores.<sup>10)</sup> In fact, if we focus on the distribution of AQ scores for the SM group and ASD group (Figure 4), there were variations in the scores in each area for both groups. These facts suggest that children with SM and showing ASD traits exhibit behavioral traits of ASD in general, and not in a particular area.

From these findings, we can conclude that although children with SM are likely to display a tendency to ASD, no correlation can be found between the degree of SM and the tendency to ASD. Therefore, when considering specific strategies to support children with SM, it is first necessary to measure the state of SM and ASD on independent scales.

Our finding that “many children with SM show a tendency to ASD” will provide a new perspective in considering support strategies. In other words, to help children with SM adapt to school life, we need to offer support that includes approaches to ASD traits, not just approaches to the inability to speak. This approach is seldom attempted currently. To help children with SM to adapt to school life, the authors suggest to explore effective approaches from both the “inability to speak” and “ASD tendency” aspects. This could be an opportunity to reconsider the core problems in school life for children with SM.



Due to the small sample size, future research should replicate this study using a larger sample. Additionally, research involving participants with a formal medical diagnosis of SM would allow us to bolster the validity of these results.

### Acknowledgment

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