

# Analysis of the Personality Diagnostic Test in Children with Severe Allergic Rhinitis

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## Abstract

Pediatric allergic rhinitis is a disease characterized by paroxysmal sneezing, runny nose, and nasal obstruction. In addition, there can be mental/psychological problems, but these aspects have not been precisely clarified. We investigated the psychological characteristics of children with severe pediatric allergic rhinitis. The subjects were 40 children with drug-resistant severe pediatric allergic rhinitis. Personality diagnostic tests were conducted using the TS-type infant/child character diagnostic test method. Compared with normal children, children with severe allergic rhinitis had more emotional instability (i.e., lack of confidence in daily life and strained tension), a greater lack of self-control (i.e., outrageous anger induced by immature control of emotions and a lack of self-suppression), and more dependency (i.e., a lack of independence from parents and surrounding people, and a lack of desirable social development during childhood). Instability at home was also observed. These results suggested that severe allergic rhinitis affected mental and personality traits of children. Therefore, it might be important to take these mental/psychological problems into consideration while considering the medical treatment of these patients.

## Keywords

- ▶ pediatric allergic rhinitis
- ▶ nasal obstruction
- ▶ mental aspect

## Introduction

Pediatric allergic rhinitis is a disease characterized by paroxysmal repetitive sneezing, rhinorrhea, and nasal congestion. It has several adverse impacts, both physically and mentally.<sup>1</sup> Daytime rhinitis symptoms decrease the quality of life of patients at school and at home, and the symptoms generally become worse at night.<sup>2</sup> It has been suggested that sleep disorders and sleep-related breathing disorders due to nasal obstruction and rhinorrhea can cause reduction in high-order brain function and exert an irreversible influence on brain development.<sup>3,4</sup> Pediatric allergic rhinitis lowers patients' quality of life due to many complications, such as nocturnal enuresis, attention deficit, hyperactivity disorder, aggression, and poor academic performance.<sup>5</sup> However, the actual extent to which pediatric allergic rhinitis affects the mentality of the patients was not fully clarified.

In this study, we aimed to clarify the actual condition of personality and psychological traits of pediatric patients

with severe to most severe allergic rhinitis receiving treatments at our outpatient clinic. We performed the personality diagnostic test and based on the obtained results, proper treatment of pediatric allergic rhinitis was discussed.

## Subjects and Methods

### Subjects

The study subjects included 40 pediatric patients (33 males and 7 females) with severe to most severe allergic rhinitis. They received treatment at our outpatient clinic between January 2011 and November 2013. The patients were 6 to 12 years old (mean age, 10 years). The severity of allergic rhinitis was determined in accordance with the Severity Classification of Allergic Rhinitis provided by the Japanese Society of Allergology.<sup>6</sup> All pediatric subjects had treatment-resistant symptoms, which means that they had persisting nose symptoms despite receiving the conservative treatment

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recommended by Glenis (including nasal irrigation at home, intranasal glucocorticoid, and oral medication such as anti-allergic drugs or leukotriene antagonists<sup>7</sup>) for 3 months or more. In addition, all subjects are diagnosed as having severe (3+; mouth breathing caused by nasal obstruction) or most severe symptoms of nasal congestion (4+; completely obstructed throughout the day) based on the severity classification provided by the Japanese Society of Allergology. Nasal cavity examination revealed the following: (1) severely swollen mucous membrane of the inferior turbinate, septum, and bottom and (2) almost no ventilation. Furthermore, the positive rates for specific IgE against mites and cedar pollen were 85 and 77.5%, respectively (antibody titer  $\geq 0.70$  U<sub>A</sub>/mL was considered positive). In 11 cases in which nonspecific IgE was measured, the average value was 697 U<sub>A</sub>/mL. In addition, the adenoid–nasopharyngeal ratio was  $0.5 \pm 0.1$ , and hypertrophy of the palatine tonsils was below class II according to the Mackenzie's classification, indicating that the obstruction in the nasal cavity was more severe than that in the nasopharynx or oropharynx.

Of the included subjects, 23 subjects had no medical history, 10 had asthma, 2 had atopic dermatitis, 2 had both asthma and atopic dermatitis, 1 had Kawasaki disease, and 2 had other diseases.

### Personality Diagnostic Test

To test personality and psychological traits, the TS-type Infant and Child Personality Diagnostic Test<sup>8</sup> was used. This test is composed of a questionnaire regarding the personality and behaviors of infants and children and evaluates their behavioral patterns by the parents/guardians of the child. The questionnaire comprises a total of 139 questions that can be answered as “yes” or “no.” The first edition of the questionnaire was created by Takagi and Sakamoto in 1962 and revised in 1997.<sup>8</sup> We used the revised version in this study. We implemented this test because it is not burdensome for participants and the interpretation of the test results is relatively easy. In addition, no age-related effects are noted because the test results are represented as percentile ranks converted from raw scores using an age-specific conversion table. The percentile ranks indicate the percentage of subjects who scored above a certain raw score in a group of children of the same age. For example, when a certain raw score corresponds to the 40th percentile rank, it indicates that 40% of the subjects in that group acquired a higher raw score than the tester's raw score. In this study, a lower raw score corresponded to higher percentile rank, indicating a child had no particular problems. Conversely, a higher raw score corresponded to lower percentile rank, indicating that a child required some consideration. According to the information of the test, 1,209 children (577 males and 632 females) from three elementary schools in Tokyo participated in the test for the standardization of the test.

This test comprises 10 behavioral characteristics (histrionic, nervousness, emotional instability, autonomy, dependency, regression, aggression, sociality, family adjustment, and school adjustment) and 3 basic indicators (constitutional, personal, and social stability), and each of these traits is evaluated by percentile ranks of 1 to 99 using the age-

specific conversion table (►Fig. 1). The different ranges of percentile ranks indicate the following:  $\geq 1\%$  to  $\leq 10\%$ , showing an extremely striking behavioral pattern and sufficient consideration is necessary for their nursing and education (Group A);  $>10\%$  to  $\leq 30\%$ , requires care and some consideration is needed (Group B);  $>30\%$  to  $\leq 70\%$ , a striking pattern is possible, but it is rather common at that age (Group C); and  $>70\%$  to  $\leq 99\%$ , no exceptional issues (Group D).

In this study, we instructed the parents/guardians of the study subjects to answer the 139 questions as “yes” or “no”; the number of “yes” was calculated as the raw score, which was converted to a percentile rank using the conversion table.

### Ethical Consideration

Before conducting the survey, all pediatric subjects and their parents/guardians were explained the contents and significance of the survey in written and oral forms, following which consent was obtained. The study was approved by the Ethics Committee of the Nose Clinic Tokyo.

### Statistical Analysis

Mann-Whitney *U*-test was employed for statistical analyses using a JMP 11 (SAS institute, Inc., Cary, NC). A *p*-value of  $<0.05$  was considered as statistically significant throughout the present study.

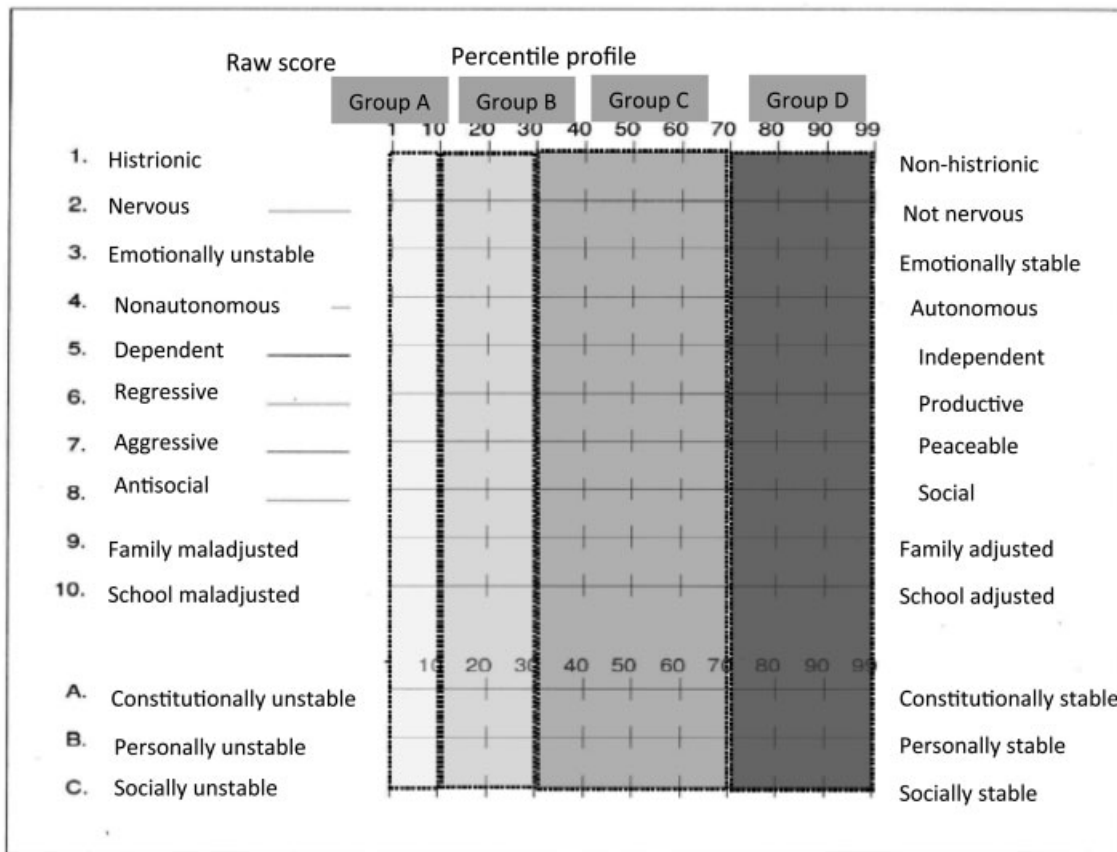
## Results

►Fig. 2 presents the mean and standard deviation values of the percentile ranks of each of the test items of 40 children with severe to most severe allergic rhinitis. A percentile rank is a numerical value that indicates the percentage of children under a certain score to represent a child's position in a group of same-aged children. The subjects with severe or most severe allergic rhinitis had a percentile rank of 50 percentile or below, which was below the average rank of same-aged children, in 8 of the 13 items including histrionic, emotional instability, autonomy, dependency, regression, family adjustment, constitutional stability, and personal stability.

The percentage of the children classified into the four groups (Groups A–D) is shown in ►Fig. 3.

The subjects of Group D scored a percentage of 20 to 30% for each item; however, the score was approximately 40% for the items of school and socially maladjusted. Furthermore, the percentages of the subjects of Groups A and B were as follows: emotionally unstable, 47.5%; autonomous, 47.5%; dependent, 50%; regressive, 35%; family maladjusted, 57.5%; school maladjusted, 40%; personally unstable, 40%; and constitutionally unstable, 55%. All percentages were higher than the standard percentage of 30%. In addition, Group A, the group of children below the 10 percentile rank, had the following percentages: nervous, 15%; emotionally unstable, 20%; autonomous, 20%; dependent, 20%; regressive, 20%; aggressive/impulsive, 12.5%; antisocial, 20%; family maladjusted, 20%; constitutionally unstable, 35%; personally unstable, 22.5%; and socially unstable, 12.5%. These percentages are higher than the standard percentile value of 10%.

## Personality diagnostic test profile



**Fig. 1** Percentile profile of TS-type infant and child personality diagnostic test. The 13 mental items were divided into the following four groups for examination. Group A ( $\geq 1\%$  to  $\leq 10\%$ ): showing an extremely striking behavioral pattern and sufficient consideration is necessary for their nursing and education. Group B ( $> 10\%$  to  $\leq 30\%$ ): attention is necessary and some consideration is needed. Group C ( $> 30\%$  to  $\leq 70\%$ ): a striking pattern is possible, but it is rather common at this age. Group D ( $> 70\%$  to  $\leq 99\%$ ): no exceptional issues.

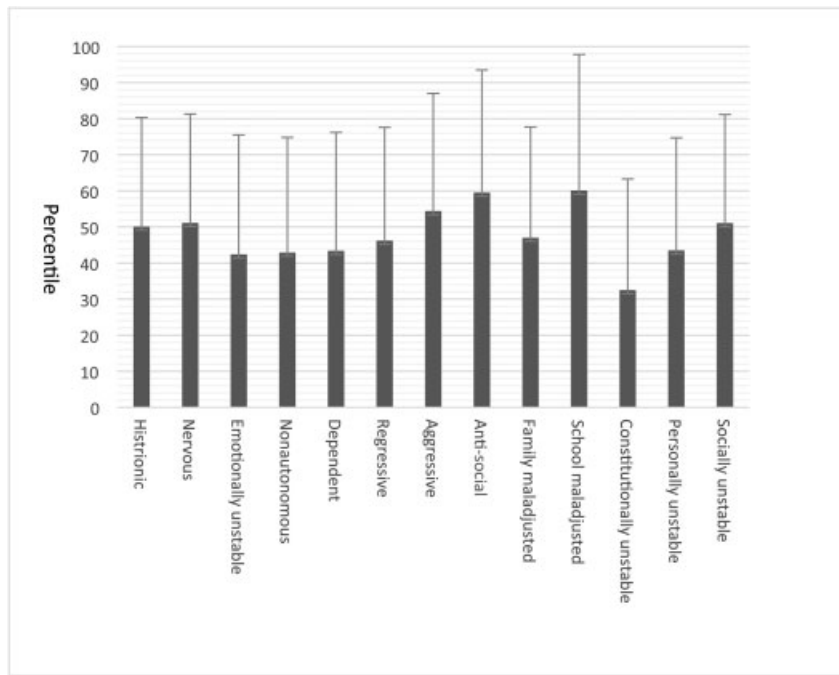
In addition, considering the influence of medical history, the groups with atopic dermatitis (4 cases) and asthma (12 cases) were compared with that without atopic dermatitis or asthma (26 cases). Notably, the comparison performed with Mann-Whitney *U*-test of the percentile ranks of these groups did not show a significant difference in terms of any of the items.

## Discussion

In this study, we investigated the effect of severe pediatric allergic rhinitis on the mental and psychological aspects of affected children using the personality diagnostic test. The results showed that the group of patients that exhibited an extremely striking behavioral pattern and required sufficient consideration (Group A) had a percentile rank of 10 to 20% for all 13 items, particularly emotional instability, autonomy, dependency, family maladjustment, constitutional instability, and personal instability, and more than 40% of the subjects were in the group that required sufficient consideration or the group that required some consideration (Groups A and B). From the above, the subjects with severe to most severe allergic rhinitis tended to be more emotionally unstable (i.e.,

lack of confidence in daily life and strained tension), have a greater lack of self-control (i.e., outrageous anger induced by immature control of emotions and a lack of self-suppression), and be more dependent (i.e., a lack of independence from parents and surrounding people, and a lack of desirable social development during childhood) when compared with children of the same age. An instability at home was also observed. Deterioration of the functions of the frontal association area is considered a possible reason for such results in this survey. The cause of the mental and psychological disorders is unclear. But, children with severe to most severe allergic rhinitis have symptoms such as constant nasal congestion, frequent mouth breathing, and snoring in many cases. Masuda also suggested that allergic rhinitis is a risk factor for snoring.<sup>9</sup> In addition, it has been reported that even in the absence of respiratory disorder, awakening stimulus caused by mouth breathing due to nasal congestion while sleeping is transmitted to the brain, affecting the quality of sleep.<sup>10</sup> Deterioration of the quality of sleep weakens the functional connection between the frontal association area and amygdala, which is responsible for controlling emotions.<sup>11</sup>

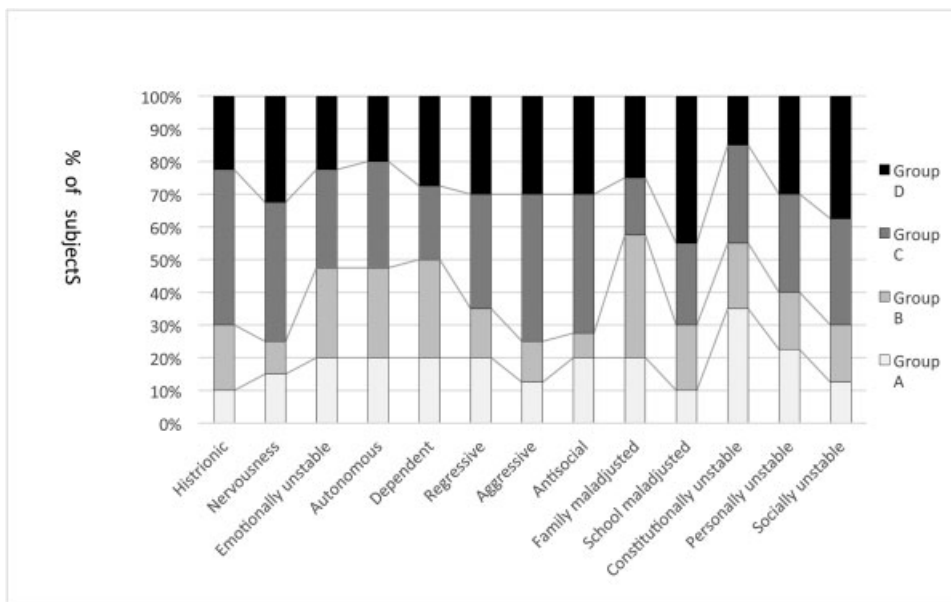
As a limitation of this study, the severity classification of allergic rhinitis used to evaluate the severity of patients with



**Fig. 2** Average percentile of the personality diagnostic test results of children with severe or most severe allergic rhinitis. The percentile ranks of the mean and standard deviation values of each item of the personality diagnostic conducted in 40 children with severe or most severe allergic rhinitis are shown. Eight of the 13 items, including histrionic, emotional instability, lack of autonomy, dependency, regression, family maladjustment, constitutional instability, and personal instability, had a rank of 50th percentile or below, which were below the average values of same-age children.

pediatric allergic rhinitis was originally intended for adults. Therefore, although accurate information could be obtained from parents/guardians regarding nasal congestion, it was difficult to obtain accurate information about sneezing and rhinorrhea. Thus, the development of a severity classification for pediatric allergic rhinitis is needed in the future.

The current situation of children with severe to most severe allergic rhinitis can be summarized as follows. The physical characteristics of such children include mouth breathing and the associated adenoid facies, small jaw, prominent upper front teeth, and elevated lower jaw due to mouth breathing resulting in the center of the gravity of



**Fig. 3** Personality diagnostic test results of children with severe to most severe allergic rhinitis. The percentage of the number of children is shown for each group: Groups A–D. The percentages of Groups A and B, in which children need some consideration, were as follows: emotionally unstable, 47.5%; autonomous, 47.5%; dependent, 50%; family maladjusted, 57.5%; school maladjusted, 40%; personally unstable, 40%; and constitutionally unstable, 55%; all percentages were higher than the standard value of 30%.

the head shifting backward and leading to poor posture.<sup>11</sup> These children prefer strong tastes and flavors due to hyposmia associated with nasal obstruction, and during meals they swallow without chewing because they need to breathe through the mouth while eating. Furthermore, they find difficulty in focusing in class as they tend to frequently blow their nose, which hinders their school life. In addition, there have been many studies worldwide, including that of Japan, reporting that sleep disorders associated with nasal obstruction result in learning disabilities.<sup>12</sup> A nationwide survey in Japan targeting elementary school children revealed that nasal obstruction and snoring are associated with restlessness, and snoring is further associated with deterioration in learning motivation.<sup>13</sup> Thus, pediatric allergic rhinitis tends to cause various impacts depending on the severity of the symptoms and to lower quality of life. It is hypothesized that all these factors were reflected in the results of the personality disorder test used in this study.

The results of this study revealed the personality and psychological traits of children with severe to most severe allergic rhinitis, but the cause of the traits may not necessarily solely be derived from rhinitis, although rhinitis is believed to be highly involved considering the extent to which its symptoms affect such children. It is a common belief that the personality of an individual is influenced by genetic factors, family environment, educational policies of parents, existence of siblings, and medical history including atopic dermatitis and asthma. Therefore, if rhinitis treatment administered to children with severe to most severe rhinitis improves the symptoms, such that it could lead to a change in their personality traits to the standard ones, rhinitis could be determined as a causative factor. However, there is no report confirming this to date, warranting further studies.

Regarding medical history, there were four cases with atopic dermatitis and 12 with asthma, which are relatively small numbers and were limited to only reference values, but there was no significant difference in the results of the personality diagnostic test in terms of concurrent atopic dermatitis or asthma. Furthermore, there was no association between the concurrent atopic dermatitis and asthma and the test results that showed many of the children with severe to most severe allergic rhinitis to be categorized in the group that required consideration in items including emotionally unstable, non-autonomous, dependent, and family maladjustment.

In addition, in some recent reports in the literature, an association between attention-deficit hyperactivity disorder (ADHD) and pediatric allergic rhinitis has been suggested. Chou et al compared the prevalence of allergic rhinitis between the general population and ADHD patients in Taiwan and found it to be 15.2% in the general population and 28.4% in ADHD patients, indicating that it was significantly higher in ADHD patients. On the other hand, the prevalence rates of asthma in ADHD patients and general population were 9.6 and 6.4%, respectively; the prevalence of atopic dermatitis was 4.5% in ADHD patients and 4.7% in the general population, indicating neither asthma nor atopic dermatitis has a significant difference in this regard.<sup>14</sup> In

addition, Brawley et al demonstrated that 80% of 30 patients diagnosed with ADHD had allergic rhinitis symptoms, whereas 43% had the typical physical features of allergic rhinitis and 100 had atopic family history, indicating the possibility that evaluation and treatment of allergic rhinitis are beneficial for ADHD patients.<sup>15</sup>

Schmitt et al reported that based on the increase in the prevalence of atopic diseases (e.g., eczema, rhinitis, and asthma) over the past several decades and the fact that a worldwide increase in diagnosed cases of ADHD exists in parallel, they systemically reviewed 20 studies regarding the association between ADHD and atopic diseases. As a result, they concluded that eczema had a stronger correlation with ADHD than rhinitis or asthma and that pruritus from eczema is the major cause of sleep disorders in the early stages of life, causing ADHD symptoms; this suggests the importance of studying the association between eczema and ADHD in the future.<sup>16</sup>

Overall, we observed that there is no unified view regarding ADHD and allergic rhinitis to date, although an association has been suggested.

## Conclusion

We performed the TS-type infant and child personality diagnostic test to investigate the effects of severe allergic rhinitis on the mental and psychological aspects of children. Psychological disorders such as emotional instability, lack of self-control, dependency, and psychological instability at home were observed. Therefore, it might be important to take these mental/psychological problems into consideration while considering the medical treatment of these patients.

### Conflict of Interest

None declared.

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