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Original Article

Evaluating the Coping Behavior of Children with Psychosomatic Disorders under Frustrating Situations Simulated Using the Rosenzweig Picture-Frustration Study

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Psychosomatic disorders are influenced by psychosocial factors such as interpersonal relationships. Coping behaviors, especially in frustrating situations, reflect a patient's ability to cope with stress, and it is important to assess these behaviors for the treatment of psychosomatic diseases. This study aimed to clarify the interpersonal relationships and coping behaviors of pediatric patients with psychosomatic diseases during frustrating situations simulated using the Rosenzweig Picture-Frustration study. This retrospective study included 126 patients (41 male, 85 female) with an average age of 12.9 (6-16) years who were consulted at the Department of Pediatric Psychosomatic Medicine at Okayama University Hospital from 2013 to 2018 and underwent the P-F study. Each score was compared with a standardization sample. The mean group conformity rating did not differ significantly between the participants and healthy children. Compared with healthy children, those with psychosomatic diseases were less likely to explain their perspective. The children with psychosomatic disorders responded to frustrating situations in a sensible and age-appropriate manner. However, they were less likely to respond by explaining their perspective to protect themselves.

Key words: psychosomatic disorder, picture-frustration study, children, projective technique, group conformity rating

Psychosomatic disorders are physical disorders, conditions, or diseases in which psychosocial factors play a significant role. According to the definition by the Japanese Society of Psychosomatic Medicine (1991), a psychosomatic disease is defined as "Indicates a physical diseases in which psychosocial factors are deeply involved in the onset and course of the physical disease and organic or functional impairment is observed, excluding physical symptoms caused by psychiatric disorders such as neurosis and depression" [1]. Under the influence of psychosocial stress, children are more likely to develop physical symptoms as well as emotional and behavioral changes because they are still growing. For this reason, the definition of psychosomatic diseases by the Japanese Society of Pediatric Psychosomatic Medicine (2014) includes "all conditions that present with physical symptoms in children with psychosocial factors being involved in the onset and course"; psychosomatic diseases "may involve develop-

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mental and behavioral problems and psychiatric symptoms" [2]. Therefore, in addition to diagnosing and treating physical illnesses, it is necessary to understand the child's psychological and developmental characteristics and to consider environmental factors at home, school, and other settings during the treatment of psychosomatic diseases.

Interpersonal problems are among the most important psychosocial factors to be considered during treatment. In particular, psychological stress is more likely to occur in conflict situations, and coping behavior usually reveals the individual's personality traits. Therefore, several studies have investigated personality traits and coping behavior patterns of patients, and some studies have reported personality traits in adult patients with psychosomatic disorders. Patients with psychosomatic disorders have been found to exhibit a perfectionist and immodithymic personality [3], type A behavioral patterns [4], overadaptation characteristics, and alexithymia. Overadaptation is defined as an individual's attempt to fully meet the demands and expectations of the environment. Additionally, overadaptive individuals try to meet external expectations and demands even when society or their environment violently suppressrs their needs [5]. Alexithymia is a personality trait proposed by Sifneos [6] that is characterized by difficulty in recognizing one's feelings (emotions) and expressing them in words, and it is accompanied by a lack of introspection.

In contrast, there are only a few reports on these personality traits and coping behavior patterns in children. Studies on psychosomatic disorders in children have revealed that students (adolescents) with psychosomatic complaints have higher scores on the Egogram Adapted Child (AC) scale [7]. AC is associated with overadjustment, and AC is characterized by troublesome interpersonal relationships with maladjustment, depressed mood, and a tendency to overadapt [8]. Previous studies have shown that children with psychosomatic disorders exhibit overadjustment and alexithymia [9]. The association between psychosomatic disorders and alexithymia conforms with our own experience, since we have often observed that our pediatric patients with psychosomatic disorders have difficulty recognizing psychosomatic correlations and talking about themselves. However, we recently observed cases in which some affected children were passive and unable to act positively in interpersonal relationships, which is difficult to consider an overadaptation.

Therefore, we considered using the Rosenzweig Picture-Frustration study (P-F study) as a method of assessing coping behaviors. The P-F study is a test assessing the characteristics of coping behaviors in frustrating situations. However, analyses of the characteristics of the P-F study in children with psychosomatic diseases are few and limited to reports on diabetes [10] and on sick children who had undergone bone marrow transplants [11]. Additionally, some analyses using the P-F study have report lower group conformity ratings (GCR)% in children with psychosomatic disorders [12, 13]; however, these studies included fewer than 50 subjects and did not include quantitative data analyses.

Here we used the P-F study to characterize the interpersonal coping behaviors of children with psychosomatic diseases in frustrating situations. We hypothesized that understanding the coping behavior of children with psychosomatic diseases in frustrating situations may be useful in their treatment.

Methods

Subjects. This study initially enrolled 173 children analyzed using an initial P-F study (Children's Form) at the Department of Child Psychosomatic Medicine of the Okayama University Hospital, Japan, from April 2013 to March 2018. After screening, 126 (41 male, 85 female) children fulfilled the criteria set in this research, as described below (Figure 1).

The inclusion criteria were as follows: (a) Intelligence Quotient (IQ) $\geqq 70$, assessed using the Wechsler Intelligence Scale for Children Fourth Edition or the

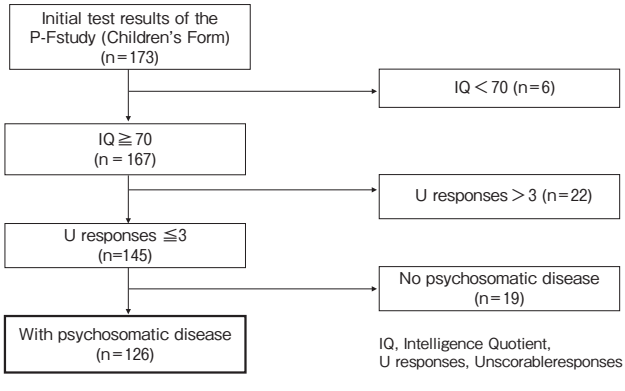

Fig. 1 Subject selection.

Tanaka-Binet Intelligence Scale V based on previous studies [14]; (b) unscorable responses (U) ≦3, which was established because the standardized data of the P-F study (Children's Form) [15] adopted data with no more than 3 U; and (c) patients with psychosomatic disease. The Japanese Society of Pediatric Psychosomatic Medicine's definition of psychosomatic disease was followed in this study [2]. That definition includes "any condition that presents with physical symptoms in children and in which psychosocial factors are involved in the onset and course" and noted that it "may be accompanied by developmental or behavioral problems or psychiatric symptoms". In other words, there is no single disorder called "psychosomatic disease," and patients with psychosomatic disease are diagnosed with several conditions.

Basic clinical information (*i.e.*, age, gender, school year, psychosomatic diseases or symptoms, and neurodevelopmental disorders) was collected from electronic clinical records. Neurodevelopmental disorders as comorbidities were diagnosed using the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders [16]. Patients were considered to have no attendance at school if they were absent from school for more than half of the past month.

P-F Study. The P-F study is a personality test based on a projection devised by the American psychologist Saul Rosenzweig [17]. In this test, 24 frustrating situations often encountered in daily living are presented to a patient in the form of a comic. The patient is then asked to fill in responses to the frustrating scenes. These responses are graded, allowing quanitification of the patient's social adaptability and ability to handle conflict. Responses are categorized into 11 factors, with 9 factors (3 directions of aggression multiplied by 3 types of aggression) and 2 transformation factors (variation Intropunitive (**I**), variation Extrapunitive (**E**)) (Table 1). A qualitative judgment of the reaction score is calculated as a percentage of the total number of scenes.

The three directions of aggression are Extraggression (E-A%), Intraggression (I-A%), and Imaggression (M-A%). E-A% is a reaction in which frustration is caused by other people or external factors. I-A% is a self-inflicted frustration reaction. M-A% is a reaction with an untraceable cause of frustration, in which the person believes that no one caused the frustration and that they cannot be helped. The three types of aggression are Obstacle Dominance (O-D%), Ego Defense (E-D%), and Need Persistence (N-P%). O-D% is a response that is more concerned with the situation that caused the frustration. E-D% is a response that suggests

Table 1 List of Rating Factors [15]

Direction of aggression ↓	Type of aggression		
	O-D (Obstacle-Dominance)	E-D (Ego-Defence) (Etho-Defence)	N-P (Need-Persistence)
E-A (Extraggression)	**E' (Extrapeditive)** Strongly point out the obstacles to frustration and express disappointment and dissatisfaction.	**E (Extrapunitive)** Attacking those around you with blame and hostility. E: Denial of responsibility	**e (Extrapersistive)** Turning to others for solutions to frustrations, seeking fulfillment or assistance from others
I-A (Intraggerssion)	**I' (Intropeditive)** Denying frustration, saying it was a good thing, or wondering if you caused others to be frustrated.	**I (Intropunitive)** Turn the blame or criticism on yourself and apologize. I: Explain their perspective	**i (Intropersistive)** Solve problems on your own and offer to make amends or atone for your sins.
M-A (Imaggression)	**M' (Impeditive)** Making light of frustrating obstacles as if they were almost non-existent.	**M (Impunitive)** Tolerate the frustrated person as if no one is responsible and it is unavoidable.	**m (Impersistive)** Be patient and follow conventions, hoping that the problem will eventually be solved.

who is responsible for the frustration. N-P% is a response that resolves the feeling of frustration.

The 9 factors are as follows: Extrapeditive (**E'**) is a reaction expressing displeasure or dissatisfaction. Intropeditive (**I'**) is a reaction of bewilderment or dismay; Impeditive (**M'**) is a reaction to downplay the frustration. Extrapunitive (**E**) is a direct attack or assertive response to the opponent; Intropunitive (**I**) is a response in which one accepts responsibility; Impunitive (**M**) is an acceptable response to the other; Extrapersistive (**e**) is the reaction of looking to others to solve the problem; Intropersistive (**i**) is a response that actively tries to solve the problem on its own; Impersistive (**m**) is a reaction that expects the problem to be solved naturally with the passage of time. U was used for responses that could not be classified into any of the 11 factors, such as "mute" or "..." responses, responses that could not be deciphered, responses where the scene was not understood, responses that were too simple to be meaningful (*e.g.*, "yes," "so"), and ambiguous responses that could be scored differently. Additionally, the GCR% indicated agreement between the typical response of the standard population and the subject's response. The superego factor score is a measure of the tendency to react in superego-inhibiting situations. $\underline{E}$ is a positive claim to deny responsibility for one's own mistakes; $\underline{I}$ is passive assertiveness to explain oneself, such as explaining one's perspective; $\underline{E}+\underline{I}$ is a summary of active and passive assertiveness; E-$\underline{E}$ is a naive impulsive attack; I-$\underline{I}$ is a response in which one sincerely admits he or she was wrong; and (M-A)+$\underline{I}$ is a response that understands and tolerates the other person's position.

GCR%, profile score, and superego factor score were converted to T scores using a standardization sample (n=2,897) [15].

Two certified public psychologists (CPP) scored the P-F responses according to the manual (Explanation of P-F study) [15]. The agreement rate was 98.4%. In the case of a disagreement in scoring, the two CPP had to discuss the matter and reach a consensus.

Statistical analysis. For comparison with the standardized sample, we converted the P-F study score to a T-scores from the standardized sample's mean and standard deviation (SD) by gender and grade of school.

The test was repeated three times for each of the three aggression types (O-D%, E-D%, N-P%) and for each of the three aggression directions (E-A%, I-A%, M-A%). Bonferroni's correction was used, and $p<0.02$ was used to indicate statistically significant differences. The nine factors had nine repetitions of the test, and in the Bonferroni correction $p<0.006$ indicated statistically significant differences. The superego factor score had six repetitions of the test, and in the Bonferroni correction $p<0.008$ indicated statistically significant differences. By comparing patients with the standardization sample (n=2,897) [15] as the Mean50 (SD ± 10.0), the T-score of the P-F study was assessed using Student's *t*-test. The standardization sample in this study was specified as a group of healthy children.

Ethical approval. This study was approved by the Ethics Committee of the Okayama University Graduate School of Medicine, Dentistry, and Pharmaceutical Science and Okayama University Hospital (#1810-010).

Results

Patient demographics. Patient demographics are presented in Table 2. This study included 126 participants (41 male and 85 female) with an average age of 12.9 years (6-16 years). Out of 126 study participants, 47 (37.0%) had a diagnosis of autism spectrum disorder (ASD), whereas 6 (4.8%) had a diagnosis of attention-deficit/hyperactivity disorder. Of the 47 with comorbid ASD, 31 (66.0%) were diagnosed with ASD only after their visit to our clinic. Seventy-five of the 126 patients (59.6%) were considered to have school absenteeism at the time of the P-F study. Moreover, 55 patients (43.7%) had primary headache, while 41 (32.5%) had orthostatic dysregulation.

Results of the P-F study and characteristics compared with the normal group. The scoring components (T-score of GCR%, category, and scoring factor) of the P-F study are presented in Tables 3 and 4. Comparison between healthy children and those with psychosomatic disease revealed no significant differences in GCR%, which was presented in the average range. Among the types of aggression, N-P% was lower in patients with psychosomatic diseases ($p<0.02$, Cohen's $d=0.23$), and 0% of patients had an N-P% score above 2 SD. In N-P%, **i** was lower in patients with psychosomatic diseases ($p<0.006$, Cohen's $d=0.24$), and 0% of patients had an **i** score below 2 SD. Moreover, in O-D%, **M'** was lower in patients with psychosomatic diseases ($p<0.006$, Cohen's $d=0.26$). However, both effect sizes were low.

Table 2 Charasteristic (n=126)

Median age (year)	12.9 (6.10 : 16.6)
Male : Female (n)	41 : 85
Diagnosis of physical symptom (n)	
Primary headache	55 (43.7%)
Orthostatic dysregulation	41 (32.5%)
Functional dyspepsia	39 (31.0%)
Insomnia	29 (23.0%)
Autonomic ataxia	18 (14.3%)
Eating disorders	13 (10.3%)
Somatoform disorder	8 (6.3%)
Psychogenic vision impairment	6 (4.8%)
Other (vague fever, pain, etc)	41 (32.5%)
Comorbidity of ASD (n)	47 (37.0%)
Comorbidity of ADHD (n)	6 (4.8%)
Patients with school refusal at the time of the P-F study (n)	75 (59.5%)

ASD, autism spectrum disorder; ADHD, attention deficit hyperactivity disorder.
Those disorders were diagnosed in the DSM-5 [12]. school refusal was considered if he or she was absent from school more than half of past one month.

Table 3 Scoring component (T-score of GCR, Category)

	Psychosomatic disease (n=126)		Healthy children (n=2,897)		Difference				
	Mean	SD	Mean	SD	% of −2SD	% of +2SD	T-score	*t*-test	Cohen's *d*
GCR%	50.5	9.98	50.0	10.00	3.2	0.0	0.5	n.s	
Directions of aggression									
E-A%	48.4	12.50	50.0	10.00	6.3	5.5	−1.6	n.s	
I-A%	48.4	11.74	50.0	10.00	7.2	1.6	−1.6	n.s	
M-A%	49.0	10.41	50.0	10.00	3.2	3.2	−1.0	n.s	
Types of aggression									
O-D%	48.3	10.43	50.0	10.00	2.4	1.6	−1.7	n.s	
E-D%	49.9	11.21	50.0	10.00	3.2	4.0	−0.1	n.s	
N-P%	47.7	9.89	50.0	10.00	2.4	0.0	−2.3	−2.57*	0.23

Significant difference for *t*-test modified by bonferroni *: $p<0.02$

The superego component of the P-F study is presented in Table 5. I was lower in patients with psychosomatic diseases, and the effect size was medium ($p<0.008$, Cohen's $d=0.54$). Moreover, E+I was lower in patients with psychosomatic diseases ($p<0.008$, Cohen's $d=0.32$); (M-A)+I was also lower in patients with psychosomatic diseases ($p<0.008$, Cohen's $d=0.43$). Overall, 5.6% of patients had a score of 2SD below the standardization sample. I-I was higher in patients with psychosomatic diseases ($p<0.008$, Cohen's $d=0.44$), and 7.9% of patients had a score of 2SD above the standardization sample.

Table 4 Scoring component (T-score of Scoring factor)

	Psychosomatic disease (n=126)		Healthy children (n=2,897)		Difference				
	Mean	SD	Mean	SD	% of −2SD	% of +2SD	T-score	*t*-test	Cohen's *d*
E' (Extrapeditive)	50.7	12.76	50.0	10.00	0.0	7.9	0.7	n.s	
E (Extrapunitive)	51.4	12.54	50.0	10.00	0.0	6.3	1.4	n.s	
e (Extrapersistive)	49.2	15.83	50.0	10.00	1.6	4.0	−0.8	n.s	
I' (Intropeditive)	50.9	9.96	50.0	10.00	0.0	6.3	0.9	n.s	
I (Intropunitive)	50.2	11.69	50.0	10.00	3.2	4.0	0.2	n.s	
i (Intropersistive)	47.6	8.46	50.0	10.00	0.0	3.2	−2.4	−2.62*	0.24
M' (Impeditive)	47.4	8.75	50.0	10.00	0.0	0.8	−2.6	−2.84*	0.26
M (Impunitive)	50.2	10.99	50.0	10.00	0.0	5.6	0.2	n.s	
m (Impersistive)	52.0	10.23	50.0	10.00	1.6	4.0	2.0	n.s	

Significant difference for *t*-test modified by bonferroni *: $p<0.006$

Table 5 Scoring component (T-score of Factor of Super-ego)

	Psychosomatic disease (n=126)		Healthy children (n=2,897)		Difference				
	Mean	SD	Mean	SD	% of −2SD	% of +2SD	T-score	*t*-test	Cohen's *d*
E	51.3	11.5	50.0	10.00	0.0	10.3	1.3	n.s	
I	44.6	8.1	50.0	10.00	0.0	2.4	−5.4	−5.99*	0.54
E+I	46.8	9.4	50.0	10.00	0.0	2.4	−3.2	−3.47*	0.32
E-E	50.4	11.71	50.0	10.00	0.0	6.3	0.4	n.s	
I-I	54.4	12.27	50.0	10.00	0.0	7.9	4.4	4.78*	0.44
(M-A)+I	45.7	10.40	50.0	10.00	5.6	1.6	−4.3	−4.70*	0.43

Significant difference for *t*-test modified by bonferroni *: $p<0.008$

E: positive claim to deny responsibility for his own mistakes, I: passive assertiveness to explain oneself, such as making excuses, E+I: sum of active and passive assertiveness, E-E: naive impulsive attack, I-I: response to honestly admit that you were wrong, (M-A)+I: response that understands and tolerates the other person's position.

Discussion

Various psychological tests are used to assess interpersonal relationships and coping behaviors. There are several analyses of the results of the P-F study in adults with various psychosomatic conditions [18]. The P-F study is a projective technique that can directly identify coping behaviors in stressful situations and thereby demonstrate interpersonal challenges. For example, a lower GCR% has been noted in patients with stomach ulcers [19] and pulmonary tuberculosis [20], whereas higher intraggression (I-A%) has been observed in patients with stomach ulcers [19], circumscribed neurodermatitis [21], pulmonary tuberculosis [19], and asthma [22].

In this study, we found that the GCR% for group adaptation was within the mean range in children with psychosomatic disease. Patients with psychosomatic diseases have been reported to have a lower GCR% [12,13], but those children responded in age-appropriate ways with common sense in frustrating situations. In other words, it was clear that the children were not necessarily exibiting problematic reactions in interpersonal relationships. According to research on the P-F study and overadaptation, there is a link between **I** and high levels of **m** [23]. In the superego aspect, wherein the reaction to a situation is caused by frustration toward oneself, I was significantly lower. These were less assertive and did not explain themselves well as a way to defend themselves in conflict situations. They

were also less likely to consider the situation that led to their frustration and solve the problem. Some patients had extremely high I-$\underline{I}$ scores. Notably, I-$\underline{I}$ scores indicate sincere apologies, which was a characteristic of patients with psychosomatic disease. The (M-A) + $\underline{I}$ scores were significantly lower in such patients, reflecting the lack of age-appropriate coping behavior in conflict situations. In other words, it was inferred that the patients lacked interpersonal coping skills such as verbal defense and that they were mentally immature. In summary, children with psychosomatic disorders responded to frustrating situations with common sense and sincere apologies, and they were less likely to defend themselves by explaining their perspective or by being assertive.

In addition, 37% of the subjects in this study had comorbid ASD, of whom 66% were diagnosed with ASD only after their visit to our clinic. Therefore, it is considered necessary to pay attention to comorbidities in the treatment of psychosomatic disorders. It has been noted that ASD patients have low GCR% [24-27], high E-A%, and low M-A% [25-27] in the P-F study. In particular, it has been noted that, due to the lack of third-person perspective, O-D% (blaming others or external sources of frustration) is high, which does not lead to positive and constructive problem solving [26]. These were different from the results of the present study, which showed a lack of self-explanation and an inability to solve problems. Thus, it is suggested that ASD children with comorbid psychosomatic disorders may have different styles of coping with conflict compared to those with ASD without comorbid disorders. In the future, the characteristics of ASD with comorbid psychosomatic disorders need to be clarified. In any case, it should be noted that interpersonal problem-solving is difficult for ASD children because they share some common features with alexithymia [6], in which they are unable to verbalize their feelings and thoughts.

This study found that children with psychosomatic disease had a communication style that is more passive and less proactive than overadaptive. In treating pediatric psychosomatic disease, we need to encourage children to protect themselves using appropriate assertiveness and moderate self-explanation. It can be difficult to verbally teach younger children how to assert themselves. Thus, psychotherapy for younger children using nonverbal imagery, such as sand play therapy, may be effective in encouraging emotional expression. If the patient is old enough for verbal counseling, age-appropriate social skills and assertion training should be provided to encourage problem-solving behavior.

This is the first report to assess how children with psychosomatic disorders react to frustrating situations simulated by the P-F study. The P-F study is a projective technique that requires specialized knowledge for evaluation and interpretation. However, when considering specific situations, parents and children can reflect on the results and discuss interpersonal relationships with each other. In the treatment of children with psychosomatic disorders, the P-F study is proven to be a meaningful psychological test that can directly assess stress coping mechanisms.

Limitations of study and future directions. All patients were collected from a single hospital. Moreover, due to the nature of psychosomatic illnesses, the patients had various diagnoses, thereby introducing bias into the study population. The small number of subjects in this study made it difficult to examine each physical disease and neurodevelopmental disorder in detail. Future studies with higher quality should involve collaboration with other institutions to increase the number of subjects.

In conclusions this study characterized the reactions of children with psychosomatic disorders in frustrating situations simulated by the P-F study. Pediatric patients with psychosomatic diseases often adopt passive interpersonal relationships in conflicting situations, and appropriate psychoeducation is needed to deal with this.

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