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The Effects of Behavior Support Targeting Self-injurious Behavior through Promotion of Task Engagement on Problem Behavior in ASD Children

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Background: Problem behavior is a factor that can make everyday life and studying in educational settings difficult for children with developmental disorders, resulting in reduced quality of life. Problem behavior is one of the difficulties presented by children with autism spectrum disorder (ASD) and developmental disorders; and self-injurious behavior (SIB) is one such behavior that clearly negatively impacts the child's quality of school life. Recent studies have indicated the effectiveness of initiatives to reduce problem behaviors through promoting and supporting task engagement behavior.

Purpose: The present study is an interventional study carried out on three children with ASD enrolled in special needs schools. Behavior support plan that promoted task engagement behavior was carried out with the objectives of (a) confirming whether task engagement behavior is effective in reducing SIB in targeted settings and (b) verifying the effects of task engagement behavior on problem behaviors other than SIB in everyday school life.

Methods: For each child, an examination was carried out to determine the setting within school life in which SIB occurred most readily; this setting was specified as the target setting. Functional assessments of the children within these settings were carried out and behavior support plans drawn up on the basis of the results were carried out. In the target settings, instruction from homeroom teachers took place in both intervention and baseline periods.

Results: As the result of above procedure, all three children showed greater task engagement behavior during the intervention period than during the baseline period, and there was a reduction in SIB from the start of the intervention period. In addition, the results of the Aberrant Behavior Checklist Japanese Version (ABC-J), which evaluate behaviors in everyday life, completed by the same teacher showed that in everyday school life outside the specified target setting, there were improvements in three subscales of ABC-J (1.Irritability/Agitation, 2.Lethargy/Social Withdrawal, 4.Hyperactivity/Noncompliance).

Conclusions: The results indicate that carrying out a behavior support plan that promotes task engagement behavior based on a functional assessment not only reduces SIB in the intervention setting, but also brings about improvement in other problem behaviors shown by the child in everyday school life.

Keywords: Autism spectrum disorder, applied behavior analysis, self-injurious behavior, task engagement, positive behavior support

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I. Introduction

Problem behavior is a factor that can make daily life and studying in school educational settings difficult for children with developmental disorders,

resulting in reduced quality of life (QOL)¹. Problem behavior is one of the difficulties presented by children with autism spectrum disorder (ASD) and developmental disorders, and it refers to worrying behaviors such as stereotyped behavior or rigid

insistence on particular objects or procedures, as well as challenging behaviors such as panic, self-injury, or injury to others¹⁾. Of these behaviors, the most problematic for rehabilitation and education tends to be self-injurious behavior (SIB)²⁾. A high rate of 74.1% has been reported for SIB among ASD children enrolled in special needs schools and facilities for the mentally retarded²⁾, SIB threatens health and life, and impedes educational activities, while using physical restraint to prevent SIB makes free movement and activity impossible³⁾. This is clearly counter to the “maintenance and promotion of good health” outlined in the Courses of Study for Schools for Special Needs Education⁴⁾, and also leads to lower QOL, hampering the development of “an attitude of engaging in life fully and happily”⁴⁾, thus constituting a serious problem in terms of school health.

Within this context, Positive Behavior Support (PBS) which aims to improve QOL of children with developmental disorders not only by reducing negative behavior problems, but also by creating and expanding appropriate behaviors, has been advocated recently.^{5) 6)} Some researchers have examined the effectiveness of positive support for task engagement behavior as appropriate behavior based on PBS principles on reduction of SIB^{7) 8)}. Clarke et al.⁷⁾ and Ogasawara et al.⁸⁾ used functional assessment to determine the contingencies of preceding events and consequences in settings in which SIB occurred during task engagement behavior. These were used to build support plans to reduce SIB, and the results indicated the validity of this method. However, Hirasawa and Ogasawara⁹⁾ pointed out that while some studies focused on resolving problem behavior, none have been reported that support is developed and assessed from the point of view of daily life. Even if support is given to SIB with the target behavior, no studies have investigated the effects of this support on other problem behaviors that these children may have in daily school life.

Clarke et al.⁷⁾ and Ogasawara et al.⁸⁾ reported that ASD children with SIB also have numerous other problem behaviors in situations in which they do not know what to do. Fujiwara¹⁰⁾ pointed out that problem behavior in these situations manifests itself in a variety of ways. Therefore, the effects of support targeting SIB on other problem behaviors in daily school life need to be investigated.

Carr and Durand¹¹⁾ pointed out the problem behavior of children with intellectual disability or

ASD as “nonverbal communicative acts” to request specific, socially-mediated reinforcement. They explained the occurrence and maintenance of problem behavior in terms of the following four functions: (1) to gain social attention (attention function); (2) to escape from or avoid unpleasant situations (escape function); (3) to gain objects or activities (tangible function); and (4) to gain stimulation (sensory function)¹²⁾. Therefore, clarifying the functions of problem behavior by carrying out functional assessment¹³⁾ encompassing all the problem behaviors a child may have, beyond SIB, should allow a more comprehensive understanding of the problem behavior of the target child in daily school life.

In the present study, the effects of support for task engagement behavior were examined among ASD children in special needs schools. The effects on problem behaviors other than SIB in daily school life contexts were examined after confirming SIB reduction effectiveness in targeted situations previously described by Clarke et al.⁷⁾ and Ogasawara et al.⁸⁾.

II. Methods

1. Participants

The participants in this study were three students enrolled in special needs schools.

Child A (girl, third-year senior high school student, chronological age (CA) was 18:2 at the start of the study) was diagnosed with autism accompanied by profound intellectual disability (at age 3 years 3 months). Her developmental quotient (DQ) was 11 (at age 18 years 4 months) according to the Kyoto Scale of Psychological Development, and the score on the ASQ (Autism Screening Questionnaire¹⁴⁾; cutoff point: 13) administered to her mother was 24.

Child B (boy, second-year elementary school pupil, CA 7:6 at the start of the study) was diagnosed with autism accompanied by intellectual disability (at age 3 years). His DQ was 32 (at age 3 years), and the score on the ASQ administered to his mother was 25.

Child C (girl, first-year senior high school student, CA 16:4 at the start of the study) was diagnosed with autism accompanied by profound intellectual disability (at age 2 years 4 months). Her DQ was 14 (at age 15 years), and the score on the ASQ administered to her mother was 21.

2. Ethical considerations

This study was approved by the Ethics Committee of the Department of Medicine, Osaka University. Before the study was implemented, it was explained to officials of the participating school and the parents or guardians of the participating children. Informed consent was obtained from all participants.

3. Implementation and period of the study

To implement the study, the authors requested the cooperation of a special needs school where the participating children were enrolled, and obtained the school's consent. The children received direct support from their homeroom teachers (including the multiple homeroom teacher system). The main researcher of this study consulted with each child's homeroom teacher regarding the formulation of the support policy. The study was supervised by the other, a specialist in behavior analysis.

This study used an experimental design known as multiple-baseline design¹⁵⁾. This is based on implementation of an intervention following a baseline period, from A (baseline period) to B (intervention period), where a baseline is established for each participating child, and the experimental intervention is conducted consecutively at different times. The advantage of this design is that, even when no control group is established, if the participating child shows "time-lag" changes, chance occurrence due to external variables that have not been controlled can be negated¹⁶⁾, the correlation between the intervention and target behavior becomes clear, and it becomes possible to control variables such as the child's past experiences.

The study implementation period for each child was from June 18, 2013, to March 17, 2014.

4. Functional assessment

(1) Selection of intervention settings (sessions)

All classes were surveyed over a four-week period according to the method of Hirasawa¹⁷⁾ and Fujiwara and Hirasawa¹⁾, and classes with a high frequency of SIB were selected.

(2) Antecedent-behavior-consequence (A-B-C) analyses of sessions

The selected classes were recorded on video, and then the videos were analyzed.

First, the contingencies of antecedent and consequence when SIB or other problem behavior (hereafter, SIB or other behavior) occurred were analyzed through an A-B-C analysis based on the methods of O'Neill et al.¹³⁾ and Fujiwara and Hirasawa¹⁾. This allowed identification of the functions of each child's SIB or other behavior, so that a hypothesis of the main causes of the occurrence of SIB or other behavior could be constructed. Second, an A-B-C analysis of the task engagement that each child needed to strive for was carried out, and the contingencies when this behavior occurred were analyzed.

Next, with the cooperation of homeroom teachers, the competing behavior model¹³⁾ was used to clarify features of an effective environment for the participating child. This model comprises three steps: Step 1 is "Diagram the functional assessment summary statements."; Step 2 is "Define alternative or competing behaviors, and the contingencies associated with them."; and Step 3 is, "Select intervention procedures that will make the problem behavior irrelevant, inefficient, and ineffective.". Environmental features elicited through these three steps were used in creating behavior support plans and selecting intervention strategies. By using this model, it becomes possible to match intervention processes with results of functional assessment, and also to match the values and skills of those providing support and the resources they use and flow of the daily schedule with the processes implemented, thereby facilitating coherent and realistic planning.

The above procedure clarified the contingencies of SIB and other behavior and of task engagement. From this, it should be possible to create behavioral contingencies that maintain adaptive behavior and discover opportunities for behavior that generate positive reinforcement by promoting task engagement contingencies that are in opposition to those that show SIB or other problem behavior⁸⁾⁹⁾. The following hypotheses for giving support were constructed for each child.

a) Child A

Sessions for Child A were held during the second 30 min of the occupational learning class.

Problem behaviors other than SIB shown included “simply watching the homeroom teacher without saying anything,” “shouting at the homeroom teacher,” “running while screaming,” “wandering around,” and “jumping with both feet.” Based on the results of functional assessment, it was conjectured that the intended functions of these problem behaviors were to escape from the task, to gain attention from and interaction with the homeroom teacher, and to gain physical and visual stimulation. It was therefore decided that the homeroom teacher would finely divide the content of the tasks into specific actions and give instructions making use of visual aids. At the same time, the teacher would stay beside the child to watch over her progress during the task. In addition, the teacher would praise the child verbally, and engage in physical contact on completion of each process in the task through actions such as touching her hand.

b) Child B

Sessions for Child B were held during the school lunch preparation period.

Problem behaviors other than SIB shown included “standing up when told to sit down,” and “remaining seated when asked to help.” From the results of functional assessment, it was conjectured that the intended functions of these problem behaviors were to escape from preparation for school lunch, to gain the attention of the homeroom teacher, and to gain physical stimulation. It was therefore decided that indicators showing where food should be located would be placed on the desk (visual aids), and verbal signals would be given to indicate when the child needed to commence a target behavior. In addition, the child would be praised verbally when he carried out the tasks, and frequent physical contact would be built up through actions such as stroking the head and embracing and holding both hands.

c) Child C

Sessions for Child C were held during the preparation period for going home.

Problem behaviors other than SIB shown included “shouting while looking at her homeroom teacher and waving the fingers of both hands in front of her eyes,” and “jumping in place with both feet while shouting.” From the results of the functional assessment, it was conjectured that the intended functions of these problem behaviors were to gain attention from and interaction with the homeroom teacher, and to gain

physical stimulation. It was therefore decided that the homeroom teacher would give verbal instructions during the preparation period for going home in order to show the child that she was getting attention, and that the teacher would maintain contact by handing the child the things that she needed to prepare before going home. If she did not commence the target behavior with this encouragement alone, she would be given gentle physical prompts.

The results of the functional assessments and the behavior support plans are shown in **Tables 1–3**.

5. Analysis and evaluation of session results

(1) Calculation of rate of occurrence of SIB and task engagement

The videos were used to examine the occurrence of SIB and task engagement in 10-second intervals, according to the interval-recording method¹⁸⁾.

The equations for calculating occurrence rates are as follows:

rate of SIB (%) = (no. of intervals in 1 session in which SIB occurred / total no. of intervals in 1 session) × 100;

rate of engagement (%) = (no. of intervals in 1 session in which engagement occurred / total no. of intervals in 1 session) × 100

(2) Assessment of validity

Using a random selection of 52.6% of the total video of sessions for each child, two evaluators independently recorded the occurrence of task engagement and SIB. Reliability (%) was then calculated according to the following equation:

reliability (%) = (no. of matches / [no. of matches + no. of discrepancies]) × 100

The results showed that reliability was 99.4% and 91.1% for SIB and task engagement, respectively, for Child A, 98.4% and 95.7%, respectively, for Child B, and 99.5% and 91.6%, respectively, for Child C.

6. Evaluation of problem behavior in daily school life

Changes in the problem behavior of each child in daily school life were evaluated using the Japanese version of the Aberrant Behavior Checklist (ABC-J)^{19) 20)}. As well as enabling evaluation of overall problem behaviors across all areas of life

Table 1 Problem summary, hypothesis, and description of behavior support plan for Child A (occupational learning class)

Problem summary, hypothesis of SIB and other problem behavior

Setting event	Antecedent	Problem behavior and its function	Consequences
<p>Prone to occur particularly on hot and humid days, or else during or near her period</p>	<ul style="list-style-type: none"> • Homeroom teacher tries to get child to return to the task • Homeroom teacher is next to child, but not looking at child • No one is near child, child has no contact with anyone 	<ul style="list-style-type: none"> • Self-injurious behavior (hitting head, striking left arm, striking right thigh, etc.) • Other (simply watching the homeroom teacher without saying anything, shouting at the homeroom teacher, running while screaming, wandering around, jumping with both feet) <p>function escape attention/interaction sensory</p>	<ul style="list-style-type: none"> • Escape from the task • Gain interaction (attention, verbal contact, physical contact) with homeroom teacher • Gain self-stimulation (physical and visual stimulation)



Behavior support plan

Support for setting event	Support for antecedent	Support for behavior	Support for consequences
<p>Bearing in mind the child's condition on that day, make the task simpler, adjust the temperature of the room, make the task easier to approach</p>	<ul style="list-style-type: none"> • Homeroom teacher not only watches over child beside her, but also checks child's emotions, speaks for her as far as possible, and always shows interest in her • Gives verbal encouragement for target behavior when behavior is supposed to begin 	<p>In occupational learning class:</p> <ul style="list-style-type: none"> • Stick hand-shaped marks onto the acrylic plates used in die-cutting tasks to teach the child where to place hands • When cutting up clay disks, place a mark to show position for inserting wooden knife • The number of times the clay is hit to make the indentation when making plates is recorded on voice output communication aid as the name of the number 	<ul style="list-style-type: none"> • When each process is completed, the child is verbally praised with "OK" or "Thank you," and physical contact such as touching her hand is given in order to give the child a sense of achievement • Praise is given immediately when child gestures or vocalizes to the homeroom teacher

among children and young people, this scale has been proven to be useful in evaluating the effectiveness of treatment and intervention for problem behaviors related to mental retardations and developmental disorders¹⁹⁾.

The checklist comprises 58 items, all evaluated at four levels, and five subscales (1: Irritability/Agitation; 2: Lethargy/Social Withdrawal; 3: Stereotypic Behavior; 4: Hyperactivity/Noncompliance; and 5: Inappropriate Speech). Higher scores indicate greater severity.

For this study, the homeroom teachers (including those in the multiple homeroom teacher system) were designated as evaluators. The evaluators needed to have sufficient knowledge of the participating children's behaviors and be able to evaluate all concerned and make records²¹⁾; homeroom teachers were considered most appropriate as they are involved with the participating children on a daily basis in the

school context. Evaluations occurred at the beginning of the baseline period and the end of the intervention period. Evaluators were not shown the evaluation results from the beginning of the baseline period in order to eliminate bias.

Evaluation criteria followed the Aman and Singh²¹⁾ manual, comparing total scores on each ABC-J subscale at each of the two time points described. Subscale with Inappropriate Speech was excluded as all three children were almost incapable of meaningful speech. In addition, when comparing scores on individual evaluation items on subscales, this study followed the Japanese scale creator's guidelines (Ono Y., personal communication, August 25, 2014) in defining a reduction of 2 points or more as "improvement", and a rise of 2 or more points as "deterioration".

Table 2 Problem summary, hypothesis, and description of behavior support plan for Child B (school lunch preparation setting)

Problem summary, hypothesis of SIB and other problem behavior

Setting event	Antecedent	Problem behavior and its function	Consequences
None in particular	<ul style="list-style-type: none"> • Homeroom teacher or other teachers hardly watching child • Homeroom teacher encourages particular behavior 	<ul style="list-style-type: none"> • Self-injurious behavior (hitting head, striking left arm, etc.) • Other (standing up when told to sit down, remaining seated when asked to help) <p>function escape attention sensory</p>	<ul style="list-style-type: none"> • Escape from helping • Gain attention of homeroom teacher • Gain physical stimulation



Behavior support plan

Support for setting event	Support for antecedent	Support for behavior	Support for consequences
None in particular	<ul style="list-style-type: none"> • Homeroom teacher not only watches over child at child's side, but also gives as much verbal encouragement as possible and always shows interest in child • Prompting when it is time to begin the target behavior (verbal encouragement, holding hands, etc.) 	<ul style="list-style-type: none"> • In the task of putting on the apron, homeroom teacher puts apron on child's head and watches over child as he performs subsequent actions • When setting place for lunch, "hints" (e.g., plates, cups) are pre-placed on the table where the food is supposed to go 	<ul style="list-style-type: none"> • When engagement is performed, this is evaluated and always verbally praised, and physical contact (e.g., stroking head, hugging, touching both hands) is incorporated

Table 3 Problem summary, hypothesis, and description of behavior support plan for Child C (preparation for going home)

Problem summary, hypothesis of SIB and other problem behavior

Setting event	Antecedent	Problem behavior and its function	Consequences
None in particular	<ul style="list-style-type: none"> • Homeroom teacher interacts with other students or talks to everyone in the class • Homeroom teacher only watching child without verbal encouragement or physical prompts 	<ul style="list-style-type: none"> • Self-injurious behavior (hitting head, hitting desk or shelves) • Other (shouting while looking at homeroom teacher and waving the fingers of both hands in front of her eyes, jumping in place with both feet while shouting) <p>function attention/interaction sensory</p>	<ul style="list-style-type: none"> • Gain attention of homeroom teacher • Gain interaction with homeroom teacher • Gain physical and visual stimulation



Behavior support plan

Support for setting event	Support for antecedent	Support for behavior	Support for consequences
None in particular	<ul style="list-style-type: none"> • Give child verbal instructions to prepare for going home when task needs to be carried out • Go to child's side, watch closely as child prepares for going home 	<ul style="list-style-type: none"> • Items necessary for going home (e.g., bag, towel, correspondence notebook, thermos) handed to child • Gentle physical prompts given 	<ul style="list-style-type: none"> • When task engagement is performed, or when child manages something she was previously unable to do well, praise is always given (verbal praise given, and positive effort made to give physical contact)

III. Results

1. SIB and task engagement during sessions

Changes in the occurrence of SIB and task engagement for each child are shown in **Figure 1**.

Regarding Child A, during the baseline period (sessions 1–6), the mean SIB occurrence rate was 14.9% and the mean task engagement occurrence rate was 39.7%. During the intervention period (sessions 7–22), the mean SIB occurrence rate was 7.6%; this rate decreased compared with that during the baseline period, although this decrease varied between sessions. Task engagement during the intervention period was 60.1%, which was an increase over the baseline period.

Regarding Child B, during the baseline period (sessions 1–7), the mean SIB occurrence rate was 9.6% and the mean task engagement occurrence rate was 4.2%. During the intervention period (sessions 8–34), the mean SIB occurrence rate was 0.8%. This rate decreased compared baseline, and the amount of variation in the occurrence rate between sessions grew smaller. The occurrence rate of task engagement increased to 25.7% during the intervention period. Considerable variation was seen between sessions during the first half of the intervention period, but from session 20 onward, the rate of task engagement stabilized to 20–30%.

Regarding Child C, during the baseline period (sessions 1–10), the mean SIB occurrence rate was 6.2% and the mean task engagement occurrence rate was 19.1%. During the intervention period (sessions 11–35), the mean SIB occurrence rate was 1.3%. The occurrence rate was slightly higher during the first half of the intervention period (sessions 11–18), but a reduction was seen during the second half. At the same time, task engagement during the intervention period was 61.8%, which was an increase with respect to baseline, and the occurrence rate showed a trend toward increasing after greater numbers of sessions.

2. Problem behavior in daily school life

The ABC-J subscale scores for each child are shown in **Table 4**.

Both Child A and Child C showed a reduction in scores on three subscales, and Child B showed a reduction on all four subscales.

Next, within the subscales for which a reduction

in score was seen for each child, the evaluation items with an improvement of 2 points or more are as follows (lower section of **Table 4**).

Regarding Child A, improvement was seen in item 47 (subscale 1), item 43 (subscale 2), and item 48 (subscale 4).

Regarding Child B, improvement was seen in item 41 (subscale 1), items 20 and 26 (subscale 2), and items 18, 31, and 54 (subscale 4). Reduction was also seen in total score for subscale 3; however, none of the items in this subscale had a difference of 2 points or more.

Regarding Child C, improvement was seen in item 43 (subscale 2). Reduction was also seen in total score for subscales 3 and 4; however, none of the items in these subscales had a difference of 2 points or more.

IV. Discussion

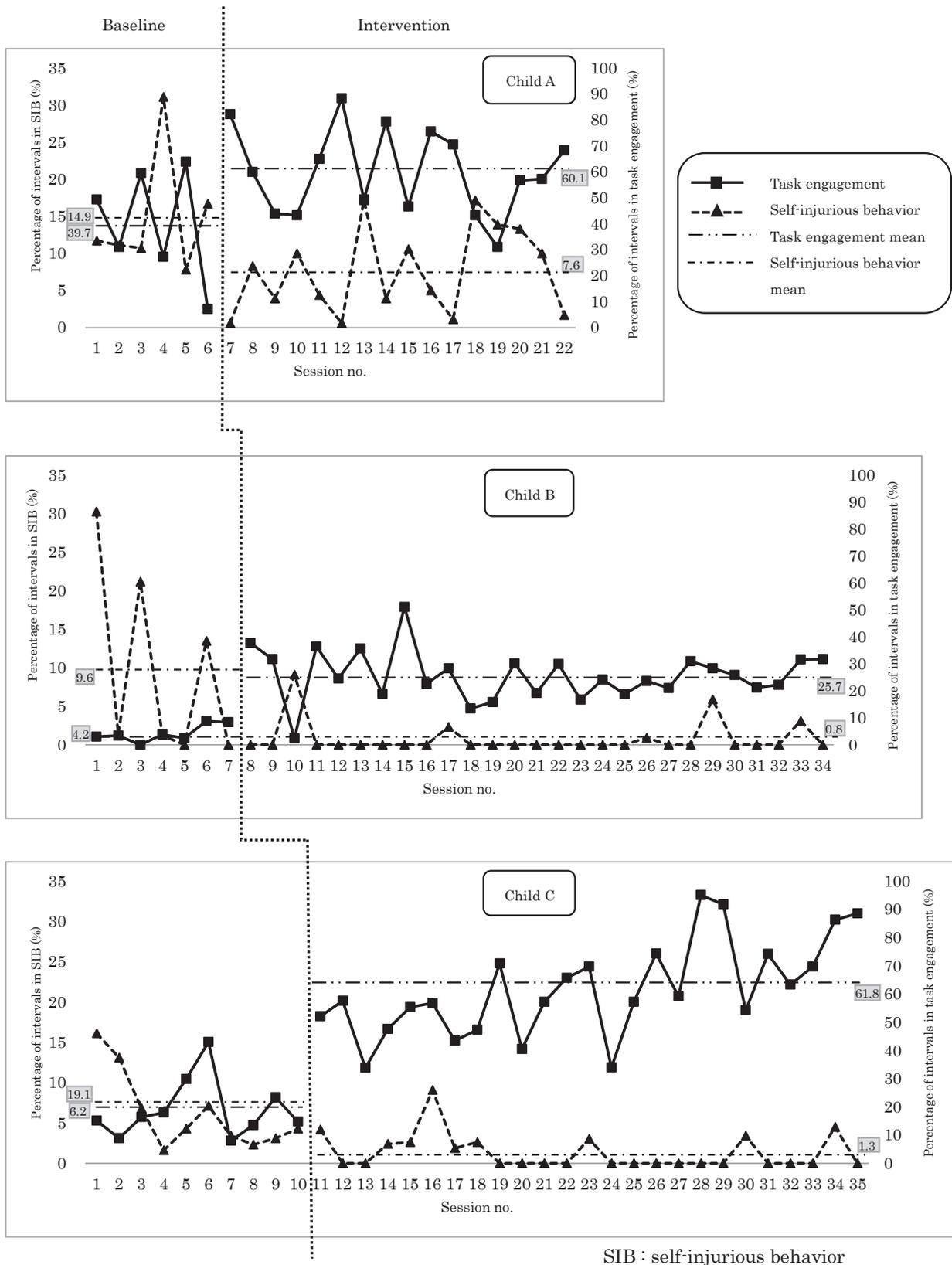
1. Reduction of SIB by promotion of task engagement

At the start of the intervention period, all three children showed an increase in the rate of task engagement, accompanied by a decrease in the rate of SIB, with respect to baseline. In the present study, the contingencies of SIB and other problem behavior and of engagement were clarified through functional assessments. This allowed creation of behavior contingencies to maintain task engagement and discovery of opportunities for behavior that generate positive reinforcement.

In studies by Clarke et al.⁷⁾ and Ogasawara et al.⁸⁾ support plans were formulated on the basis of functional assessments that made use of the four functions that cause or maintain problem behavior¹²⁾. Through these support plans, it was possible to increase task engagement. We obtained similar results in the present study.

2. The effects on problem behavior in daily school life

In order to achieve the aim of this study, which was to examine the effects of initiatives to encourage task engagement behaviors targeted at SIB on the problem behaviors of each participating child in daily school life contexts, results of the ABC-J evaluations done by homeroom teachers were comparatively analyzed.



SIB : self-injurious behavior

Figure 1 Changes in occurrence percentage of SIB and task engagement for each child

Table 4 ABC-J subscale scores and results for each item for all three children

Subscale score results	Child A		Child B		Child C	
	BL	IV	BL	IV	BL	IV
1. Irritability/Agitation	29	24	31	20	24	24
2. Lethargy/Social Withdrawal	16	10	15	6	15	14
3. Stereotypic Behavior	5	5	9	7	9	7
4. Hyperactivity/Noncompliance	26	14	11	3	20	19

Subscale	Evaluation item	Child A		Child B		Child C		
1. Irritability/Agitation	2. Injures self on purpose	2	2	2	2	1	0	
	4. Aggressive to other children or adults (verbally or physically)	2	3	0	0	1	0	
	8. Screams inappropriately	2	2	1	1	2	3	
	10. Temper tantrums/outbursts	2	3	3	2	0	1	
	14. Irritable and whiny	2	1	2	1	2	2	
	19. Yells at inappropriate times	2	2	1	1	1	2	
	25. Depressed mood	0	0	2	1	0	0	
	29. Demands must be met immediately	1	1	3	2	3	2	
	34. Cries over minor annoyances and hurts	1	0	2	1	0	2	
	36. Mood changes quickly	2	1	3	2	3	2	
	41. Cries and screams inappropriately	2	2	3	1	1	2	
	47. Stamps feet or bangs objects or slams doors	3	1	0	0	2	2	
	50. Deliberately hurts himself/herself	3	2	3	2	3	2	
	52. Does physical violence to self	3	2	3	2	3	2	
	57. Has temper outbursts or tantrums when does not get own way	2	2	3	2	2	2	
	2. Lethargy/Social Withdrawal	3. Listless, sluggish, inactive	1	1	0	0	0	1
		5. Seeks isolation from others	1	1	0	0	0	1
12. Preoccupied, states into space		0	0	2	1	0	1	
16. Withdrawn; prefers solitary activities		1	0	3	2	1	1	
20. Fixed facial expression; lacks emotional responsiveness		0	0	3	0	1	1	
23. Does nothing but sit and watch others		0	0	3	2	1	1	
26. Resists any form of physical contact		1	0	3	0	0	1	
30. Isolates himself/herself from other children or adults		1	1	1	0	1	1	
32. Sits or stands in one position for a long time		1	1	0	1	1	0	
37. Unresponsive to structured activities (does not react)		2	2	0	0	2	1	
40. Is difficult to reach, contact, or get through to		1	1	0	0	1	1	
42. Prefers to be alone		1	1	0	0	1	1	
43. Does not try to communicate by words or gestures		2	0	0	0	3	1	
53. Inactive, never moves spontaneously	1	1	0	0	1	1		
55. Responds negatively to affection	1	0	0	0	1	0		
58. Shows few social reactions to others	2	1	0	0	1	1		
3. Stereotypic Behavior	6. Meaningless, recurring body movements	0	1	0	1	0	0	
	11. Stereotyped behavior; abnormal, repetitive movements	0	0	2	2	2	2	
	17. Odd, bizarre in behavior	2	1	3	2	2	1	
	27. Moves or rolls head back and forth repetitively	0	1	0	0	1	1	
	35. Repetitive hand, body, or head movements	1	0	2	1	0	1	
	45. Waves or shakes the extremities repeatedly	1	1	2	1	2	1	
4. Hyperactivity/Noncompliance	49. Rocks body back and forth repeatedly	1	1	0	0	2	1	
	1. Excessively active at home, school, work, or elsewhere	2	1	1	2	2	2	
	7. Boisterous (inappropriately noisy and rough)	2	2	0	0	2	2	
	13. Impulsive (acts without thinking)	2	2	1	0	2	2	
	15. Restless, unable to sit still	1	1	1	0	1	1	
	18. Disobedient, difficult to control	2	1	2	0	1	1	
	21. Disturbs others	1	0	0	0	1	1	
	24. Uncooperative	1	1	1	0	1	1	
	28. Does not pay attention to instructions	1	1	0	0	2	1	
	31. Disrupts group activities	1	0	2	0	1	1	
	38. Does not stay in seat (during lesson, training session, meals, etc.)	2	1	0	0	1	1	
	39. Will not sit still for any length of time	2	1	0	0	0	1	
44. Easily distractible	2	1	0	0	1	1		
48. Constantly runs or jumps around the room	2	0	0	0	1	1		
51. Pays no attention when spoken to	2	1	0	0	2	1		
54. Tends to be excessively active	1	0	3	1	1	1		
56. Deliberately ignores directions	2	1	0	0	1	1		

ABC-J : Aberrant Behavior Checklist Japanese Version

BL: Start of baseline period

IV: Completion of intervention period

 Oval indicates an item with a reduction of two or more points between baseline and intervention period

Child A showed the problem behaviors of “simply watching the homeroom teacher without saying anything” and “shouting at the homeroom teacher” during the baseline period. The improvement shown in Subscale 2 (Lethargy/Social Withdrawal), Item 43 (Does not try to communicate by words or gestures) appeared to indicate that Child A became capable of showing her intentions in appropriate ways. In actual intervention settings, Child A began to show the behavior of giving a sign (indicating the area of her stomach with the palm of her hand) when she wanted to rest. Sato et al.²²⁾ reported a study in which the homeroom teacher, while watching the target child intently, waited for target behavior to occur spontaneously while the students were changing clothes in the morning and afternoon, during lunch, free-play and individual study periods. When the target behavior occurred, the teacher immediately helped the child; this successfully brought about and increased requests for assistance. In the present study, the homeroom teacher provided support by staying at Child A’s side to watch over her progress with the task and giving prompt praise when she completed an operation. It is likely that this led to Child A attempting independent communication because it corresponded to the attention function, which was one of the functions of Child A’s SIB.

Next, regarding Child A’s problem behaviors of “running while screaming,” “jumping with both feet,” and “wandering around,” the results for Subscale 4 (Hyperactivity/Noncompliance), Item 48 (Constantly runs or jumps around the room) showed that the problem behaviors improved. Child A’s homeroom teacher gave support such as sticking marks the size and shape of a hand onto the acrylic plates used in die-cutting tasks to teach the child hand placement, and indicating with a mark the place to start cutting when cutting up clay disks. Visually embodying the task in this way probably made the task easier to understand, thereby increasing the desire to carry out the task. This led to a reduction in running or jumping problem behavior and in escape behavior, resulting in an increase in task engagement. Shiomi and Togasaki²³⁾ stated that an important means of reducing problem behavior (leaving the seat) among children with severe intellectual disability was the creation of a readily understandable environment using supplementary teaching tools. In the present study, the increase in task engagement brought about by the creation of such an environment appears to

have led to a reduction in problem behavior.

Regarding Child B, improvement was seen in Subscale 4 (Hyperactivity/Noncompliance) Item 18 (Disobedient, difficult to control) and Subscale 2 (Lethargy/Social Withdrawal) Item 20 (Fixed facial expression; lacks emotional responsiveness), which correspond to the problem behaviors “standing up when told to sit down” and “remaining seated when asked to help.” In particular, the child began to respond appropriately to the homeroom teacher’s encouragement to set the table for lunch. The homeroom teacher created an environment in which it was easy for the child to understand the details of the task by giving encouragement when it was time to begin the behavior, and by placing visual aids (e.g., plates and cups) in the locations where the child needed to put the food in advance. The homeroom teacher thus gave timely verbal encouragement and showed the task that Child B needed to perform through concrete visual aids. This led to an increased desire to perform the task and a reduction in escape behavior on the part of the child. It also led to a reduction in defiant behavior and apathetic attitude in daily school life.

Regarding Child C, an improvement was seen in problem behavior as indicated by ABC-J item 43 (Does not try to communicate by words or gestures), which corresponds to the initial problem behaviors “shouting while looking at her homeroom teacher and waving the fingers of both hands in front of her eyes,” and “jumping in place with both feet while shouting,” which showed that the child began to demonstrate her intentions in appropriate ways. Child C’s homeroom teacher passed objects to her and gave physical prompts such as gently pressing the child’s arm when necessary. Child C was able to address the task because the affirmative attention and encouragement that the homeroom teacher gave her corresponded to the initial functions of the problem behaviors, which were to gain attention and physical stimulation. The continuation of this connection strengthened the relationship between Child C and the homeroom teacher, which led to an increase in the child’s desire to communicate with the teacher in daily school life.

Finally, this section discusses the links between support for SIB reduction and improvement of other problem behaviors in daily school life contexts shown in ABC-J.

The intervention process used in this study was based on the competing behavior model¹³⁾, but as

defined in Step 2, “Define alternative or competing behaviors, and the contingencies associated with them.”¹³⁾, improvements seen in problem behaviors on ABC-J in this study can be considered to be contingencies shared with the development of SIB. In other words, in this study, there is a high possibility that homeroom teachers who promoted task engagement behaviors aimed at reducing SIB also naturally provided support to promote task engagement when other problem behaviors occurred in school life, even if not in the targeted situations in which the main focus of SIB occurred. In actually providing support, “the team of people who will implement the intervention”¹³⁾ studied how to change phenomena resulting from problem behaviors and desirable behaviors, and how to ensure that desirable behaviors competed and won over problem behaviors¹³⁾. In following this model in practice, these kinds of interventions by homeroom teachers may have led to striking improvements, especially in problem behaviors that have the same function as SIB occurring in targeted situations.

On the other hand, Alberto and Troutman¹⁸⁾ asserted the possibility of stimulus generalization in behavior theory (a response trained by a specific teacher in a specific situation may occur in a different situation or with a different teacher). In other words, in response to the intervention implemented in this study, participating children may instigate task engagement behaviors (desirable behaviors) in situations other than the targeted ones identified, and as a result, the occurrence of problem behaviors may be changed.

3. The significance and limitations of the present study with respect to the PBS approach

Results of this study suggested that support encouraging task engagement behavior based on functional assessment for ASD children with SIB may promote improvements not only in SIB in targeted situations, but also in many problem behaviors observed in daily school life contexts. Noted as an issue by Hirasawa and Ogasawara⁹⁾, this would imply the potential to elicit opportunities for new appropriate behaviors, and to maintain these behaviors and create behavior contingencies. Moreover, by creating the potential to reduce problem behaviors and create and expand appropriate behaviors in daily school life contexts, the attempts made in this study could be

further connected to the fostering of “maintenance and promotion of good health”⁴⁾ and “an attitude of engaging in life fully and happily”⁴⁾.

On the other hand, the present study has a number of limitations. First, as there were only three participants, future studies with greater numbers of cases are needed. Second, none of the children in the present study showed improvement in problem behavior included in subscale 3 of the ABC-J (Stereotypic Behavior). Further studies aimed at reducing problem behavior of this type are therefore needed.

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