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Brief Note

Function-Based Interventions for Behavior Problems of a Student With a Developmental Disability: School-Based Treatment Implementation

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The present study examined effects of a function-based intervention on a student's participation in his class and on his teachers' implementation of the intervention. A 12-year-old boy with Asperger's syndrome participated, along with staff at his school. Functional assessment of the student's behavior suggested that his problem behavior might be maintained by the consequences of escape and attention. In Intervention I, setting events and extinction were introduced. In Intervention II, based on a functional assessment of the teachers' behavior, the procedure was modified to add permission cards, which were visual cues for implementation of the intervention. It was hypothesized that the cards would function as an alternative to the problem behavior. The results showed that the function-based intervention with the permission cards was effective for reducing the student's problem behavior and for facilitating implementation by the school staff. The results were discussed in terms of the function of the permission cards and the importance of assessment of the teachers' behavior.

Key Words: function-based intervention, problem behavior, implementation by teachers, visual cues, boy with Asperger's syndrome

Introduction

Recent research in applied settings has shown that the use of descriptive functional assessment can be effective for developing intervention plans for reducing problem behavior (e.g., Scott & Kamps, 2009). Descriptive functional assessment is a process of gathering information by both direct observation and indirect measures (e.g., interviews, rating scales) on events preceding and following a target behavior, and then generating hypotheses about the functional relationship between the environment and the problem behavior (Miltenberger, 2001). Based on those hypotheses, multi-component intervention plans are developed to reduce problem behavior and facilitate appropriate behavior.

Although function-based intervention has been demonstrated to be effective,

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implementation in the absence of verification of the consistency of that implementation provides no conclusive information on the merits of the intervention (McIntyre, Gresham, DiGennaro, & Reed, 2007). Most function-based interventions, by their nature, require school staff to change aspects of their own behavior that are associated with the problem behavior (Hirasawa, Fujiwara, & Yamane, 2009). Therefore, ensuring the consistency of implementation of treatments by staff is a necessary component to ensure that there is a functional relationship between the intervention and the reduction of the problem behavior (McIntyre et al., 2007).

To ensure consistency of implementation of treatments in school settings, researchers have attempted to identify effective consequences, such as performance feedback (e.g., Codding, Feinberg, Dunn, & Pace, 2005; DiGennaro, Martens, & Kleinmann, 2007; Noell, Duhon, Gatti, & Connell, 2002). Despite its success in previous studies, the potency of performance feedback has been criticized for several reasons, including the following: (a) There may be lack of acceptability by teachers, because feedback may serve as a punishing event for some teachers (Codding et al., 2005). (b) Performance feedback is time-consuming for both teachers and consultants (Mortenson & Witt, 1998). (c) The results have not been maintained at high rates (Mortenson & Witt, 1998), thus it is necessary to provide teachers with ongoing feedback about their own performance (DiGennaro et al., 2007).

For these reasons, more acceptable strategies for enhancing teacher implementation are required. Some researchers have focused on antecedent strategies in the consultation process for improving teacher's implementation of interventions (Hirasawa et al., 2009; Petscher & Bailey, 2006). For example, Hirasawa et al. (2009) reported that a function-based intervention with an antecedent strategy that included re-arranging the physical environment of the classroom reduced a student's hand biting and concurrently promoted staff implementation (e.g., interacting individually, extinguishing hand biting). This suggests that the physical setting functioned as a common antecedent stimulus, promoting not only the student's appropriate behavior, but also staff's implementation of the intervention.

Antecedent strategies can be effective and efficient interventions for promoting implementation. However, effective antecedent strategies differ according to the situation (Kern & Clemens, 2007). Therefore, it is important to assess why teachers do not implement intervention plans accurately and, based on that information, develop procedures for supporting implementation. The purpose of the present study was to examine the effect of visual cues for improving both a student's appropriate behavior and his teachers' implementation of the intervention. The method used was based on a descriptive functional assessment of both the student's problem behavior and his teachers' implementation.

Method

Participants, Study Period, and Settings

A 12-year-old male student with a diagnosis of Asperger's syndrome participated

in the present study. He was enrolled in a special support class in a general education elementary school. The boy spent about 18% of his time in the special support classroom, with the rest spent in the general education classroom. His full IQ (tested at CA11 : 8) was 64 on the Wechsler Intelligence Scale for Children-Third Edition (WISC-III). His academic performance was delayed about 3 years in all subjects. Although he had enough verbal capability for daily conversation, he usually refused to talk with people he did not know, especially in group settings. In addition, he tended to be hostile and verbally abusive to people who instructed him to do something, such as being on-task for his lessons.

Six school staff, including a general education teacher, a special support teacher, a para-educator, a school nurse, a librarian, and a school janitor, who contacted the student on a daily basis participated as consultees. The school janitor was a school employee who engaged in maintenance at the school, including cleaning, pruning, and equipment management.

The present study was conducted from May to September 200*x* in the boy's general education classroom. However, during the summer vacation, from July 20th to August 31st, no intervention was implemented. The boy had four or five lessons in a day in the general education setting; each lesson was 45 minutes long. There were thirty children in the classroom, a general education teacher, and a para-educator. The para-educator supported the boy only when he was working on independent worksheets. The independent worksheets were prepared by the special support teacher, and usually provided to him by the classroom teacher.

Procedure

General procedures. The present study was conducted in collaboration with the teachers in a response to a request from the school for assistance. The first author visited the school once a week and worked as a consultant. He conducted the functional assessment, developed the intervention plans, made some of the materials, and held conferences with the teachers.

Target behavior. The principal complaint by the boy's classroom teacher was that the boy did not stay in the general education classroom. It was difficult for his classmates and the teacher to develop a relationship with him. As a result of the first conference, the boy's participation in the classroom activities was selected as a target behavior. This included engaging in tasks required by the teacher, such as working on the independent worksheets, listening to the teacher's lessons, working with his peers in group activities, reading textbooks, and writing in a notebook.

Descriptive functional assessment of the student's behavior. Concurrently with baseline observations, preliminary information was collected via functional assessment interviews (O'Neill, Horner, Albin, Sprague, Storey, & Newton, 1997); direct ABC (Antecedent, Behavior, Consequence) observations were also made, in order to delineate specific antecedent and consequent events that set the occasion for and maintained the problem behavior. The first author observed and recorded the student's behavior and environmental events descriptively in and outside of the classroom for 12 lesson

TABLE 1 Function-Based Hypothesis and Intervention Plan for the Student

Antecedent	Behavior	Consequence
Hypotheses about the student's behavior:		
• lack of history of reinforcement • lack of understanding of the plan for the day's activities • instructions to sit or participate	• leaving the classroom • verbal abuse	• escape from tasks • get attention from staff • have a chance to read books
Interventions:		
1. have classmates go over to talk with the student 2. show him the day's schedule of activities	• participation	3. praise for participation (give permission cards in Intervention II) 4. extinction for leaving the classroom

periods, that is, for a total of 540 minutes during three days of the baseline period.

During the observation periods, the student stayed in the classroom for a total of 45 minutes, or about 8% of the total lesson time. In the classroom, he often left his seat and engaged in inappropriate behavior such as walking around and lying on the floor. When the classroom teacher or para-educator told him to sit down and do some task, he sometimes verbally abused them and often left the classroom. After he had left the classroom, the teachers stopped asking him to work and instead gave him permission to be out of his classroom.

During the observation period, he spent a total of 495 minutes of what would have been his lesson time in the library, the nurse's office, or with the school janitor. In these settings, he read books or talked with the school staff. Although the school staff sometimes told him to go back to his classroom, he ignored that and continued to read or talk. If the student continued to read or talk, the staff gave him no further instructions.

According to an interview with the student, he did not like the classroom environment, because he did not understand which activities were planned for the day, and had very few opportunities to be reinforced. This was confirmed in the interview with his classroom teacher. Based on the information derived from the interviews and observations, the hypotheses and intervention plans were developed (see Table 1).

The information from the interviews and observations suggested that a possible antecedent event for the student's leaving the classroom included the teacher's instructions that he participate. His leaving the classroom might have enabled him to escape from the demand to do the classroom tasks. The access to enjoyable situations such as talking with the staff also reinforced his leaving the classroom. His lack of the understanding of the plans for the day and the lack of opportunities for his behavior to be reinforced were considered to be setting events that increased the probability of occurrence of the problem behavior.

Therefore, the following procedures for setting events were planned: (a) to

provide him with information about the activities of the day by giving him a schedule of the class's activities, and (b) to reduce the feeling of dislike of the classroom by arranging opportunities for him to interact with peers. The following procedures for consequences were planned: (c) to reinforce his appropriate participation with praise, and (d) to remove any reinforcement for his leaving the classroom, i.e., extinction.

Baseline. This phase was the functional assessment observation period. The classroom teacher and other school staff were told to respond to the student's behavior as usual.

Intervention I. In this phase, the procedures for setting events and extinction for the student's leaving the classroom were implemented. The procedures for setting events included three elements: having his classmates go over to talk with the student before the lessons, showing him the activity schedules during the morning activity time, and placing the student's seat near the door. The activity schedules were shown to him by the special support teacher, and included brief information about the lessons for that day. The other two procedures were implemented by the classroom teacher. In the classroom, the teachers praised his participation. Outside the classroom, the librarian, school nurse, and school janitor were asked to implement extinction, that is, they were instructed not to allow him to read books, and not to talk with the student during the time he was supposed to be in his classroom. Changing the location of the student's seat was introduced because that made it easy for him to return to the classroom during lesson periods.

Descriptive functional assessment for teachers. During Intervention I, the school staff often failed to implement the extinction procedure, and the boy continued leaving the classroom to some extent. The first author then observed school staff's implementation and interviewed them in order to modify the intervention plan.

According to the results from the interviews, the procedures for the setting events were implemented in the classroom to some extent only. The classroom teacher explained that there were few opportunities to praise the boy's participation, because he was not participating in any classroom tasks. Staff outside the classroom said that it was difficult to decide how they should respond to him, because he often told them that he had permission to leave his classroom. Observations showed that the student replied to instructions with verbal abuse, after which the staff often stopped giving him instructions and permitted him to read books, or talked with him.

Based on the information above, a modified plan was developed (see Table 2).

The information obtained in the conferences suggested that, in the classroom, the teacher needed some more powerful reinforcer in order to encourage the student's participation. Therefore, the first author instructed the classroom teacher to use "permission cards" as the consequence for his participation. These card were 10 cm × 15 cm laminated paper, and had printed on them (in Japanese), for example in the case of the 4th lesson time, "You have achieved your goal for this lesson, so you may stay anywhere you want until the time for the *4th* lesson is over". The number indicating the lesson differed according to the card, from 1st to 6th. The classroom teacher gave the student the card corresponding to the lesson time only when he had

TABLE 2 Function-Based Hypothesis and Intervention Plan for Teachers

Antecedent	Behavior	Consequence
Hypotheses about the classroom teacher's behavior:		
• the student's leaving the classroom	• permit the student to leave the classroom	• escape from resistance (e.g., verbal abuse) • do not have to take teaching time for correction
Interventions:		
• the student's leaving the classroom	1. give permission cards for task engagement	• escape from resistance (e.g., verbal abuse) • do not have to take teaching time for correction
Hypotheses about the school staff's behavior:		
• the student's leaving the classroom • lack of information about whether he had permission to leave the classroom	• conversation • permit reading	• keep positive interaction • escape from his resistance to instructions (e.g., verbal abuse)
Interventions:		
2. information about permission to leave the classroom (with or without permission cards)	3. extinction 4. remind about the permission cards	• escape from his resistance to instructions (e.g., verbal abuse) • keep positive relationship

finished his independent worksheets and placed them in the box at the front of the classroom. Because the time of validity of one permission card was only to the end of one lesson's time, the student had to return to the classroom before the start of the next lesson. He was instructed to put the card in the box with the worksheets when he got back, and to take one of the worksheets. The permission cards were expected to serve as a reinforcer that was functionally equivalent to his leaving the classroom. The cards were also expected to function as visual cues to remind him to go back to his classroom when the lesson time was over.

The information from the student and teachers also suggested that, outside the classroom, the staff's lack of information about whether the boy had been given permission to leave the classroom equated to a lack of a discriminative stimulus for the staff who were supposed to be implementing the extinction procedure. Therefore, each staff member was instructed to determine whether to implement extinction by examining the permission card that the student had. If he did not have the card corresponding to the current lesson time, the staff were to remind him to go back to his classroom, ignore his talking, and stop him from reading. That is, the permission cards were expected to function as visual cues for the staff so that they would implement extinction.

Intervention II. In addition to the procedures for setting events, the permission cards were introduced. The cards were placed with the worksheets in the box at the

front of the classroom throughout this condition so that they were available to the student at all times. Prior to this intervention, the first author held a conference with the relevant school staff (classroom teacher, special support teacher, librarian, para-educator, school nurse, and school janitor), and instructed them to implement the interventions described in Table 2. The first author gave a concrete demonstration of how the permission cards were to be used, and the staff rehearsed the procedures. The day after that conference, the classroom teacher implemented the following as preparation for the intervention: (a) instructed the student in how to use the permission cards, (b) signed a behavior contract with him, (c) explained about the procedures to his classmates, and (d) explained about the procedures to all the staff of the school in a staff meeting.

Conferences. Throughout the study, the first author and school staff held conferences. Each conference, whether for planning or modifying the intervention, was held after school for about an hour. The classroom teacher and special support teacher participated in every conference, and the other staff did also, if they were needed. In the planning conferences, the first author proposed procedures based on the assessment and the opinions of the teachers. After the permission cards were introduced, the conferences were held on a weekly basis during the lunch break for about 20 minutes. The classroom teacher, or the special support teacher, or sometimes both, participated. In the weekly conferences, the data on the student's behavior were reviewed and anecdotal data were also shared.

Data Collection and Reliability

Data were collected by direct observation during each lesson by the classroom teacher and para-educator independently, on the basis of the following categories: (a) the boy participated in the lesson for 45 minutes, (b) the boy spent all of the lesson time outside of the classroom (0 minutes in the classroom), (c) the boy left the room with a permission card after finishing his independent worksheets, and (d) the boy left the room without permission during a lesson. The percentage of each category was calculated as the number of lessons in each category divided by the total number of lessons in the day times 100. For example, if the boy participated for 45 minutes in three out of five lessons throughout the day, used permission cards in one lesson, and left during one lesson, the percentage of participation (45 min) was 60%, leaving the classroom (0 min. in the room) was 0%, leaving during a lesson was 20%, and using a permission card was 20%.

At the end of each phase, staff implementation data were collected. School staff who had participated in the study used a checklist to evaluate the difficulty of implementing the intervention procedures. The scale of difficulty of implementation ranged from 1=difficult to implement to 5=easy to implement.

Inter-observer agreement on the data for the student's behavior was assessed for all school days during the study. The data collected by the classroom teacher and by the para-educator were compared, and whether their categorization of the student's behavior agreed or disagreed was checked for each lesson. Agreement rate was

calculated as the number of lessons in which their records agreed divided by the total number of lessons times 100. The agreement rate was 98% throughout the study.

Results

Student's Behavior

Figure 1 displays the percentage of lessons in which the student participated, left the classroom during a lesson, used a permission card, and left the classroom without permission.

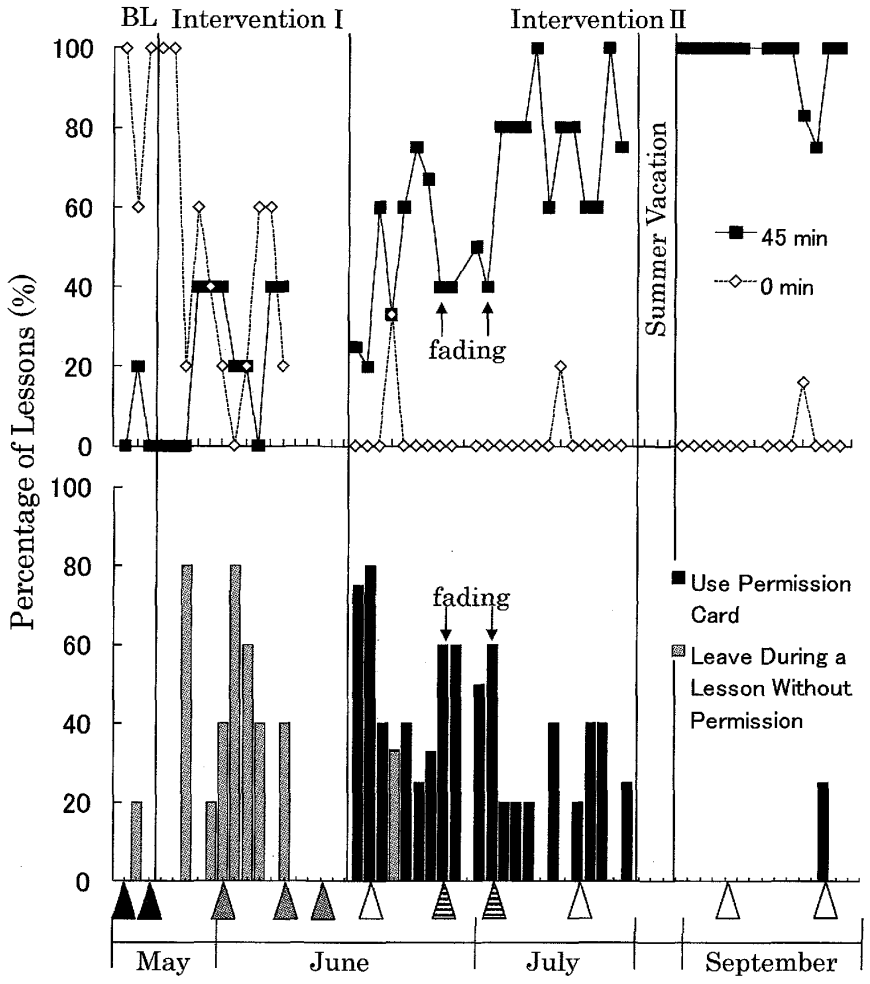

FIG. 1 Percentage of Lessons in Which the Student Participated, Left the Classroom During a Lesson, Used a Permission Card, and Left the Room Without Permission.

Notes. BL=baseline. Black triangles indicate the days that a conference for developing the first intervention was held; gray triangles, the days of conferences for modifying the plans; striped triangles, the days of conferences about fading; white triangles, information exchange conferences.

During baseline, the student left the classroom during 87% of lessons on the average; his participation averaged 7%. In Intervention I, his leaving the classroom decreased drastically to 45% on the average. In contrast, his class participation increased to 22% on the average. However, he left during lessons without permission 33% of the time, on the average. After the permission cards were introduced in Intervention II, he hardly ever left the classroom without permission. In addition, he always came back to the classroom before the start of the next lesson, and often used the permission cards. Before summer vacation, the percentage of lessons in which he used permission cards averaged 34%. In this period, the rate of his participation in the classroom gradually increased to 62% on average. After summer vacation, his participation became stable at 97% on average, and the permission cards were used only a few times.

Anecdotal data about the permission cards were also collected: (a) On the fourth school day in Intervention II, the student left the classroom without a permission card, and was strongly reprimanded by another classroom teacher. After that day, he never left the room without a permission card. (b) On eighth school day in Intervention II, the boy accidentally lost the permission card for the 4th lesson time. This incident was used as a natural fading of the intervention component, and the card was not reissued. (c) He lost the card for the 5th lesson time four days after of that day. This incident was also used as part of the fading procedure.

According to anecdotal information from the classroom teacher, after the middle of July, the boy's relations with his classmates improved and his frequency of play with them during breaks between lessons and after school gradually increased.

According to his mother, this was the first time in his school life that the boy had played with his classmates after school. In response to hearing this, the first author requested the mother to set opportunities for the boy to play with his classmates as many times as possible during the summer vacation. Thereby, the boy played with his classmates at either his house or theirs two or three days a week during the vacation.

After summer vacation, the first author was told positive anecdotes continuously by the teacher, such as: the boy participated in practice for a sports festival and worked appropriately with his classmates, or he chatted with his peers pleasantly during recess.

Staff Implementation

Table 3 displays the self-evaluation scores of school staff in each phase. In procedures for setting events, arranging placement of the boy's seat was evaluated as easy to implement. On the other hand, sending the classmates to talk with him and showing him the day's activity schedule were evaluated as being relatively difficult to implement. The permission card system was likely to be implemented properly in and outside the classroom. The component of extinction was scored differently in Intervention I and Intervention II. In Intervention I, extinction was evaluated as difficult to implement. In contrast, it was evaluated as easy to implement in Intervention II.

TABLE 3 Self-Evaluation by the School Staff of Their Implementation of the Procedure

	Intervention I				Intervention II				
	seat	*peer*	*sche*	*ext*	*seat*	*peer*	*sche*	*card*	*ext*
classroom teacher	5	3	—	—	5	4	—	5	—
special support	—	—	2	—	—	—	3	—	—
para-educator	—	—	—	3	—	—	—	5	4
librarian	—	—	—	3	—	—	—	5	5
school nurse	—	—	—	2	—	—	—	5	5
school janitor	—	—	—	1	—	—	—	5	4

Notes. Columns represent the intervention components.
Seat=seat arrangement in the classroom, *peer*=his classmates going over to talk with the student before the lessons started, *sche*=activity schedules, *ext*=extinction, *card*=permission cards. Arabic numerals (1 to 5) indicate the self-evaluation score of each school staff member.

Discussion

The present study examined effects of a function-based intervention, including permission cards. Based on a functional assessment of the behavior of the student and his teachers, the permission cards were expected to have multiple functions for their behavior. The results showed that, in Intervention II, the modified procedures based on the functional assessment of the teachers' behavior facilitated implementation of the intervention as well as appropriate behavior of the student.

On the other hand, there were limited effects during Intervention I, in which the intervention was based on functional assessment of only the student's problem behavior.

In Intervention II, introducing the permission cards, the boy's behavior of leaving the classroom decreased drastically, and his participation increased gradually. These results suggest that the permission cards functioned as a reinforcer for the student that was functionally equivalent to leaving the classroom. Because use of the permission cards had the same consequences as leaving the classroom, card use was reinforced as a behavioral alternative to the problem behavior.

In addition, extinction outside the classroom was implemented consistently in this phase. In other words, differential reinforcement of alternative behavior (DRA) was consistently implemented. Therefore, the use of the cards might be reinforced more efficiently than leaving the classroom. In fact, the permission cards were likely to be a powerful reinforcer because the student was willing to use them.

The results also suggested that the permission cards functioned as visual cues for participation. In this study, the permission cards contained the following rules: (a) receiving the cards was a consequence of his participation, and (b) his privileges lasted only during the present lesson time. It is possible that these descriptions of the rules served as a prompt for the boy to get back to the classroom before the start of

the next lesson (Cooper, Heron, & Heward, 2007). In addition, when he got back to the classroom, he returned the card for the previous lesson time to the box holding the independent worksheets and took the next worksheets that he had to do. This behavioral chain may have facilitated his participation.

When viewed from the perspective of enhancing implementation, the permission cards functioned differently for the teachers than for the student. For the school staff, the permission cards functioned as visual cues for discriminating when to implement extinction. In Intervention I, despite a downward trend, leaving the classroom persisted at 45%. This may have been so in part because extinction for leaving the classroom was not implemented adequately. In fact, the staff who worked outside the classroom reported in their self-evaluations that it had been difficult to implement extinction in this phase.

On the other hand, after the permission cards were introduced, the staff reported that the cards had facilitated the implementation of extinction. These results are consistent with the hypotheses from the functional assessment of the teachers' behavior, which had suggested that one of the causes of their failure to implement the extinction procedure consistently was the lack of a discriminative stimulus for extinction.

In the present study, consistent implementation of extinction was a key point for guaranteeing the effectiveness of the differential reinforcement of alternative behavior for reducing the problem behavior and improving participation in the classroom. Koegel, Koegel, Boettcher, Harrower, and Openden (2006) indicated that functionally equivalent behaviors may not always be reinforced in the natural environment, especially when problematic behaviors continue to be reinforced. However, in natural settings, extinction is not likely to be implemented consistently without certain strategies supporting the staff's behavior (Muramoto & Sonoyama, 2009). Therefore, it is important for ensuring the effectiveness of function-based interventions to arrange an environment in which extinction is implemented correctly and consistently.

In summary, the permission cards functioned as follows: (a) as a reinforcer that was functionally equivalent to the problem behavior, (b) as a visual cue for participation, and (c) as a visual cue for the teachers' implementation of extinction. The results of present study suggest that, in order to enhance treatment fidelity in an intervention, it is important to arrange an appropriate discriminative stimulus, one that is chosen on the basis of a functional assessment of the teachers' behavior. In addition, if procedures are developed on the basis of functional hypotheses about both the teachers' and the student's behavior, interventions can be more effective and efficient.

Several limitations of the present research should be noted, and may be addressed in future research. First, it was unclear how the peer group's actions affected the student's participation. According to the anecdotal data, the frequency of the boy's interactions with his classmates increased concurrently with the gradual increase in his participation in the class. Particularly, after playing with peers frequently in summer vacation, the percentage of participation remained at a high level. Thus, it was possible to presume that the more the relationship with his classmates improved,

the more the boy's participation was socially reinforced by them. However, it is difficult to draw specific conclusions about the influence of his peers' actions because no quantitative data were collected about their interactions. Greenwood and Hops (1981) indicate that, in the classroom settings, a student's peer group is the agent with the greatest power for modification of children's behavior. Therefore, future research should collect quantitative data on those interactions (e.g., during breaks between lessons). Those data may reveal the process of improvement of the target behaviors more clearly.

An applicable condition of the permission cards was another issue. In the present study, before introducing the permission cards, five planning conferences were held. In the conferences, the first author explained the following to the teachers: (a) the procedures of the intervention, (b) the reasons the procedures were being employed, and (c) prospects for fading the procedure.

In the fifth conference, the first author provided brief instruction to the teachers. In addition, the classroom teacher announced the procedure to the boy's classmates and whole staff of the school. Although this preparation was needed in this study, required conditions may be different in other cases. Thus, it is necessary to apply the unique qualities of teams and specific factors of the case to the development and implementation processes (Bambara, Gomez, Koger, Lohrmann-O'Rourke, & Xin, 2001).

Finally, the quality of the data collected in this study should be noted. In the present study, all of the data collection was done by the school staff. Therefore, it was difficult to obtain extensive data about the boy, such as his engagement in each of the classroom activities, academic skills, and social skills. Although having the school staff themselves collect the data is valuable in relation to generalization of data-collecting behavior in the school, more attentive data collection is needed in order to have a more complete evaluation of the student's improvement.

In addition, it was also unclear whether the school staff actually implemented the intervention to the extent described in their self-report data. Although the improvement of the student's behavior intimated that the staff had implemented the procedures consistently, future research should assess the level of the teachers' implementation by direct observation.

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