Identifying Training Procedures to Improve Practitioners' Intervention Skills for Children with Developmental Delay: Dissemination Strategies to the Community
1. INTRODUCTION

Evidence has demonstrated that early behavioral interventions for children with developmental delay improve their intellectual, social, and communication functions. A requisite condition to receive effective interventions may be having well trained therapists because that the effects of the intervention heavily depend on the fidelity. However, it may be difficult for some children and their families in Japan because the number of trained therapists are far fewer than the number of children and families who need the interventions.

People who provide interventions for children with developmental delay in Japan, instead of behavioral intervention therapists in other countries, are parents at home, nursery teachers at nursery schools, special education teachers at schools, and clinical psychologists, occupational therapists, and speech and language therapists at child development support centers.

Under such situations, the author developed a new model to disseminate the evidence-based behavioral interventions which can be fit in the welfare and educational system. The main concept of the new model is teaching behavioral intervention strategies to practitioners who had been working with children with developmental delay in their professions. If we can teach them the evidence-based behavioral intervention strategies, the duration of the training may be reduced because they already had basal knowledge, experience, and plenty of activity ideas in their professions. More importantly, it may expand the availability of evidence-based behavioral interventions for children with developmental delay and their families in community settings.

The purpose of the present dissertation is to identify the method to develop human resources to increase the number of practitioners who can implement evidence-based behavioral interventions in community settings.
The primary aims of this dissertation are to: (a) Investigate trainees’ (i.e., parents, nursery teachers, clinical psychologists, and special education teachers) baseline characteristics and examine the effects of the training programs on their intervention skills; (b) identify determinants of the intervention effects on intervention skills; (c) examine the effects of each training procedure on acquisition of intervention skills and knowledge; (d) examine the effects of training programs on children’s development; (e) examine the effects of a pyramidal training program to inherit behavioral intervention strategies; and (f) examine the acceptability of the training programs.
2. EXPERIMENT

2.1 EXPERIMENT 1: Effects of a Brief Parent Training Program on Parents’ Behavioral Intervention Skills

Many studies have found that the effects of early intervention for children with developmental delay increase when parents are involved in the interventions. To provide a training program efficiently and widely to parents, the training program should be cost effective, which can be implemented in a short period of time, with a limited human resources and without much labor. Therefore, the author developed a brief parent training program consisting of a didactic lecture and video feedback.

In this experiment, the brief parent training program was applied to 20 parents of young children with autism spectrum disorder, and the effects on parents’ intervention skills, parental stress, and children’s development were examined.

Method

Participants

Twenty parent–child dyads participated. The parents were all mothers, nine parents had two or more children, and 11 parents had only a child. Their children, being younger than six years of age, had all been diagnosed as autism spectrum disorder by pediatricians.

Design and Procedure

A between-subjects group design was used to examine the conditions of
**didactic lecture** (i.e., individual or group) to assess parents’ intervention skills, parental stress, children’s language skills, early communication skills, and social skills over a 2-month time span.

**Intervention.** The brief parent training program consisted of a 3-hr **didactic lecture** and 30-min individual **video feedback**. During Didactic lecture, parents received a 3-hr **didactic lecture** either individually or in a small-group setting. During Video feedback, 30-min **video feedback** session was provided to each parent individually a month after the **didactic lecture**.

**Dependent Measures**

**Parent outcome measures.** (1) Fidelity of implementation: The fidelity list for parents evaluated parents’ use of 10 intervention skills. The intervention skills were divided into three categories: antecedent, target behavior, and reinforcement. (2) Parental stress: Parental stress was measured using the Japanese Parental Stress Index (JPSI: Kanematsu et al., 2006).

**Child outcome measures.** (1) Language development: Language development was measured using the Japanese MacArthur Communicative Development Inventory (JCDI: Watamaki & Ogura, 2004): Language and Gestures. (2) Early communication development: Early communication development was measured using the KEIP early communication developmental checklist (Yamamoto & Matsuaki, 2010, 2016). (3) Social skills: Social skills were measured using the Kinder Infant Developmental Scale (KIDS: Miyake et al., 1990): Type T.

**Acceptability Measure.** Parents completed an acceptability survey at the end of the experiment.
Results

Parent Outcome

(1) Fidelity of implementation: As summarizing the data for parents in both conditions, 90% of the parents increased their fidelity score after the intervention, and 70% of them reached the mastery criterion at post-intervention compared with 15% at pre-intervention. The main effect for time was significant regardless of group, being on average significantly higher at post-intervention than pre-intervention. There was no main effect for group. (2) Parental stress: The average of total parental stress slightly decreased. However, the main effect for time and group were not significant.

Child Outcome

(1) Language development: For comprehension scores, 85% of the children increased as summarizing the data for children in both conditions. For production scores, 80% of the children increased as summarizing the data for children in both conditions. The main effects for time were significant, but there were no main effect for group for both scores. (2) Early communication development: As summarizing the data for children in both conditions, 85% of the children increased. The main effect for time was significant, but there was no main effect for group. (3) Social skills: 55% of the children increased social relationship with children DA scores, and 60% of the children increased social relationship with adults DA scores after the intervention. For social relationship with children DA scores, there was no main effect for time and group. For social relationship with adults DA scores, the main effect for time was significant, but there was no main effect for group.
Acceptability

Overall, parents were very satisfied with the didactic lecture, video feedback, and apps as materials.

Discussion

Experiment 1 showed that the brief parent training program was effective in improving parents’ intervention skills and children’s language, early communication, and social skills. Also, the average level of parental stress decreased to some extent after the intervention. Parents rated the didactic lecture, video feedback, and apps as highly acceptable. There were no differences observed between the training conditions, individual or group settings for the didactic lecture, on all measures. The results show the feasibility of the training program to be used in community settings.

Since the author developed it as a training program that could be quickly and easily gone through, the cost and labor of implementing it was minimized, which would allow more families to be able to receive it in community settings.

2.2 EXPERIMENT 2: Effects of Performance Feedback Conditions on Nursery Teachers’ Behavioral Intervention Skills and Knowledge

As the number of children with developmental delay increases globally, nursery teachers’ responsibilities when working with these children have increased in tandem. Developing effective and feasible training programs for teachers is an urgent challenge.
A number of studies have shown the effects of a training program that utilized performance feedback as a key component to teach behavioral intervention skills. Performance feedback can be divided into two major conditions: in-vivo feedback and delayed feedback. In-vivo feedback mainly involved the use of verbal comments as a form of feedback. In contrast, delayed feedback involved the use of written notes, graphs, and videos as forms of feedback. Although the effectiveness and possible disadvantages of each condition have been reported in previous studies, few studies have examined the difference made by the conditions on teachers’ acquisition of behavioral intervention skills by employing a between-subjects group design.

In this experiment, different feedback conditions were applied to 24 nursery teachers, and the effects on teachers’ intervention skills and knowledge were examined.

**Method**

**Participants**

**Teachers.** Twenty-four licensed nursery teachers participated. Seven teachers were assigned to the non-feedback group, eight teachers were assigned to the video feedback group, and nine teachers were assigned to the in-vivo feedback group.

**Children.** A total of 24 children with developmental delay, being younger than six years of age, participated.

**Design and Procedure**

A between-subjects group design was used to examine the differences between the feedback conditions.

**Intervention.** All groups received a 3-hr didactic lecture. Teachers in the video
feedback group received the 3-hr didactic lecture followed by a 30-min video feedback via telehealth technology. The in-vivo group received the 3-hr didactic lecture followed by a 30-min in-vivo feedback while they were intervening with a child in a one-to-one setting. Data were collected pre- and post-intervention.

**Dependent Measures**

**Teacher outcome measures.** (1) Fidelity of implementation: The fidelity list for nursery teachers evaluated teachers’ use of 20 intervention skills. The intervention skills were divided into three categories: antecedent, target behavior, and reinforcement. (2) Knowledge: A 20-mark knowledge examination was used to evaluate teachers’ knowledge on behavioral intervention principles and treatment procedures.

**Acceptability measure.** Teachers anonymously completed an acceptability survey at the end of the experiment.

**Results**

**Teacher Outcome**

(1) Fidelity of Implementation: Post intervention, 14% of the teachers in the non-feedback group, 50% in the video feedback group, and 89% in the in-vivo feedback group reached the mastery criterion. Although the average scores increased in all groups after the intervention, a significant difference between pre- and post-intervention fidelity scores was only found in the in-vivo feedback group. (2) Knowledge Examination: The average scores increased in all groups after the intervention, and significant difference between pre- and post-intervention knowledge examination scores were found in all groups. Significant differences among feedback conditions in post-
intervention knowledge examination scores were not found.

**Acceptability**

Overall, teachers were very satisfied with the training program, regardless of the conditions.

**Discussion**

Experiment 2 examined the effects of three different feedback conditions on the acquisition of intervention skills and knowledge of behavioral intervention and treatment procedures. The results indicate that *in-vivo feedback* was the most effective among the three feedback conditions in improving intervention skills. The skills they acquired with the *in-vivo feedback*, but not with *non-feedback* and *video feedback*, were skills teachers need to change depending on child’s ever-changing responses. Contrary to the fidelity scores, knowledge examination scores improved in all conditions and there were no differences among them.

The author demonstrated that *in-vivo feedback* was effective for teaching behavioral intervention skills to teachers working in community settings. The most noteworthy finding in the experiment was that a single 30-min *in-vivo feedback* session made such a significant difference. The temporal cost and labor of the feedback were much lower than that of training programs examined in previous studies.
2.3 EXPERIMENT 3: Effects of an Expert Training Program on Practitioners’ Behavioral Intervention Skills and Knowledge

Numerous studies have demonstrated the effectiveness of behavioral skills training (BST) in teaching a wide variety of behavioral skills. BST is a training package consisting of instructions, modeling, rehearsal, and feedback.

Previous studies demonstrated the effectiveness of BST for trainees to acquire behavioral intervention skills for children with developmental delay. However, we should carefully consider who the trainees can be, what the best combination of duration and frequency of intervention are, how long intervention should be continued, and so on in order to make the training more reliable.

The author developed BST, named expert training program, and systematically applied it on clinical psychologists, special education teachers, and nursery teachers working at a child development support center. In Experiment 3-1, 3-2, and 3-3, the effects of the expert training program on trainees’ intervention skills, knowledge, and children’s development were examined.

2.3.1 Experiment 3-1: Effects of the Expert Training Program for Clinical Psychologists

Method

Participants

Trainees. Two clinical psychologists participated.
**Children.** Two young children with autism spectrum disorder participated.

**Design and Procedure**

A non-concurrent multiple baseline design was used to examine changes in trainee’s fidelity. A pre-post design was used to assess changes in trainees’ knowledge of behavioral principles and treatment procedures, and children’s development.

**Baseline.** Each trainee was randomly assigned to one of the children, and the trainees were instructed to teach communication skills to their respective child in a one-to-one setting.

**Intervention.** The expert training program consisted of a *didactic lecture, role-playing, in-vivo feedback, and video feedback*. The *video* and *in-vivo feedback* sessions continued until the trainee met the mastery criterion, which was 85% or above in all categories.

**Post-intervention.**

**Stabilization.** The trainees were instructed to lead 30-min one-to-one sessions in order to examine whether the trainees could maintain fidelity for a longer period.

**Generalization.** The original pair were switched to their counterparts in order to examine whether the trainees could generalize fidelity from a familiar child to a novel child.

**Follow-up.** Follow-up sessions were scheduled three months after the final *in-vivo feedback* session.

**Dependent Measures**

**Trainee outcome measures.** (1) Fidelity of implementation: The fidelity list
for experts evaluated trainees’ use of 50 intervention skills. The intervention skills were divided into five categories: *setting*, *antecedent*, *target behavior*, *reinforcement*, and *managing challenging behaviors*. (2) Knowledge: A 100-mark knowledge examination was used to evaluate trainee knowledge of behavioral principles and treatment procedures.

**Child outcome measures.** (1) Language skill: Language skill was measured using the Japanese MacArthur Communicative Development Inventory (JCDI: Watamaki & Ogura, 2004): Language and Gestures. (2) Social engagement: Social engagements were measured using Child Behavior Rating Scale (CBRS: Mahoney & Wheeden, 1998) and conducting behavioral observations of compliance.

**Results**

**Trainee Outcome**

(1) Fidelity of implementation: After the *didactic lecture* and *role-playing*, the fidelity scores of both trainees had slightly improved. Both trainees improved their fidelity scores as feedback sessions proceeded, and met the mastery criterion (85%) for all categories during the six and seventh feedback sessions. Once the mastery criterion for all categories had been met, the trainees continued meeting even though assessment times grew longer and intervention on a novel child occurred. Moreover, the fidelity was maintained during the 3-month follow-up phase. (2) Knowledge: Both trainees increased their scores after the intervention.

**Child Outcome**

(1) Language skill: Both children’s *comprehension* scores increased after the
intervention; one child increased *gesture score* and *production score*. (2) Social engagement: Both children increased attention score, initiation score, and compliance percentages.

**Discussion**

Experiment 3-1 showed that the clinical psychologists acquired, generalized, and maintained behavioral intervention skills with the expert training program. In addition, their knowledge improved, and children’s language and social skills improved as did clinical psychologists’ intervention skills.

The results of Experiment 3-1 raise the question of whether special education teachers acquired intervention skills and knowledge as much as clinical psychologists did, and whether fidelity scores kept increasing, even feedback procedures terminated before fidelity scores reached the mastery criterion.

### 2.3.2 Experiment 3-2: Effects of the Expert Training Program for Special Education Teachers

**Method**

**Participants**

*Trainees.* Two special education teachers participated.

*Children.* Two young children with autism spectrum disorder participated.
Design and Procedure

A non-concurrent multiple baseline design was used to examine changes in trainees’ intervention skills. A pre-post design was used to assess changes in trainees’ level of knowledge on the behavioral principles and treatment procedures.

**Baseline.** Trainees were instructed to teach communication skills to their respective child in a one-to-one setting.

**Intervention.** The same intervention procedures as those used in Experiment 3-1 were employed, which included a *didactic lecture, role-playing, in-vivo feedback,* and *video feedback.* The difference in the nature of the intervention between this experiment and Experiment 3-1 was the number of *in-vivo* and *video feedback* sessions provided. The *in-vivo* and *video feedback* sessions were provided only four times, regardless of trainees’ fidelity scores in this experiment.

**Follow-up.** Follow-up sessions were scheduled one month after the final *in-vivo feedback* session.

Dependent Measures

**Trainee outcome measures.** (1) Fidelity of implementation: The fidelity list for experts evaluated trainees’ use of 50 intervention skills, same as the one used in Experiment 3-1. (2) Knowledge: A 100-mark knowledge examination was used to evaluate trainee knowledge of behavioral principles and treatment procedures, same as the one used in Experiment 3-1.
Results

Trainee Outcome

(1) Fidelity of implementation: One trainee’s fidelity scores improved as feedback session proceeded; however, his scores didn’t reach the mastery criterion during the intervention as well as during the 1-month follow up phase. The other trainee reached the mastery criterion in all categories on the second feedback session, and continued meeting them throughout the 1-month follow-up phase. (2) Knowledge examination: Both trainees increased their scores after the intervention.

Discussion

Experiment 3-2 showed that one of the special education teachers acquired the intervention skills to the mastery level within the intervention, while the other teacher did not reach the mastery criterion within the intervention and didn’t meet the criterion during the follow-up phase as well. This experiment discloses the fact that the fidelity scores didn’t increase when feedback sessions had terminated before the fidelity score reached the mastery criterion. The author therefore concludes that feedback did indeed need to continue until a trainee reached the mastery criterion.

In the next experiment, the author further replicated the experiments for nursery teachers working at a child development support center, to examine whether the expert training program was effective, even if each in-vivo feedback session was provided over a shorter duration of time.
2.3.3 Experiment 3-3: Effects of the Expert Training Program for Nursery Teachers Working at a Child Development Support Center

Method

Participants

Trainees. Two nursery teachers working at a child development support center participated.

Children. Six young children participated. Three children were diagnosed as having autism spectrum disorder and three were diagnosed as experiencing delays in communication development.

Design and Procedure

A pre-post design was used to examine changes in trainees’ intervention skills, and children’s development.

Baseline. The trainees were instructed to teach communication skills to their respective children in a one-to-one setting for each child. In addition, trainees’ interventions in a small group setting were video-recorded to measure the generalization effect.

Intervention. The same intervention procedures as those used in Experiments 3-1 and 3-2 were employed, including a didactic lecture, role-playing, in-vivo feedback, and video feedback. The difference between the intervention procedures used in Experiment 3-3 compared with the other experiments included the duration and number of the in-vivo feedback sessions. Twenty-min in-vivo feedback sessions were provided for 15 times for each trainee in this experiment compared to 1-hr in-vivo feedback.
sessions for four to six times in Experiments 3-1 and 3-2.

**Follow-up.** Follow-up sessions were scheduled two months after the final *in-vivo feedback* session.

**Dependent Measures**

**Trainee Outcome Measure.** Fidelity of implementation: The fidelity list for experts evaluated trainees’ use of 50 intervention skills, same as the one used in Experiments 3-1 and 3-2.

**Child outcome measures.** (1) Language skill: Language skill was measured using the Japanese MacArthur Communicative Development Inventory (JCDI: Watamaki & Ogura, 2004): Vocabulary and Grammar. (2) Social skill: Social skills were measured using the KIDS (Miyake et al., 1990): Type T.

**Results**

**Trainee Outcome**

Fidelity of implementation: The baseline scores in one-to-one setting showed relatively high level, however neither of the trainees met the mastery criterion. The baseline data of group settings were as high as for scores in one-to-one settings. During the intervention phase, the scores for both trainees improved with the addition of feedback sessions and reached the mastery criterion. During the 2-month follow-up phase, all scores in all categories stayed at 100 for both trainees. The average follow-up data of group settings also met the mastery criterion.
Child Outcome

(1) Language skill: Five children showed improvement via the scores for *expressive language*, *auxiliary words*, and *auxiliary verbs*. Two children also improved their scores for *complexity of sentences*: Vocabulary and Grammar. (2) Social skill: All children showed improvements via the *social relationship with children* scores. Five children also improved *social relationship with adults* scores.

Discussion

Experiment 3-3 was a systematic replication of Experiments 3-1 and 3-2. The results indicate that nursery teachers working at a child developmental support center acquired intervention skills as much as clinical psychologists and special education teachers did.

Trainees in this experiment received more frequent *in-vivo feedback* sessions of shorter duration. The amount of feedback procedures required to reach mastery criterion were about the same for Experiments 3-1 and 3-3. The experiments demonstrated that both procedures were equally effective in improving trainees’ fidelity scores.

Trainees’ fidelity scores in a group setting also dramatically improved after the intervention. This result indicates that both trainees generalized the acquired skills to the group setting.

The children showed significant improvements in vocabulary and social skills. With regards to the number of sessions in which children received the intervention, developmental changes were overt. The children might receive effective interventions not only in the one-to-one sessions, but also in group settings as trainees acquired intervention skills. This might also occur during play and daily routines from the
2.4 EXPERIMENT 4: Effects of a Pyramidal Training to Inherit the Expert Training Program and Post-hoc Analyses for Practitioners in Experiments 3, 4-1, and 4-2

The author has developed and examined the effects of the expert training program in Experiment 3. The next challenge is to develop a system that can provide the effective expert training program that is continuous and efficient in community settings. Growing evidence suggests that effective training programs can be successfully inherited using pyramidal training. Pyramidal training is a dissemination model in which training is provided to a small number of individuals who are instructed to train additional individuals (Page, Iwata, & Reid, 1982).

In Experiment 4-1 and 4-2, a pyramidal training program was applied to 11 practitioners, and the effects on practitioners’ intervention skills, knowledge, and trainers’ procedural fidelity were examined. In Experiment 4-3, the author summarized the results in Experiment 3, 4-1, and 4-2, and identified participant practitioners’ pre-intervention characteristics and determinants of intervention effects on intervention skills.
2.4.1 Experiment 4-1: Effects of the Pyramidal Training with a Second Tier

Method

Participants

Trainees. Seven practitioners participated from various professions.

Trainers. Four practitioners who participated as trainees in Experiments 3 participated.

Children. Seven young children with developmental delay participated.

Supervisor. The author served as a supervisor.

Design and Procedure

A non-concurrent multiple baseline design was used to examine changes in trainees’ intervention skills. A pre-post design was used to assess changes in trainees’ knowledge of the behavioral principles and treatment procedures.

Baseline. Trainees were instructed to teach communication skills to their assigned child in a one-to-one setting.

Intervention. The same training procedures as those used in Experiment 3 were employed, which consisted of didactic lecture, role-playing, in-vivo feedback, and video feedback. The supervisor was in charge of the didactic lecture, and the trainers were in charge of the role-playing, in-vivo feedback, and video feedback.

Follow-up. Follow-up sessions were scheduled one to two months after the final in-vivo feedback session.
Dependent Measures

**Trainee outcome measures.** (1) Fidelity of implementation: The fidelity list for experts evaluated trainees’ use of 50 intervention skills, same as the one used in Experiment 3. (2) Knowledge: A 100-mark knowledge examination was used to evaluate trainee knowledge of behavioral principles and treatment procedures, same as the one used in Experiment 3.

**Trainer outcome measure.** Procedural fidelity: The trainer’s procedural fidelity was measured by the respective trainee using the procedural fidelity list for trainers following the completion of intervention phase.

**Acceptability measure.** Trainees completed an acceptability survey at the end of the experiment.

Results

**Trainee Outcome**

(1) Fidelity of implementation: Most of the trainees, except one for one probe, did not meet the mastery criterion during baseline phase. Improvements did not occurred much after *didactic lecture* and *role-playing*, and the fidelity scores significantly increased as feedback sessions proceeded. At the last session of the intervention phase, all trainees’ scores reached the mastery criteria. The acquired skills were maintained during the follow-up phase. (2) Knowledge: All trainees increased their scores after the intervention.

**Trainer Outcome**

Procedural fidelity: All trainees except one answered that their respective trainer
provided all items appropriately, and 97.91% of the fidelity was correctly demonstrated as the average.

**Acceptability**

Overall, trainees were very satisfied with the training experience.

**Discussion**

The trainees’ fidelity scores did not improve much after the *didactic lecture* and *role-playing* were provided, which was consistent with Experiment 3. Their scores significantly improved as *in-vivo* and *video feedback* proceeded, and all the trainees’ scores reached the mastery criteria (85%) by the end of the intervention.

The knowledge examination scores significantly increased at post-intervention regardless of the difference of provision of the *didactic lecture*; face-to-face and via telehealth technology. The results show that the condition of face-to-face or telehealth technology did not affect the knowledge score, and both procedures were equally effective.

Experiment 4-1 succeeded in demonstrating that previously trained practitioners trained seven second-tier trainees. In Experiment 4-2, the author further evaluated the effects of the pyramidal training with a third tier of four trainees.
2.4.2 Experiment 4-2: Effects of the Pyramidal Training with a Third Tier

Method

Participants

Trainees. Four practitioners participated from various profession.

Trainers. Four practitioners who participated as trainees in Experiment 4-1 participated.

Children. Four young children with developmental delay participated.

Supervisor. The author served as a supervisor.

Design and Procedure

A non-concurrent multiple baseline design was used to examine changes in trainees’ intervention skills. A pre-post design was used to assess changes in trainees’ knowledge of the behavioral principles and treatment procedures.

Baseline. Trainees were instructed to teach communication skills to their assigned child in a one-to-one setting.

Intervention. The same training procedures as those used in Experiments 3 and 4-1 were employed, which consisted of didactic lecture, role-playing, in-vivo feedback, and video feedback. The supervisor was in charge of the didactic lecture, and the trainers were in charge of the role-playing, in-vivo feedback, and video feedback. The feedback sessions were applied only four times regardless of their fidelity scores to examine the self-feedback rehearsal effect.

Follow-up. Follow-up sessions were scheduled one to two months after the
final in-vivo feedback session.

**Dependent Measures**

**Trainee outcome measures.** (1) Fidelity of implementation: The fidelity list for experts evaluated trainees’ use of 50 intervention skills, same as the one used in Experiments 3 and 4-1. (2) Knowledge: A 100-mark knowledge examination was used to evaluate trainee knowledge of behavioral principles and treatment procedures, same as the one used in Experiments 3 and 4-1.

**Trainer outcome measure.** Procedural fidelity: The trainer’s procedural fidelity was measured by the respective trainee using the procedural fidelity list for trainers following the completion of intervention phase.

**Acceptability measure.** Trainees completed an acceptability survey at the end of the experiment.

**Results**

**Trainee Outcome**

(1) Fidelity of implementation: The changes from the average baseline score to the first probe of the intervention phase show that not much improvement occurred and this was consistent with Experiment 4-1. Three out of four trainees’ scores reached the mastery criteria at the fourth feedback session during intervention phase, and the fidelity were maintained during the follow-up phase. One trainee did not reach the mastery criteria at the fourth sessions, and her follow-up scores did not meet the criteria as well.

(2) Knowledge: All trainees increased their scores after the intervention.
Trainer Outcome

Procedural fidelity: All trainees answered that the respective trainer provided all items appropriately in which 100% fidelity was correctly demonstrated.

Acceptability

Overall, trainees were very satisfied with the training experience.

Discussion

This experiment was a systematic replication of the Experiment 4-1 to examine whether the pyramidal training was effective for another tier. Experiment 4-2 showed that the third tier trainees acquired and maintained behavioral intervention skills with the pyramidal training. On the average baseline fidelity scores and the fourth fidelity scores during intervention, significant differences were not found among the three tiers. In addition, their knowledge of behavioral intervention principles and treatment procedures improved. On the pre- and post-intervention knowledge scores, significant differences were not found among the three tiers.

2.4.3 Experiment 4-3: Post-hoc Analyses for Participant Practitioners in Experiments 3, 4-1, and 4-2

Method

Participants

A total of 17 practitioners participated in Experiments 3, 4-1, and 4-2.
**Results**

**Acquisition Process in Each Category**

Baseline average fidelity scores of *target behavior* and *reinforcement* categories were lower than those of the *setting* and *antecedent* categories. The average fidelity score for the *reinforcement* category increased after the *didactic lecture* and *role-playing*; however, the average fidelity score for the *target behavior* did not increase. Significant changes were found between the first feedback and the fourth feedback in all categories. The average fidelity score of the *antecedent* category even significantly increased at the follow-up.

**Profession**

The Kruskal–Wallis test was used to compare average baseline fidelity scores and the fourth fidelity scores during intervention among three professions. Significant differences were not found among the professions.

**Experience**

Spearman’s rank correlation coefficient was used to examine the correlations among practitioners’ experience in years, average baseline fidelity scores, and fourth fidelity scores during intervention, as well as average 1- to 3-month follow-up fidelity scores. Significant correlations were not found between any of the measures.

The author further examined whether there were significant differences in the number of practitioners who reached the mastery criterion by the fourth feedback session during intervention and those who did not, between practitioners who were in charge of classes or sessions when they participated in the experiment and practitioners
who were not in charge of any classes or sessions. Applying Fisher’s exact test, the percentage of practitioners who were in charge of classes or sessions was significantly greater.

**Baseline Fidelity Scores**

Spearman’s rank correlation coefficient test was used to examine correlations among baseline fidelity scores, fourth fidelity scores during intervention, and average 1- to 3-month follow-up fidelity scores. Significant correlations were found between baseline fidelity scores and fourth fidelity scores, but not between fourth fidelity scores and average follow-up fidelity scores.

**Knowledge Examination Scores**

Spearman’s rank correlation coefficient was used to examine the correlations between the practitioners’ pre-intervention knowledge examination scores, post-intervention knowledge examination scores, average baseline fidelity scores, and fourth fidelity scores during intervention. Significant correlations were only found between pre-intervention knowledge examination scores and post-intervention knowledge examination scores.

**Discussion**

The author found several variables which were or were not related to trainees’ outcomes. First, the results of Experiments 3, 4-1, and 4-2 show that trainees’ professions were not related to the outcomes. The quantity and speed of acquiring intervention skills were about equal. Second, the results of the experiments show that
trainees’ experience in years was not related to the outcomes. However, whether the trainees were on active duty or not was significantly related the number of in-vivo and video feedback sessions needed to reach mastery criterion. Third, average baseline fidelity scores were related to the number of in-vivo and video feedback sessions needed to reach the mastery criterion. Finally, knowledge examination scores were not correlated with fidelity scores. The results indicate that knowledge of behavioral principles and treatment procedures was not a predictor of the level of fidelity.
3. GENERAL DISCUSSION

The author found that (a) all the trainees had difficulty in reinforcing children as their baseline characteristics, and trainees required more time to acquire the skills they needed to change their behaviors depending on the child’s ever-changing response; (b) whether or not the trainees were in active duty was significantly related to the number of feedback sessions required to reach the mastery criterion; (c) there were differences of the effects of training procedures on acquisition of intervention skills and knowledge; (d) the training programs were effective on children’s development; (e) the pyramidal training program was effective to inherit behavioral intervention strategies; and (f) the training programs were acceptable and feasible for the trainees.

As for trainees’ baseline characteristics and the effects of the training programs on their intervention skills, the author found that all the trainees (i.e., parents, nursery teachers, clinical psychologists, and special education teachers) had difficulty in reinforcing children as their baseline characteristics. However, they quickly acquired the skills as the intervention proceeded; the post-intervention fidelity regarding reinforcement was very high. In contrast, trainees required more time to acquire intervention skills concerning target behavior, and the post-intervention fidelity regarding target behavior was lower than those of other categories (i.e., setting, antecedent, and reinforcement).

The essential difference between the skills that they quickly acquired and those they did not was that the former skills were the ones that they could provide regardless of the child’s behavior. The skills they required more time to acquire were ones for which they needed to change their behaviors depending on the child’s ever-changing response. Since the skills that had to be adapted in accordance with a child’s response were not uniform, the trainees probably required more time to practice in various contexts.
As for determinants of intervention effects on intervention skills, the author found that whether or not the trainees were in active duty was significantly related to the number of feedback sessions required to reach the mastery criterion. In contrast, trainees’ professions, years of experience, knowledge of examination scores, and child’s development levels were not related to the outcomes.

As for effects of each training procedure on acquisition of intervention skills and knowledge, the author found the following: (a) A didactic lecture had a minimal effect in improving trainees’ intervention skills, but was sufficient for improving their knowledge of behavioral intervention strategies; (b) video feedback was effective in improving intervention skills, which could be automatically implemented for every child and in every activity; however, it was not sufficient to improve the skills in which trainees need to adapt depending on ever-changing responses of the child; (c) the self-feedback rehearsal effect did not seem as strong as the feedback from trainers; and (d) in-vivo feedback was the most effective in teaching behavioral intervention skills in a short period of time and the only one that taught skills to adapt trainees’ behaviors depending on the child’s responses.

As for effects of training programs on children’s development, the author found that children clearly showed improvements in regard to attention, initiation, imitation, language skills, and social skills. With regards to the number of training sessions in which children received the intervention (e.g., five 20-min one-to-one sessions in the expert training program), the development were overt. The children might receive effective interventions not only during the one-to-one sessions, but also within their daily activities as trainees acquired behavioral intervention skills.

As for effects of the pyramidal training program to inherit behavioral intervention strategies, the author found that the expert training program was successfully inherited by using the pyramidal training in Experiment 4-1 and 4-2. The results indicate that the use of the
expert training program and pyramidal training is effective for disseminating research-based behavioral intervention strategies efficiently and continuously.

As for acceptability of the training programs, the author found that the trainees were very satisfied with the trainings. The results presented the acceptability and feasibility of the training programs to be used in community settings. The trainees did not seem to mind the temporal cost and labor of the training. They were also satisfied with the training even though their intervention skills did not change much. The results suggest that trainees may appreciate any training programs regardless of the content as well as changes in their intervention skills. Stated differently, the claim here is that trainers need to assess improvements in trainees’ fidelity, but not rely heavily on the degree of their satisfaction when examining the effects of the training program.

The author believes that the findings will help to develop a dissemination model that will fit in with the Japanese welfare and educational system. I truly hope that the findings will help to increase the number of research-based training programs; enable individuals who work with children with developmental delay to receive the trainings without economical, temporal, and/or geographical restriction; enable the individuals to be reinforced by children through interventions; and expand the availability of evidence-based behavioral interventions for children with developmental delay and their families in community settings.
4. REFERENCES


