

# The Effect of Behavioral Parent Training on Problem Behaviors of Persons with DD and Collateral Effects on Mothers: A Single-Group Pre-post Treatment Design

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The purpose of this study was to examine the effectiveness of behavioral parent training (BPT) on problem behaviors in Korean children with developmental disabilities (DD) using a single-group pretest-posttest treatment design. Additionally, the collateral effects on Korean mothers with respect to levels of depression, stress, self-efficacy, and knowledge of behavior modification were analyzed. Participants were 60 mothers of children with DD who received 12 weeks of BPT in groups of five to six participants. Data regarding changes in children's problem behaviors and parenting stress, depression, efficacy, and knowledge were collected through self-reports at pre-, post-, and 3-month follow-ups. The results showed significant decreases in children's aggression, but no changes were detected for self-injury and stereotypy. For mothers, depression and stress levels decreased, and efficacy and knowledge increased. These findings were present post-treatment and were maintained at follow-up. The data collected show strong evidence for the beneficial effects of BPT on parents and children with DD. Implications and challenges are discussed further.

**Keywords:** behavioral parent training, developmental disabilities, parental effects, problem behaviors

With the sudden surge in interest in developmental disabilities (DD), much research has begun focusing on the prevention and treatment of problem behaviors among persons with DD. Studies have consistently shown that 40-45% of children with intellectual disabilities have mild to severe problem behaviors (Kanne & Mazurek, 2011; Matson et al., 2008; Murphy et al., 2009; Sajith et al., 2018), constituting various symptoms such as aggression, self-injurious behavior (SIB), stereotypic behavior, and property destruction (Beherec et al., 2011; Ellis, 2018; Matson et al., 2011). Such problem behaviors obstruct the child from receiving optimal education, acquiring, and performing daily living skills, and develop-

ing social skills. In addition, various studies have shown that problem behaviors lead to higher levels of stress and mental health problems among parents (Blacher & McIntyew, 2006; Emily & Grace, 2015; Weiss et al., 2012), ultimately hindering the family's overall quality of life (Allik et al., 2006; Brereton et al., 2006; Herring et al., 2006; Newcomb & Hagopian, 2018).

Among the various types of treatments available for problem behaviors, behavioral intervention has proven to be one of the most successful in reducing these behaviors (Lundahl et al., 2006; Wong et al., 2015). Behavioral treatment is further divided into various subtypes, among which behavioral parent training (BPT), the implementation of behavior principles through parents as agents of change, has been proven to be effective in reducing problem behaviors in children (Long et al., 2017; Lundahl et al., 2006). BPT has received much attention and interest because of its potential to maximize treatment gains through persistent and constant implementation and its cost effectiveness (Johnson et al., 2007;

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Pelham & Fabiano, 2008; Ruppert et al., 2016).

BPT is generally used to implement changes in various target behaviors or to encourage the acquisition of different skills. Having originated in application for oppositional defiant disorder (ODD), it has been modified and successfully applied for DD and Autism Spectrum Disorder (ASD) (Hayden & Patterson, 2018; Odom et al., 2003; Whittingham et al., 2009). BPT is a cost-effective method for addressing problem behaviors and has shown to be effective in decreasing the frequency and severity of disruptive behaviors (Bearss et al., 2013; Ruppert et al., 2016), increasing social skills (Sofronoff et al., 2004), and promoting the acquisition of general functional skills (Crockett et al., 2007). It allows treatment to become generalized to the home environment and other relevant settings, offers an economical option for participating in group settings, and can be utilized as a preventive rather than a responsive method for problem behaviors (Leijten et al., 2013; Menting et al., 2013).

BPT not only positively impacts children with DD, but also has positive implications for parents. In Japanese parents of children with DD, BPT was found to decrease levels of parental overreactivity, laxness, and parental conflict while simultaneously increasing parental levels of competence (Matsumoto et al., 2007). In another study, parents of children with learning disabilities and ASD showed decreased levels of anxiety and depression after the implementation of a BPT program (Todd et al., 2010). Significant improvements in parental stress have also been found in a population of parents with young children with ASD (Tonge et al., 2006). Finally, Feldman & Werner (2002) found increases in parental self-efficacy as a collateral effect of BPT. These collateral effects suggest that improving parents' quality of life positively influences children's quality of life. For example, children of parents who experience mental health difficulties, such as depression, dysphoria, or psychological distress, have lower attainments in cognitive and social areas (Gonzalez & Jones, 2016; Lindo et al., 2016; Mensah & Kiernan, 2010; Smith, 2004). Improving parental mental health will have a positive impact not only on the parents themselves, but also on the children, and ultimately on the family as a whole. Furthermore, it has been suggested that higher parenting stress may negatively influence the efficacy of BPT in children (Agazzi et al., 2017; Strauss et al., 2012). These findings support the necessity of positive mental health in parents for higher treatment efficacy and

quality of life for both parents and children.

However, further research is needed because the above studies have several limitations. First, the above studies incorporate parental measurements that assess only one or two domains of the parents' mental health (Chadwick et al., 2001; Ros et al., 2017; Sofronoff & Farbotko, 2002), limiting a comprehensive understanding of the impact of BPT on parents. Additionally, generalization of findings from previous studies is limited due to the children's age restrictions (Plant & Sanders, 2007), gender, severity of problem behaviors (Bearss et al., 2013; Lindo et al., 2016), severity of disabilities (McIntyre, 2008), and the small number of participants (Feldman & Werner, 2002; Ruppert et al., 2016). Also, even though mothers are primary caregivers, most studies included both mothers and fathers and failed to report the results by each parent. Lastly, no study has reported any follow-up data on the long-term effectiveness of BPT.

The present study aims to draw upon the results of previous studies to address these limitations and to examine the effects of BPT on problem behaviors in children with DD and the collateral effects on mothers in further detail, especially regarding the changes that occur three months post-implementation of BPT and at follow-up, using a one-group pretest-posttest quasi-experimental design. The goals of this study were: (a) to examine the effect of BPT on problem behaviors in children with DD, and (b) to examine the impact of BPT on mothers' levels of depression, stress, efficacy, and knowledge of applied behavioral analysis (ABA) after BPT and at the three-month follow-up.

## Methods

### Participants

The participants of this study were recruited through the referral of two general hospitals, psychological clinics, and internet advertisements. From the total number of those who expressed interest in participating in parenting training, 117 mothers who met the inclusion criteria participated in the study. The inclusion criteria were as follows: (1) having one or more children under the age of 18; (2) report of at least one problem behavior from the child/children, such as aggression, self-injurious behavior, disruptive behavior, and pica; and (3) a diagnosis of ASD and/or developmental

disability by a child psychiatrist within the last three years. Fifty-seven mothers were excluded from the following data analysis because of (1) non-attendance ( $N = 3$ ); (2) absence during the posttest period ( $N = 6$ ); (3) incomplete submission of pretest and follow-up surveys ( $N = 25$ ), or (4) non-attendance during follow-up sessions ( $N = 23$ ). Sixty mothers who met the research criteria were selected for the data analysis.

The demographic information of the 60 pairs of youths (female,  $n = 16$ ) and mothers who participated in the study is shown in Table 1. Their ages ranged from 3 to 18 years, with a mean age of 9.51 years. Demographic information of the mothers is presented in Table 2. All participating parents were mothers, and their parental educational level and annual income varied. The demographic variables between the mothers who completed the study and those who dropped out are shown in Table 3. No significant differences were found between the two groups. This study was approved by the Department Review Committee and Institutional Review Board (201302-111).

**Table 1.** Demographic Characteristics of Youth

	Youth ( $n = 60$ )
Mean age (SD)	9.52 (4.65)
Gender (%)	
Male	44 (73.3)
Female	16 (26.7)
Diagnosis (%)	
ASD	21 (35.0)
DD	39 (65.0)

ASD = Autism spectrum disorder; DD = Developmental disabilities.

**Table 2.** Demographic Characteristics of Mothers

	Mothers ( $n = 60$ )
Age (SD)	39.96 (5.49)
Annual Income (%) <sup>†</sup>	
Less than \$10,000	2 (3.3)
\$10,000–\$29,999	7 (11.7)
\$30,000–\$49,999	13 (21.7)
\$50,000–\$69,999	15 (25.0)
More than \$70,000	12 (20.0)
Parental Education Level (%) <sup>†</sup>	
Bachelor's degree	43 (71.7)
High school graduate	8 (13.3)

<sup>†</sup>Excluding missing values for annual income ( $n = 11$ ) and parental education levels ( $n = 9$ ).

## Measures

### Korean Behavior Problems Inventory–01

The Behavior Problems Inventory (BPI-01; Rojahn et al., 2001) is a 52-item informant-based behavior rating measurement composed of self-injurious, stereotypic, and aggressive/destructive behavior subscales. Each item was scored on a 5-point Likert scale for frequency (0 = never, 1 = monthly, 2 = weekly, 3 = daily, 4 = hourly) and a 3-point Likert scale for severity (0 = no problem, 1 = slight problem, 2 = moderate problem, and 3 = severe problem). The total frequency score ranged from 0 to 208, and the total severity score ranged from 0 to 156. In this study, both the total frequency and total severity scores were used. The Korean version of the BPI (Jeong et al., 2013) was used in this study. Both the original and Korean versions were found to be reliable, with an internal consistency of .88 and .87 for frequency and severity, respectively (Jeong et al., 2013). The internal consistency for the current study was .73, and

**Table 3.** Frequency Analysis and Chi-Square Test for the Demographic Characteristics

		D N (%)	C N (%)	p-value
Age <sup>†</sup>	20–30	1 (2.5)	1 (2.0)	.595
	30–40	16 (40.0)	21 (42.0)	
	40–50	21 (52.5)	26 (52.0)	
	50–60	2 (5.0)	2 (4.0)	
Income <sup>†</sup>	Less than \$10,000	1 (2.7)	2 (4.1)	.965
	\$10,000–\$29,999	7 (18.9)	7 (14.3)	
	\$30,000–\$49,999	9 (24.3)	13 (26.5)	
	\$50,000–\$69,999	10 (27.0)	15 (30.6)	
	More than \$70,000	10 (27.0)	12 (24.5)	
Edu <sup>†</sup>	Bachelor's degree	34 (85.0)	43 (68.3)	.928
	High school graduate	6 (15.0)	8 (15.7)	
NT <sup>†</sup>	0–1	9 (22.5)	17 (33.3)	.938
	2–3	21 (52.5)	21 (41.2)	
	4–5	6 (15.0)	8 (15.7)	
	6–7	4 (10.0)	5 (9.8)	
TE <sup>†</sup>	Less than \$100	5 (12.5)	4 (7.5)	.491
	\$100–500	11 (27.5)	21 (39.6)	
	\$500–1,000	17 (42.5)	15 (28.3)	
	\$1,000–2,000	6 (15.0)	11 (20.8)	
	\$2,000 or more	1 (2.5)	2 (3.8)	

D = Dropped out; C = Completed; AGE = Mother's age; EDU = Mother's education; NT = Number of treatment that the children received; TE = Treatment expenses.

<sup>†</sup>Excluding missing values for mother's age ( $n = 27$ ), income ( $n = 31$ ), mother's education ( $n = 26$ ), number of treatment that the children received ( $n = 26$ ), treatment expenses ( $n = 24$ ).

.69 for frequency and severity, respectively.

#### Behavioral Vignettes Test

The Behavioral Vignettes Test (BVT; Heifetz et al., 1981) is a 20-item multiple-choice instrument used to evaluate the parent's knowledge of functional behavior principles in managing a child's problem behaviors. The measure was translated into Korean for the present study through a 3-step procedure as recommended by Brislin (1970). The BVT was first translated into Korean by a master's level researcher, who was fluent in both English and Korean. The translation was then backtranslated into Korean by a graduate student who was fluent in both languages. Items that were unclear or difficult to understand when backtranslated were further discussed and edited by the research team. Finally, a Ph.D. level Korean language literature specialist edited the Korean translation. The two translated versions were then compared by the research team, and any necessary final changes were made.

The questions describe various child problem behavior scenarios and ask the parent to choose one response from four possible responses to the situation. Each mother was asked to choose the most appropriate response for each question, with one correct answer for each situation. Higher scores indicated greater knowledge of the various principles applied when dealing with a child's problem behaviors. According to Brighthman et al. (1982), the reliability of the split-half was .75. In this study, the internal consistency of the total items was .85.

#### Beck Depression Inventory

The Beck Depression Inventory (BDI; Beck, 1961), which consists of 21 items, is one of the most commonly used measures to evaluate the severity of depression. The mothers were instructed to choose the option that best described them for each item. The total scores were used to determine whether the mothers exhibited mild, moderate, or severe levels of depression. A total score above 15 indicates a significant level of depression. Internal consistency was reported to be .85 for the Korean version of the BDI (Rhee et al., 1995). The internal consistency of the total scale in this study was .87.

#### Parenting Stress Index–Short Form

The Parenting Stress Index–Short Form (PSI-SF; Abidin, 1995) is a

standardized 36-item measurement commonly used to identify stress associated with parenting and parent-child interactions. The PSI-SF has been standardized in Korea, and its psychometric properties have been well established (Lee et al., 2008). The total stress score is obtained from three subscales: Parental Distress, Parent-Child Dysfunctional Interaction, and Difficult Child. With each subscale score ranging from 12 to 60, higher scores on each subscale indicate greater parental stress. The internal consistency of the total scale was .95 in the Korean version of the PSI-SF (Lee et al., 2008) and .88 in this study.

#### Maternal Self-Efficacy Scale

The Maternal Self-Efficacy Scale (Teti & Gelfand, 1991) is a 10-item instrument that addresses feelings of efficacy in relation to different domains of childcare. It was translated into Korean for use in the present study through the same 3-step procedure used for the BVT. The domains include understanding what the child wants, knowing what the child enjoys, effectively comforting the child, and performing tasks of general care, such as feeding and washing the child. Each item is rated on a 6-point Likert scale ranging from "strongly agree" to "strongly disagree." In this study, the internal consistency of the total score was .82.

#### Procedure

##### Experimental Design

The study was designed as a single-group pretest-posttest treatment design, for which the pretest served as the control period, in order to partially overcome the limitations of not including a control group in the study. A single-group pretest-posttest treatment design was implemented owing to difficulties in randomizing subjects and a small sample size.

##### Recruitment

Mothers who wished to participate in the study completed a phone interview with research staff who provided the study consent form and assessed their eligibility to participate in the study. After completing the screening process, mother-child pairs who met the study inclusion criteria and signed the consent form were notified about their eligibility to participate in the study.

Pretest

The questionnaire package described above was mailed to the participants' homes. They were asked to complete the questionnaire package and submit it back directly to the authors. For incomplete data, the authors called or e-mailed the participants to obtain missing information.

Intervention: Parent training

The BPT sessions consisted of groups of five–six mothers who attended an orientation session followed by 12 training sessions. BPT was offered at two general hospitals and at a university, and the length of each session ranged from an hour and a half to two hours. Each mother selected three to four problem behaviors displayed by their child and were asked to observe any changes in these behaviors on a daily basis using the Developmental Behavior Checklist-Monitoring chart (DBC-M; Einfeld, & Tonge, 2002). Mothers were encouraged to apply acquired knowledge from BPT classes in their home environment, and therapists provided feedback to mothers based on information from parental verbal reports and scores on the DBC-M. For example, if a mother did not reinforce their child for being quiet and not showing problem behaviors, the mother was told what and when to say it to the child.

BPT sessions were planned in advance, manualized, and carried out following the procedures based on behavioral principles, as outlined in Table 4 (Martin & Pear, 2003). At each session, the group discussed their previous week's homework and the main problem behaviors they targeted during the previous week. A therapist gave a lecture on behavioral principles, which was followed by explaining the homework assignment for the next week. A reward system was incorporated to foster mothers' participation in and motivation for class.

Posttest

The procedure for the posttest was identical to that of the pretest. A questionnaire package was mailed to the participants' homes within one month after the completion of the BPT program. Others were encouraged to participate in follow-up sessions and were asked to complete the same questionnaires filled out at the pretest. During the follow-up sessions, the therapist compared the data from the pre-test, posttest, and follow-up sessions and informed

**Table 4.** *Content of the Behavioral Parent Training Program*

Session	Content
Week 1	Orientation
Week 2	Identifying problem behavior; Collecting baseline data
Week 3	Identifying cause of problem behaviors functional test
Week 4	Reinforcement: Increasing behavior
Week 5	Punishment: Decreasing behavior
Week 6	Intermittent reinforcement
Week 7	Punishment
Week 8	Producing new behavior 1. (shaping, fading)
Week 9	Producing new behavior 2. (behavioral chain)
Week 10	Discriminative stimulus
Week 11	Stimulus generalization
Week 12	Token economy
Week 13	Overview
Follow-up	Assess performance maintenance after three months of termination.

the mothers about any behavioral changes in the mother and child.

Therapists

Five main therapists (one applied behavior analyst, one master's level therapist in clinical psychology, and three clinical psychologists) led the BPT sessions. For each session, a Ph. D level clinical psychologist led the group while a master's level therapist assisted the lead therapist. Master's level therapists were either enrolled in at least one graduate level course focusing on behavior principles, or a board-certified behavior analyst (BCBA). The co-therapists 1) shadowed at least 12 weeks of the BPT, 2) received intensive didactic training on basic ABA principles and procedures of the BPT from the main therapist, and 3) were instructed to familiarize themselves with information pertinent to the administration of BPT. For each session, their main tasks were to check the participating mothers' attendance, participation, and homework. In addition, they collected and organized the data, prepared feedback materials, and technical equipment required for each session. All therapists were supervised by the first author every week to ensure the quality of the delivered BPT program.

Treatment fidelity

All main therapists received a program manual to verify and promote adherence to the treatment, and a checklist was developed to assess treatment fidelity. Treatment fidelity was measured in terms



of how closely the main therapists adhered to the program manuals. Every week, co-therapists completed the checklist, which specified the contents, activities, and tasks for each session. Treatment fidelity was calculated for all participants and revealed good consistency ( $\alpha = .83-.97$ ).

### Data Analysis

All statistical analyses were conducted using the Statistical Package for Social Sciences (SPSS), Windows version 10. The characteristics of the participants were analyzed using descriptive statistical analysis, frequency analysis, and chi-square tests. One-way repeated measures analysis of variance (ANOVA) was conducted to examine whether there were significant changes in the mother's level of depression, level of parenting stress, levels of parental knowledge of behavioral principles and techniques, and parental efficacy and intensity of the child's problem behaviors. Pairwise comparisons with Fisher's least significant difference (LSD) procedures were performed in a repeated measure design across the three treatment periods: pre-training, post-training, and follow-up sessions.

## Results

### The Effects of BPT on the Child's Problem Behaviors

A repeated measures ANOVA was conducted to assess for significant changes in the severity and frequency of stereotypy, SIB, and aggression in children over the pre-training, post-training, and follow-up sessions using the BPI-01. Significant decreases were found in both severity ( $F(1,106) = 3.865, p < .05$ ) and frequency ( $F(1,106) = 3.629, p < .05$ ) for aggressive behaviors. No significant changes were found in the frequency and severity of stereotypy or SIB. For aggression, a pairwise comparison with Fisher's LSD was performed, and significant changes were found between pretests and follow-up tests, while no changes were found between pretests and posttests, and between posttests and follow-up tests (Table 5).

### The Collateral Effects of BPT on the Mothers

A repeated measures ANOVA was performed to determine whether there were significant changes in the mothers' levels of depression, parenting stress, parental efficacy, and ABA knowledge. A

**Table 5.** Repeated ANOVA for the Changes in Self Injurious, Stereotyped and Aggressive Behaviors ( $n = 54$ ) of the BPI-01

		<i>M</i>	<i>SD</i>	<i>df</i>	<i>F</i>	Fisher's LSD
SIB F	Pre	4.629	4.900	2, 106	1.852	
	Post	4.574	4.155			
	FU	3.518	3.770			
SIB S	Pre	4.518	5.042	2, 106	2.745	
	Post	4.388	4.349			
	FU	3.000	3.431			
STR F	Pre	13.703	13.663	2, 106	2.072	
	Post	13.407	12.637			
	FU	9.963	9.965			
STR S	Pre	11.166	11.611	2, 106	2.125	
	Post	10.759	11.578			
	FU	7.888	8.924			
AGG F	Pre	5.463	5.999	2, 106	3.865*	Pre > fu*
	Post	5.074	5.389			
	FU	3.463	4.091			
AGG S	Pre	5.259	5.320	2, 106	3.629*	Pre > fu* Post > fu*
	Post	5.277	5.239			
	FU	3.407	4.168			

SIB F = Frequency of self-injury; SIB S = Severity of self-injury; STR F = Frequency of stereotyped behaviors frequency; STR S = Severity of stereotyped behaviors; AGG F = Frequency of aggression; AGG S = severity of aggression.

\* $p < .05$ .

significant decrease in the level of depression ( $F(2,60) = 5.598, p < .01$ ) and parental stress ( $F(2,50) = 8.014, p < .01$ ), and increases in parental efficacy ( $F(2,92) = 6.415, p < .01$ ) and knowledge of behavioral principles ( $F(2,86) = 24.727, p < .001$ ) were observed for the overall duration of BPT. The results indicate that the level of negative factors decreased, and the level of positive factors increased significantly in the mothers. A pairwise comparison with Fisher's LSD indicated that the levels of depression, self-efficacy, and parenting stress were significantly changed and maintained even at the follow-up test. The level of knowledge of ABA consistently and significantly increased from pretest to follow-up (Table 6).

## Discussion

The purposes of this study were: (a) to examine the effect of BPT on problem behaviors in children with DD, and (b) to examine the impact of BPT on parental levels of depression, stress, efficacy, and knowledge of ABA. For the children, both the frequency and severity of aggression decreased significantly at posttest. At follow-

**Table 6.** Repeated ANOVA for the Changes in Mothers

	<i>M</i>	<i>SD</i>	<i>df</i>	<i>F</i>	
BDI ( <i>n</i> = 31)					
Pre	11.87	6.869	2, 60	5.598**	Pre > Post**
Post	8.81	5.486			Pre > FU**
FU	8.97	5.096			
PSI-SF ( <i>n</i> = 26)					
Pre	112.8077	18.43479	2, 50	8.014**	Pre > Post*
Post	104.1154	16.77457			Pre > FU**
FU	100.0385	18.48130			
PE ( <i>n</i> = 47)					
Pre	24.85	4.102	2, 92	6.415**	Pre > Post*
Post	26.38	4.342			Pre > FU***
FU	27.64	6.755			
BVT ( <i>n</i> = 44)					
Pre	8.45	2.897	2, 86	24.727***	Pre < Post***
Post	10.36	3.505			Pre < FU***
FU	11.27	3.385			Post < FU*

BDI = depression; PSI-SF = parenting stress; PE = parental self-efficacy; BVT = knowledge of behavioral principles.

\**p* < .05. \*\**p* < .01. \*\*\**p* < .001.

up, both the severity and frequency of aggression were found to be significantly decreased compared to the pretest. With regard to stereotypy and SIB, no significant changes in both frequency and severity were observed at posttest and follow-up. With mothers, significant changes were found in levels of depression, self-efficacy, and knowledge of ABA at posttest, and the posttest levels were maintained at follow-up. Furthermore, mothers' knowledge of ABA was found to have further increased at follow-up. In addition, there was a moderately significant difference in parenting stress at posttest compared to the pretest, and a highly significant decrease at follow-up compared to the level of parenting stress at pretest.

After BPT, the severity and frequency of aggressive behaviors significantly decreased from pre-test to follow-up. This finding is consistent with previous studies that have used BPT to address aggression in children with DD (Feldman & Werner, 2002; Sofronoff et al., 2004). Aggression is known to be one of the most common problems in individuals with DD (Farmer et al., 2015; Tenneij et al., 2009), and is one of the most frequent reasons for referral to mental health services (Connor, 2002). It negatively impacts relationships between the individual and the caregivers, including any involved staff and family members (Fitzpatrick et al., 2016; Hare et

al., 2004; Woodman et al., 2015). Studies have also found a higher risk of overuse of medication to treat aggression (McGillivray & McCabe, 2005), rejection in enrolling welfare services (Joyce et al., 2001), and potential abuse (Bowring et al., 2017; Strand et al., 2004) among these individuals. Most times, aggression in children has been found to be controlled and maintained by social reinforcement, with parents being identified as major reinforcers (Matson et al., 2011). Aggression may have significantly decreased in the present study as BPT targets the parents' reinforcing behaviors by educating the parents of these behavioral connections and offering alternative methods of dealing with their child's aggressive behaviors.

Compared to aggressive behaviors, stereotypic and self-injurious behaviors are more likely to be motivated by automatic reinforcement, such as sensory arousal and self-stimulation (Mace et al., 1994; Piazza et al., 2000; Rapp, 2006). Behaviors that are automatically reinforced are more difficult to treat, as these behaviors produce sensations that gratify those who engage in them (Kahng et al., 2002; LeBlanc et al., 2000; Rooker et al., 2018). These sensations tend to be stronger than those produced by other stimuli, making it challenging to find an appropriate substitute for such problem behaviors. Given these challenges, this may be a probable explanation for the lack of significant decreases in stereotypic and self-injurious behaviors after BPT in the present study.

For parental effects, all measured areas significantly improved from pretest to follow-up. The mothers' knowledge of ABA and behavioral treatments regarding their child's problem behaviors continuously increased from pre-training, post-training, to follow-up. These findings are promising, as knowledge of ABA has been suggested to be a mediating factor in the efficacy of BPT (Wang et al., 2016; Weinberg, 1999). One explanation for the increase in knowledge from posttest to follow-up is that their knowledge grew as they continued to implement behavior modification and consequently gained greater experience with the application of the behavioral principles. Through the actual implementation of learned techniques, mothers may have experienced a better or more thorough understanding of the principles behind ABA. These findings are promising as knowledge of behavior modification is crucial to accurately apply the treatment in home environments and bring about effective changes (Deeb, 2016; Kaminski et al., 2008).

For the mothers' depression levels, symptoms decreased from the pretest to the posttest and were maintained from post-test to follow-up. These findings support previous studies that have also found a significant decrease in parental depression after BPT (Agazzi et al., 2017; Chadwick et al., 2001; Drew et al., 2002; Hasting et al., 2006; Niccols & Mohamed, 2000). This decrease can be attributed to various factors. Studies have shown a bidirectional relationship between parental depression and child problem behaviors, with a decrease in the child's problem behaviors correlating with a decrease in parental depressive symptoms (Bailey et al., 2007; Dykens et al., 2014; Pardini, 2008). This explanation may be applied to the decrease in depression among mothers; however, as only aggression, not SIB and stereotypy in children significantly decreased, other probable explanations for the decrease in maternal depressive symptoms need to be explored.

Another possible explanation might be the use of group training sessions in this study. Gray (2003) found that group settings allow parents to empathize with one another. Raising a child is difficult and stressful on its own, but raising a child with ASD or DD in addition to problem behaviors can put a greater strain on a mother's emotional and mental health. By connecting with other mothers in similar situations and supporting one another, mothers may have experienced a decrease in depressive symptoms. BPT also offers mothers the chance to learn the functions and reasons behind their child's problem behaviors and are given effective instructions on how to modify them. This may also have lowered the mothers' feelings of helplessness, which in turn may have helped to decrease the levels of depression (Keeton et al., 2008).

Regarding parental efficacy, a significant decrease was found at post-treatment, which was maintained at follow-up. For mothers of children whose problem behaviors decreased, parental efficacy may have increased as a direct result of a decrease in behavioral problems. Previous research has shown an inverse relationship between parental efficacy and children's problem behaviors, with efficacy increasing as behavioral problems decrease (Mouton & Tuma, 1988). Furthermore, drawing upon the studies that indicate the positive effects of being in a group environment, self-efficacy may have increased because the mothers were able to normalize their difficulties and share effective techniques and personal accounts of the application of BPT (Chacko et al., 2009; Sonuga-Barke et al.,

2001). BPT also offers mothers the chance to gain practical skills and knowledge regarding their child and behavior problems, as shown in the present study by increasing the mothers' knowledge of behavioral principles. This experience may help mothers by increasing their feelings of competence in dealing with their child, as suggested by previous studies (Howlin, 1998; Judge, 1997). This points towards positive implications, as higher self-efficacy is correlated with lower levels of depression and stress. In other words, the higher the mothers' satisfaction regarding their handling of the child, the better the parent is coping (Coleman & Karraker, 1998; Jones & Prinz, 2005; Neff & Faso, 2015).

Along with levels of depression and self-efficacy, mothers' stress levels decreased from pretest to follow-up, which is also consistent with previous studies (Keen et al., 2010; Rickards et al., 2007; Singer et al., 2007; Solomon et al., 2008). The stress levels significantly decreased from pre- to posttest, and this change was maintained at follow-up. This decrease may be explained through the community environment of the group sessions and its associated benefits, the gain of knowledge and skills relevant to their child's problem behaviors, and the resulting sense of control. Knowledge of the functions of their child's behaviors may also have decreased feelings of responsibility or guilt regarding their child's problematic actions. All of these factors may have contributed to the decrease in maternal stress. This is extremely encouraging, as mothers of children with ASD or DD in Korea tend to report higher levels of stress than parents in other countries (Chung et al., 2013). Combined with the effects of having a child who exhibits disruptive behaviors, mothers in this study may have experienced a higher level of stress than expected in their circumstances. The significant decrease in stress levels suggests that the 12 weeks of BPT sessions may have been enough time for mothers to significantly lower their stress.

The findings of the current study are encouraging as they support the effectiveness of BPT as all positive changes were either increased or maintained at follow-up. Not only did BPT seemingly decrease the children's aggressive behaviors, but it also brought about various positive collateral effects in the mothers. This is crucial as parental stressors and child problem behaviors have a bidirectional relationship (Baker et al., 2003; Hutchison et al., 2016; Zaidman-Zait et al., 2014). Behavior problems result in high par-



enting stress and other negative factors, and high parental stress results in increased behavior problems in the children. The situation turns into an unending cycle, which increases parents' feelings of helplessness and frustration. BPT offers these parents the opportunity to modify these problem behaviors through a highly effective option at an affordable cost.

Compared to previous studies, the present study utilized various instruments for measures, incorporating a large population of children with a wide age range and a variety of problem behaviors. Follow-up data on both parents and children were also included in the study.

The limitations of the current study are as follows. First, the study had a high dropout rate (47.62%). Previous studies have found that a high dropout rate may be associated with low socioeconomic status, maternal mental health, low education level of the parents (Reyno & McGrath, 2006), and low satisfaction with the training program (Luk et al., 2001). However, no significant demographic differences in the mentioned factors were found between the groups that completed or dropped out of the study. The lack of differences between the two groups suggests that the findings of this study are not based on a biased group. Most of these dropouts occurred at follow-up; therefore, in the future, more attention should be given to how parents should be retained from posttest to follow-up.

Second, the study was conducted using a one-group pretest-posttest treatment design. Due to the nature of the target population, which consisted of children exhibiting serious problem behaviors and associated ethical concerns, attempts were made to recruit a control group, which was unfortunately unsuccessful. Furthermore, as mentioned previously, randomization of the sample would have been difficult due to practical reasons, and due to the small sample size. Therefore, it cannot be fully assumed that BPT was the sole variable that brought about the observed effects on the problem behaviors of children with DD or the collateral effects that were found in the mothers. Additionally, there is a strong stigma against participating in research in Korea. There is a lack of awareness and openness to research studies among parents, especially among those with children with ASD or DD. A possible solution is to provide awareness education about the nature of the study prior to recruitment in order to encourage participation. Another limitation was the use of parental self-reports to measure changes in child

behavior, as well as changes in depression, stress, and efficacy. Direct observations may offer more objective information regarding child behavior and parental changes. Lastly, the collateral effects of BPT should be further investigated according to different cultural variables, the severity of the problem behavior, the developmental age of the child, and gender within the DD population. Currently, there is a lack of studies that target children with DD. Further research will allow for a more accurate generalization of the results.

### Author contributions statement

Yaeun Lee, a graduate student at Villanova University, analyzed data and prepared the manuscript. Suna Park, a graduate student at Yonsei University, collected and assisted in data analysis. Yongjae Suh, a graduate student at Yonsei University, assisted in the data analysis. Kyong-Mee Chung, professor at Yonsei University, served as the principal investigator of the research grant and supervised the research process. All authors provided critical feedback, participated in the revision of the manuscript, and approved the final submission.

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