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Research Article

Initial Efficacy of Project T2P2C: A School-Based Parent Training Program for Parents with School-Aged Children with ASD

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Abstract

Teacher to Parents to Children (T2P2C) is a school-based intervention project for children with autistic spectrum disorders and their parents. T2P2C sees parents gradually learning teaching strategies under a teacher's periodic education program and teaching model, then implementing intensive intervention in a natural environment to improve the children's communication and cognitive ability. This study, by using a single-subject withdrawn design, probes into the effect of T2P2C on parental use of strategy and child communication behaviors. The study concludes that T2P2C effectively improved appropriate use of instruction, reinforcement and prompt strategies in parents of children with autism, and prompted children's correct responses to parent's communication acts. Parents indicated satisfaction with the project's goals, procedures and outcomes.

Keywords: Children with Autism; Discrete Trial Teaching; Parent; Teacher to Parents to Children

Introduction

Autism Developmental Disorder (ASD) is a neurodevelopmental disorder and its core symptoms bring great pressure to the sufferer's parents. A lot of research has found that parents of children with autism have higher levels of stress, depression, and anxiety than parents of normally developing children and parents who have children with other developmental disabilities [1-3]. Parents normally play a central role as primary caregivers to their affected children [4]. At the same time, these parents often lack specific parenting strategies for dealing with autism and adequate professional support. So, we need an effective approach to providing parenting support for this population. Parent-implemented intervention has proved effective through evidence-based practice [5], and there are already a number of comprehensive programs aimed at parents of children with ASDs, such as Hanen's 'More Than Word's Program [6,7], Natural Language Paradigm [8], Project ImPACT [9], and Early Start Denver Model [10]. A large number of studies have proved Parental-implemented intervention can produce positive results for parent and child. But existing parent training programs have some problems. First, these programs are mainly based on laboratory research, and they may not be appropriate for many families because they always take place in clinical settings. At the same time these programs are relatively intensive, with a reported frequency ranging between 1hr per week and 25hr per week, and a duration ranging between 1 week and 1 year [11]. There are also long waiting lists for these services. These complications mean these programs are difficult to deliver to families, particularly those who are highly stressed or socioeconomically disadvantaged. Although parent training is now considered an essential component of successful intervention programs for children with ASD, formal parent training programs are still the exception in community-based intervention programs for young children with ASD in the United States [12].

Secondly, while existing programs focus on providing early intervention for autistic infants and their parents based on natural interaction strategies [13,14], they are rarely given specific targets for developing individual goals and plans, and this is insufficient to meet the needs of school-age children with autism and their parents. Parents of school aged children with autism may need some direct teaching strategy, such as Discrete Trial Teaching (DTT). One of the most frequently used methods in ABA programming with children with autism is DTT, which is a method of delivering training trials

in rapid succession during a training session. DTT is made up of a series of discrete-trials, small units of instruction that typically last 5-20 s. DTT has been established as an effective intervention method for children with ASD [15]. It provides a structured learning environment, which is particularly important for children with autism and their parents. DTT is useful for teaching children with ASD new discriminations, such as responding correctly to a verbal statement, and for teaching new behaviors, such as making speech sounds and motor movements. Some studies have also confirmed that parents of children with autism can master DTT through parent training programs. But these studies focused on 2-6-year-old children with autism. We try to extract the key strategies of DTT, and improve training efficiency through arranging training order and duration according to difficulty. T2P2C sees parents gradually learning teaching strategies under a teacher's periodic education program and teaching model, then implementing intensive intervention in a natural environment to improve the children's communication and cognitive ability. In T2P2C, periodic and individualized educational programs make the school and family intervention goals consistent, so parents know what to do in family intervention; this is achieved through five phases in each training session. The purpose of this research is to develop a special school-based short-term parent training program for parents with autistic children, and to examine the effect of the program for parents and children. The main purpose is to examine whether the parents learn the appropriate use of three strategies from discrete trial teaching post-training, and at follow-up, and whether the children improve communication behavior.

Methods

Participants

Three children (10-12 years old, M = 11 years) with ASD and their mothers participated in this study. All children are come from the same public special education school. All children had a formal diagnosis of autism from a pediatric doctor. The diagnosis was confirmed using the Childhood Autism Rating Scale (CARS) and Autism Behavior Checklist (ABC). Written consent was obtained from the three families. Participant information is shown in (Table 1).

Dyad	Child age	Child gender	Parent education	Parent employment	Marital status
Dyad 1	10	M	College degree	Homemaker	Married
Dyad 2	12	M	Graduate degree	Full-time	Married
Dyad 3	11	F	College degree	Full-time	Married

Table 1: Participant Characteristics.

Settings and Materials

The majority of treatment sessions were conducted in an individualized treatment room at a special education school. The teaching materials were chosen according to context and teaching needs, and one group training session was implemented in a meeting room at the special education school. All family intervention sessions (baseline, treatment and follow-up) took place in the family homes twice a week depending on the family's schedule, and parents chose toys from those available in the home. All sessions were video recorded for later data analysis.

Procedures

This study employed an ABA (baseline-treatment-treatment withdrawn) single-subject design [16]. Participants attended the individualized treatment room 1 day a week during treatment and received 6 weeks of training in T2P2C. All parent-child dyads had for a 2-month follow-up session to examine the maintenance of skill and to update the parent and child goals.

Baseline

During baseline sessions, teachers provided teaching goals and content for school and home every week. The parent was asked to take home-intervention with the child twice a week, for 15-20 minutes. Teachers also provided an individualized course for the children to be followed twice a week independently. No discussion or feedback about the family intervention occurred in the baseline phase.

Treatment

At the beginning of treatment, the parent took part in a group training session that introduced information about each DTT strategy. The children were not present during this session. One doctoral student in special education served as trainer and (a) provided information about DTT; (b) reviewed key points about how to use teaching strategies more appropriately; (c) showed a case video of other people using the strategies with autist children; (d) responded to parents' questions and concerns. Subsequent

sessions were individualized training sessions in which participating families worked with their own parent trainer during a 30-minute long session once per week throughout the study. All trainers were the children's school teachers and had experience working with children with disabilities and their families. The strategies of DTT were taught sequentially with instruction strategy taught in the first week, followed by reinforcement strategy in week two and week three, and lastly prompt strategy in the final three weeks. There were five phases during each session, (a) trainers inform parents about children's specific goals and information about how to appropriately use the strategy learned that day; trainers arrange for children to complete some simple tasks so as to avoid boredom at the same time; (b) trainers modeled the strategy with the child while the mother watched. The mother then practiced the strategy while the trainers provided positive and corrective feedback; (c) the mother practiced the strategy in a generalization environment (usually by changing teaching materials). Trainers could move on to the next phase when the mother made only small mistakes, while returning to the last phase to provide the model again when the mother made a major mistake; (d) provided feedback on parent implementation of the strategy and other problems in the generalization environment; (e) summarized common problems when the mother used the strategy, and developed a family intervention plan for the mother. Family intervention took place in each participant's home twice a week for about 15-20 minutes. Then, the parents delivered their intervention videos to their own trainer immediately, and the parent also received written feedback about their performance related to the targeted teaching strategy, covering what the parent was doing well and what she might want to change next time.

Follow-up

After parent training, the trainer provided teaching goals and content for family intervention each week, but never provided any training or discussion about the parent's performance.

Dependent Measures

All sessions were videotaped for coding the parent's use of the strategies with their child for 15-20 minutes. We used a coding manual that detailed the parent and child behaviors to be coded for analysis. This manual included operational definitions for (a) the frequency of three teaching strategies taken from DTT, (b) the quality of the parents using of the teaching strategies (from 1=low to 4=high), and (c) the child's communicative behavior (i.e., initiating and responding).

Parent Appropriate of Strategy Use

The appropriateness with which parents implemented the teaching strategy was defined as the quality with which the targeted teaching strategy was implemented.

One calculation was made to document appropriateness across all teaching strategies. The percentage of high-quality strategy use was calculated for each session by dividing occasions of quality 4 strategy use by the total frequency of strategy use.

Child's Communication Skills

The children's communication behaviors were categorized as (a) responding to a parent's communication act (e.g., responded to parent's instruction) or (b) initiating a communication exchange (i.e., initiated a communicative act 3 seconds or more after the last communication exchange). Two calculations were made to document the children's communication skills. First, the percentage of correct responses was calculated for each session by dividing occasions of correct response by the total frequency of parent's instruction. Second, the number of times the child initiated communication was calculated for each session.

Social Validity

To assess social validity in the current study, we used a team-developed Likert-type scale questionnaire to ask parents about their opinions regarding the goals, procedures, and outcomes of the T2P2C program. And we also provided blank sections on the questionnaire to ask parents if they had any questions or suggestions.

Inter-observer Reliability

Inter-observer reliability was obtained for 30% of the sessions by trained observers. Kappa scores were used to calculate reliability for three coding categories: (a) type of strategy (i.e., instruction, prompt, or reinforcement), (b) quality of strategy (range=1-4), and (c) child behavior (i.e., responding or initiating). For Dyad 1, the kappa score for type of strategy was .997, for quality of strategy it was .853 and for child behavior it was .962. For Dyad 2, the kappa score for type of strategy was .902, for quality of strategy it was .838 and for child behavior it was .868. For Dyad 3, the kappa score for type of strategy was .979, for quality of strategy it was .773 and for child behavior it was .932.

Data Analysis

Both visual inspection and statistical analysis were used to evaluate the data. For parent and child behavior, individual data were displayed graphically and inspected for changes in level upon introduction of the training (as recommended by Kazdin, 2011). The Wilcoxon-Mann-Whitney U test [17] was used to determine whether a statistically significant change had occurred after training (i.e., baseline to training), and whether gains were maintained at follow-up (i.e., training to follow-up). In order to determine the magnitude of the changes, effect sizes were also calculated [18-20].

Results

Appropriate Strategy Use

Appropriate use of instruction strategy

(Table 2,3) provide visual analysis data on the percentage of high quality (score=4) instruction strategies mothers used across the different phases. As shown, all three mothers increased significantly in percentage of high quality of the instruction strategy after training (mean increase of 26.04%, 21.26% and 27.46%, respectively), and the Wilcoxon (z) = 2.910，p<.01，d=1.874 for Dyad 1, the Wilcoxon (z) = 2.611，p<.01，d=2.394 for Dyad 2, the Wilcoxon (z) = 2.883，p<.01，d=2.485 for Dyad 3. Dyad 1 and 2 displayed a slight increase in quality of the instruction strategy from training to follow-up (mean increase of 3.82% and 2.265%, respectively).

Item	Dyad 1			Dyad 2			Dyad 3		
Phase	A1	B1	C1	A2	B2	C2	A3	B3	C3
Condition length	4	12	4	4	12	4	4	12	4
Level range	47.83-77.78	81.48-96.43	86.11-97.22	54.24-75	69.01-94.44	84.29-87.67	55.1-77.14	88.89-100	59.09-85.71
Level change	29.95	-0.28	2.31	20.76	17.53	-2.2	-0.22	-5.8	9.8
Mean	63.61	89.65	93.47	62.64	83.9	86.165	67.77	95.23	70.99
Level stability	25%	100%	100%	75%	72.72%	100%	25%	100%	50%
Note: A1, A2 and A3 represent baseline, B1, B2 and B3 represent training, C1, C2 and C3 represent follow-up.									

Table 2: Visual Analysis Within Phase of Percent of Quality 4 Instruction Use.

Item	Dyad 1		Dyad 2		Dyad 3	
Phase	A1/B1	B1/C1	A2/B2	B2/C2	A3/B3	B3/C3
Change of mean	26.04	3.82	21.26	2.265	27.46	-24.24
Percentage of overlap	0%	75%	18.18%	100%	0%	100%
z	2.910**	1.517	2.611**	0	2.883**	-2.883**
Note: ** represent p＜0.01, * represent p＜0.05						

Table 3: Visual Analysis Between Phases of Percent of Quality 4 Instruction Use.

The gains in quality of instruction strategy observed in training were maintained at follow-up (z=1.517, p>.05, d=0.901 and z=0.000, p>.05, d=0.277, respectively). While Dyad 3 displayed a larger decrease in quality of instruction strategy from training to follow up (mean decrease of 24.24%), which was not maintained at follow-up (z=-2.883, p<.01, d=-5.870), and there was no significant difference between baseline and follow-up (z=0.289, p>.05, d=0.292) see (Figure 1).

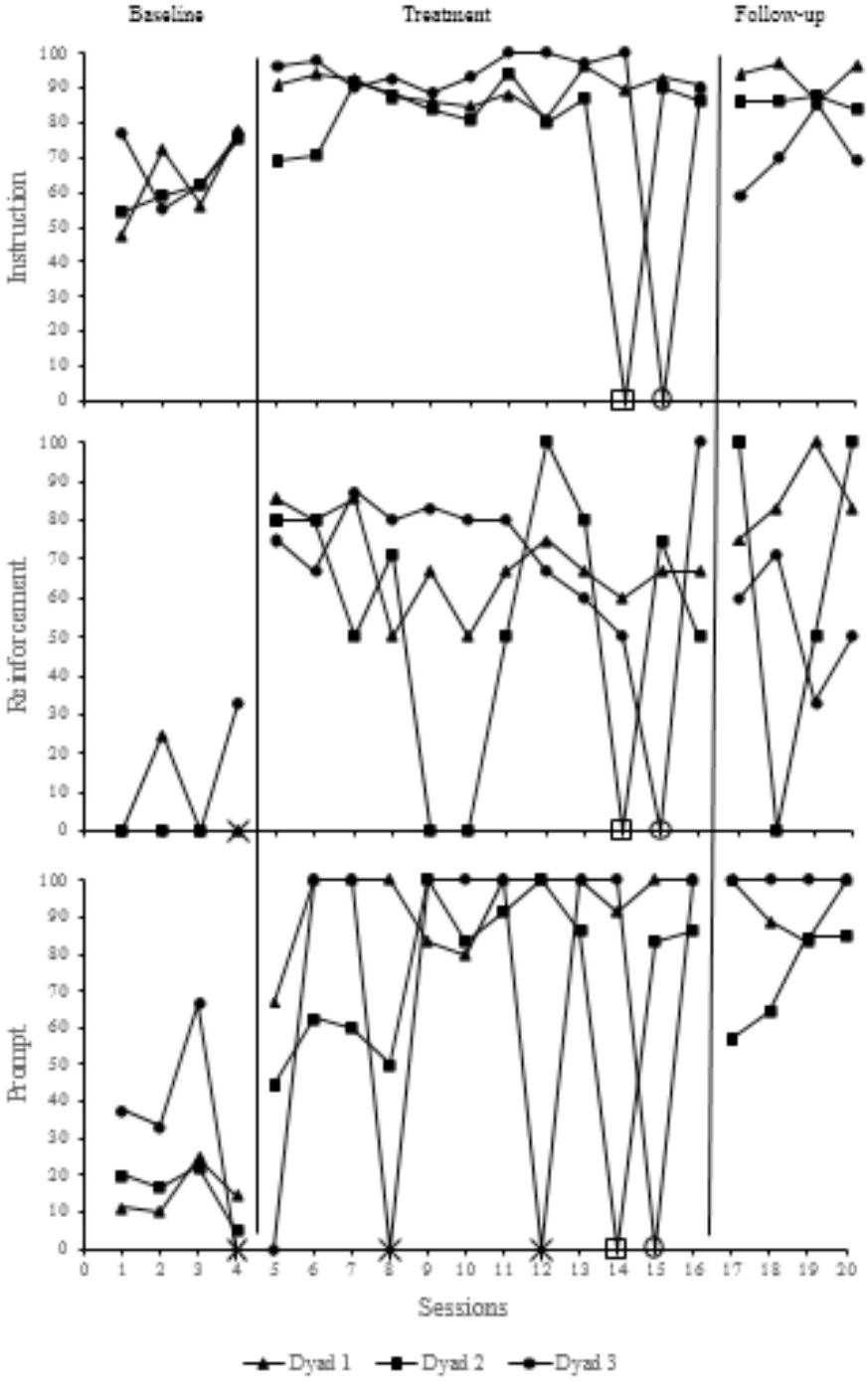

Figure 1: Parent's appropriate use of strategy. Line graphs represent the mother's percent high-quality (score=4) strategy use. X symbols represent sessions during which the mother never used the strategy; Open symbols represent no data collected.

Appropriate use of reinforcement strategy

(Table 4,5) provide visual analysis data on the percentage of high quality (score=4) reinforcement strategies mothers used across the different phases see (Figure 1). All three mothers increased significantly in percentage of high quality of the reinforcement strategy after training (mean increase of 62.06%, 53.04% and 60.77% respectively), and the Wilcoxon (z) = 2.968, p<.01, d=4.965for Dyad 1, the Wilcoxon (z) = 2.446, p<.05, d=1.697for Dyad 2, the Wilcoxon (z) = 2.896, p<.01, d=3.646 for Dyad 3. Dyad 1 and 2 displayed a slight increase in quality of the reinforcement strategy from training to follow-up (mean increase of 17.1% and 9.46%, respectively). The gains in quality of reinforcement strategy observed in training were maintained at follow-up (z=2.036, p<.05 and z=0.466, p>.05, respectively). While Dyad 3 displayed a larger decrease in quality of reinforcement strategy from training to follow up (mean decrease of 15.41%), which was not maintained at follow-up (z=-2.102, p<.05).

Item	Dyad 1			Dyad 2			Dyad 3		
Phase	A1	B1	C1	A2	B2	C2	A3	B3	C3
Condition length	4	12	4	4	12	4	4	12	4
Level range	0-25	50-85.71	75-100	0-0	0-100	0-100	0-33.33	0-100	50-71.43
Level change	0	-19.04	8.3	0	-30	0	33.33	25	-10
Mean	63.61	62.64	67.77	68.31	53.04	69.1	85.41	62.5	53.69
Level stability	0%	50%	50%	100%	16.67%	0%	0%	25%	25%
Note: A1, A2 and A3 represent baseline, B1, B2 and B3 represent training, C1, C2 and C3 represent follow-up.									

Table 4: Visual Analysis Within Phase of Percent of Quality 4 Reinforcement Use.

Item	Dyad 1		Dyad 2		Dyad 3	
Phase	A1/B1	B1/C1	A2/B2	B2/C2	A3/B3	B3/C3
Change of mean	62.06	17.1	53.04	9.46	60.77	-15.41
Percentage of overlap	0%	75%	25%	100%	8.33%	100%
z	2.968**	2.036*	2.446*	0.466	2.896**	-2.102*
Note: ** represent p＜0.01, * represent p＜0.05						

Table 5: Visual Analysis Between Phases of Percent of Quality 4 Reinforcement Use.

Appropriate use of prompt strategy

(Table 6,7) provide visual analysis data on the percentage of high quality (score=4) prompt strategies mothers used across the different phases. The percentage of high quality prompt strategies mothers used increased following training (mean increase of 78.37%, 61.18% and 54.17%, respectively), statistically significant compared with baseline (z=3.109, p<.01, d=11.448, z=2.880, p<.01, d=7.984 and z=3.115, p<.05, d=2.982, respectively). The percentage of high quality prompt strategies mother used did not change significantly from training to follow-up (z=0.000, p>.05) for Dyad 3, it was maintained at follow-up. Dyad 1 and 2 had a slight decrease during follow-up (mean decrease of 0.415% and 4.39%, respectively), but there was no significant statistical difference (z=-0.349, p>.05, d=-0.038 and z=0.272, p>.05, d=-0.224, respectively), and there was significant difference between baseline and follow-up (z=2.323, p<.05, d=11.387 and z=2.309, p<.05, d=7.411, respectively) see (Figure 1).

Item	Dyad 1			Dyad 2			Dyad 3		
Phase	A1	B1	C1	A2	B2	C2	A3	B3	C3
Condition length	4	12	4	4	12	4	4	12	4

Level range	10-14.29	66.67-100	83.33-100	5-22.22	44.44-100	57.14-85	33.33-66.67	100-100	100-100
Level change	3.18	33.33	0	-15	42.23	27.86	29.17	0	0
Mean	15.1	93.47	93.055	15.97	77.15	72.76	45.83	100	100
Level stability	25%	75%	100%	25%	45.45%	25%	33.33%	100%	100%
Note: A1, A2 and A3 represent baseline, B1, B2 and B3 represent training, C1, C2 and C3 represent follow-up.									

Table 6: Visual Analysis Within Phase of Percent of Quality 4 Prompt Use.

Item	Dyad 1		Dyad 2		Dyad 3	
Phase	A1/B1	B1/C1	A2/B2	B2/C2	A3/B3	B3/C3
Change of mean	78.37	-0.415	61.18	-4.39	54.17	0
Percentage of overlap	0%	100%	0%	100%	0%	100%
z	3.109**	-0.349	2.880**	-0.524	3.115*	0
Note: ** represent $p<0.01$, * represent $p<0.05$.						

Table 7: Visual Analysis Between Phases of Percent of Quality 4 Prompt Use.

Child Communication Skills

(Table 8,9) provide visual analysis data on the percentage of children's responses to mother's instructions across the different phases. All three children demonstrated an increase in percentage of response to the mother's instructions (mean increase of 17.92%, 7.815% and 21.7%, respectively), and this was statistically significant compared with baseline ($z=2.062$, $p<.05$, $d=1.198$; $z=1.960$, $p<.05$, $d=1.999$ and $z=2.481$, $p<.05$, $d=1.696$, respectively). For Dyad 2, the gains in response to the mother's instructions observed in training was maintained at follow-up ($z=-0.653$, $p>.05$, $d=0.067$). For Dyad 1 and 3, there was a decrease during follow-up, but there was no significant difference between training and follow-up for Dyad 1 ($z=-0.728$, $p>.05$, $d=0.416$), while there was a significant difference for Dyad 3 ($z=-2.872$, $p<.01$, $d=-4.155$), but they both had no significant difference between baseline and follow-up ($z=1.826$, $p>.05$, $d=1.529$ and $z=-0.866$, $p>.05$, $d=-0.803$) see (Figure 2).

Item	Dyad 1			Dyad 2			Dyad 3		
Phase	A1	B1	C1	A2	B2	C2	A3	B3	C3
Condition length	4	12	4	4	12	4	4	12	4
Level range	34.78-69.23	60.71-91.67	67.67-97.22	63.93-73.08	56.45-83.61	72.41-79.45	46.94-74.36	74.19-94.29	33.33-64.86
Level change	24.48	8.25	3.76	5.28	16.49	0.19	2.93	-14.29	-14.39
Mean	56.34	74.26	62.3	68.825	76.64	77.2	62.47	84.17	52.19
Level stability	50%	41.67%	50%	100%	90.91%	100%	25%	72.72%	25%
Note: A1, A2 and A3 represent baseline, B1, B2 and B3 represent training, C1, C2 and C3 represent follow-up.									

Table 8: Visual Analysis Within Phase of Percent of the Child Respond to the Mother's Instruction.

Item	Dyad 1		Dyad 2		Dyad 3	
Phase	A1/B1	B1/C1	A2/B2	B2/C2	A3/B3	B3/C3
Change of mean	17.92	-11.96	7.815	0.56	21.7	-31.98

Percentage of overlap	41.67%	75%	18.18%	100%	18.18%	100%
z	2.062*	0.728	1.960*	-0.653	2.481*	-2.872**
Note: ** represent p＜0.01, * represent p＜0.05.						

Table 9: Visual Analysis Between Phases of Percent of the Child Respond to the Mother's Instruction.

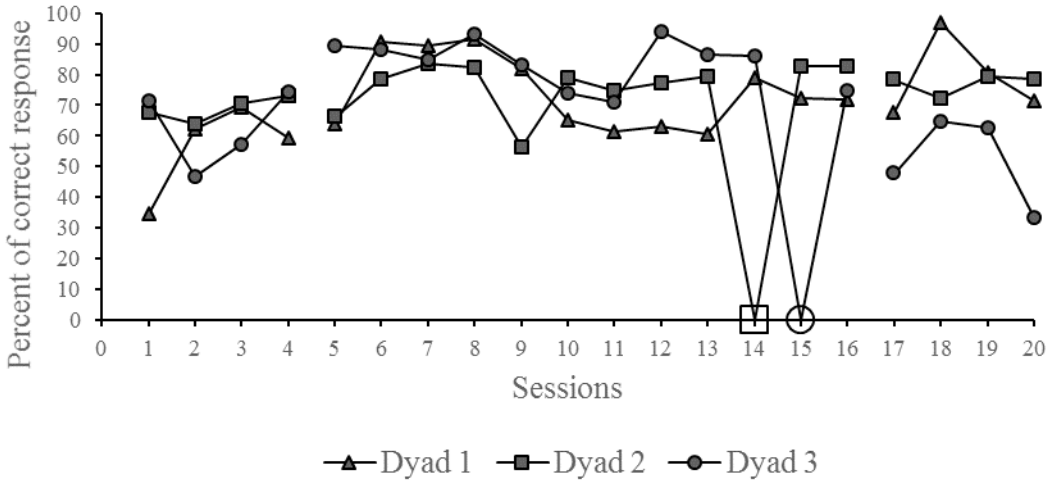

Figure 2: Percent of correct response to parent communication act. Open symbols represent no data collected. There was no significant change in spontaneous language after training (z=-0.080, p>.05, d=-0.167; z=0.298, p>.05, d=-0.136; z=0.603, p>.05, d=0.587), and at follow-up for 2 of the 3 children (z=0.959, p>.05, d=0.723; z= 0.754, p>.05, d=-0.430). Spontaneous language for Dyad 3 increased at follow-up (z=2.528, p<.05, d=3.844).

Social Validity

The average ratings of the parents' responses to the statements in the social validity questionnaire are presented in (Table 10). Parents rated all statements with an average of 4 or higher on a 5-point Likert-type scale and they indicated satisfaction with the project's goals, procedures, and outcomes. Analysis of the problems covered by the questionnaire revealed that the parents believed that the project led to improvements for their children and themselves. And they also give some advice, such as not just providing one to one training. We can provide more group training or group activities to increase the opportunities for communication between the parents and children.

Items	Average rating
The three teaching strategies trained (instruction, reinforcement, and prompt)	4.4
The guidance provided to you during training	4.4
How satisfied you are with the overall project procedures	4.2
How satisfied you are with the leading-type training	4.8
How easy it was to incorporate the strategies into your daily home routine	4.4
How useful the strategies were in meeting your child's goals	4.2
How satisfied you are with the overall project outcomes for your child	4.6
How satisfied you are with the overall project outcomes for you	4.8
Your knowledge of the teaching strategies	4.2
Your competence in implementing the teaching strategies	4.6
Your enjoyment in using the teaching strategies with your child	4.8

Table 10: Average Ratings in the Parent Social Validity Questionnaires.

Discussion

The goal of the current pilot intervention study was to teach parents of school-aged children with ASD to use instruction, reinforcement and prompt strategies chosen from Discrete Trial Teaching. The parent training based on individualized education courses of the school was implemented every week for six weeks using specially designed teaching procedures, with thorough theoretical knowledge training in groups for 5 hours.

The results confirmed that T2P2C has an acquisition effect on improving the appropriate use of strategies from DTT for parents of children with ASD. All the participants made significant progress in the use of instruction, reinforcement and prompt strategies during the treatment. Our findings are an important complement to previous research, which reported that parents of children with ASD can improve their use of treatment strategies and children can increase their rate of language through a preschool-based parent training program in which parents received training on teacher preparation days or evenings [9]. And children's response behavior was also improved. Children's correct responses to parents' communication acts were increased significantly, but there was no significant increase in the spontaneous language of children; only one child showed significant improvement during the follow-up. On the one hand, the intervention and follow-up time of this research were shorter than in previous research [8,9,21,22], for example, [1] used a social communication intervention lasting 12 months for children with autism aged from 29 months to 60 months, and measured the maintenance effect after 12 months. Baker (1989) noted the difficulty in obtaining accurate and meaningful measures of child changes in parent training programs limited to 10 weekly sessions. According to meta-analysis, the study found greater effect sizes for parental outcomes than for children's outcomes because parents act as change agents for children's development [23], and changes in children's behavior often emerge slowly, and may not be evident for months following training. On the other hand, we need to add some elements to stimulate children's spontaneous language in the project.

The results show that T2P2C has a maintenance effect; the positive outcome for children and their parents was maintained for 2 months. Only Dyad 3's appropriate use of instruction and reinforcement strategy and the child's correct response to the mother's instruction returned to baseline level. The possible reason is that the mother's pregnancy caused changes in mood or attitude meaning less attention paid to the child. She was unable to concentrate on family intervention, and the child's emotional behavioral problems become frequent at the same time according to the reports of the teacher and the mother. Thus, the parent's positive attitude and the child's stable emotional state are important factors for effective intervention. In addition, the parents were satisfied with the intervention's goals, procedures, and outcomes. The parents suggested more group training sessions. One program, called Parent-to-Parent, sees parents sharing practical information on disabilities and resources with other parents, sharing their own personal experiences [24].

Future research can increase appropriate group training sessions for parents to communicate with each other, letting parents share their experience and discuss problems they confronted to enhance their parenting ability, and this may also be able to relieve their pressure. Overall, both parents and children can benefit from the short-term school-based parent training project T2P2PC. More importantly, it is practical and replicable. First, the time cost of this project is low, so it's convenient for parents to take part in the project, and it can solve the problem of long waiting lists for services at the same time. T2P2C only provides training once a week. Ingersoll and Wainer (2013) also suggest that parents learned to use the techniques with fidelity as they were introduced and that provided coaching once per week was better than twice per week. Parents perhaps need more time to comprehend and practice the new skills. Research has indicated that parental stress decreases in low-intensity treatments, while it increases in high-intensity interventions [9]. Also, training for 30-60 minutes every time may increase the training effect according to previous research [25]. Second, specially designed teaching procedures are easily mastered and applied by teachers, and parents are more likely to benefit from this procedure. The teaching procedure has five steps, including effective methods according to previous parent training research, such as model, feedback and practice. We use this information to let parents know the key points of using the strategy appropriately, and the combination of using the model, practice with the child, and getting feedback from the trainer enables parents to use these strategies independently and appropriately. The reason why we adhere to using individualized training courses for parent training is that previous research has indicated that specific variables, such as child involvement in the parent education leads to positive outcomes for parents and children [26]. In addition, we use written feedback to ensure the generalization of parents' strategies and the quality of family intervention. Third, to provide guidance for family intervention with individualized teaching plans, we work with parents to develop individualized training plans every week; teachers prepare the training content for the next week and discuss it with the parents. Kaiser et al. (2007) suggested that the most consistent changes in parent and child behaviors occurred when parents received individualized sessions including coaching, feedback, and specific targets for the child [27]. Individualized training plans have the same goal at school and at home every week, but the content is not the same; home training content is more like a generalization of school training by changing materials.

This study has a number of limitations. First, the effectiveness of the intervention should be interpreted with caution due to methodological limitations; we used a withdrawal design with

only three families, and generalization of the findings beyond these families is limited. This program should be confirmed by a multi-baseline research design or a randomized control trial in large-scale with more families representing a diverse demographic. Second, this research did not directly assess the fidelity of implementation of parent training at home. Future research can use objective methods to measure fidelity of parent training at home, and explore the relationship between the fidelity and the change in children's ability. A final limitation is we do not discuss the change in parent variables. We can use assessment tools to examine the effect of the parent training program on stress and self-efficacy. More importantly, we can explore the relationship between subtle parental variables and the intervention effect through qualitative research methods, and the influence of intervention on the whole family.

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