

Problem-solving skills training for mothers of children recently diagnosed with autism spectrum disorder: A pilot feasibility study

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Abstract

Problem-solving skills training is an intervention designed to teach coping skills that has shown to decrease negative affectivity (depressive symptoms, negative mood, and post-traumatic stress symptoms) in mothers of children with cancer. The objective of this study was to see whether mothers of children recently diagnosed with autism spectrum disorder would be receptive to receiving problem-solving skills training (feasibility trial). Participants were recruited from a local outpatient developmental clinic that is part of a university department of pediatrics. Participants were to receive eight 1-h sessions of problem-solving skills training and were asked to complete assessments prior to beginning problem-solving skills training (T1), immediately after intervention (T2), and 3 months after T2 (T3). Outcome measures assessed problem-solving skills and negative affectivity (i.e. distress). In total, 30 mothers were approached and 24 agreed to participate (80.0%). Of them, 17 mothers completed problem-solving skills training (retention rate: 70.8%). Mothers of children with autism spectrum disorder who completed problem-solving skills training had significant decreases in negative affectivity and increases in problem-solving skills. A comparison to mothers of children with cancer shows that mothers of children with autism spectrum disorder displayed similar levels of depressive symptoms but less negative mood and fewer symptoms of post-traumatic stress. Data suggest that problem-solving skills training may be an effective way to alleviate distress in mothers of children recently diagnosed with autism spectrum disorder. Data also suggest that mothers of children with autism spectrum disorder were moderately receptive to receiving problem-solving skills training. Implications are that problem-solving skills training may be beneficial to parents of children with autism spectrum disorder; modifications to improve retention rates are suggested.

Keywords

autism spectrum disorder, family intervention, problem-solving skills training

Introduction

Autism spectrum disorder (ASD) is characterized by the early manifestation of social communication and interaction impairments and repetitive patterns of behavior and interests, which together impair everyday functioning (American Psychiatric Association, 2013). In the past 10 years, the prevalence of children with ASD has increased from 1 in 150 to 1 in 68. This increase in number is attributed to the broadening criteria for diagnosis and/or increased awareness in pediatrics, schools, and community setting regarding identification of early signs of the disorder (Center of Disease Control and Prevention, 2014). It is important to consider the effect ASD may have on families and, in particular, parents of children recently diagnosed with this disorder.

A number of studies have shown that parents of children with ASD have high levels of distress and physical health problems. Parents of children with ASD report elevated levels of distress with mothers often displaying more signs of depression than fathers (Hastings et al., 2005). According to a recent national survey, mothers of

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Robert B Noll, Children's Hospital, Office Building, 2nd Floor, 3420 Fifth Avenue, Pittsburgh, PA 15213, USA. Email: Robert.noll@chp.edu children with ASD experience high levels of distress, which places them at greater risk of poor mental health (Zablotsky et al., 2013). Another study on families of children with ASD found that the parent who is considered the primary caregiver to the child reported more health complaints, increased levels of the stress hormone cortisol, and greater fatigue than the parent who is not considered the primary caregiver (De Andres-Garcia et al., 2012). Parents of children with ASD even have higher levels of distress (i.e. anxiety, depression, and negative mood) than parents of children with other developmental disabilities such as Fragile X or Down syndrome (Abbeduto et al., 2004; Bristol and Schopler, 1984).

Given the evidence cited above that suggests parents of children with ASD are at risk of elevated levels of distress, there may be specific periods during which parents of children with ASD are at especially high risk of distress. Caregivers of recently diagnosed children may experience more distress than parents of children who have been diagnosed and treated for some period of time (Moh and Magiati, 2012). The initial stage of adapting to the challenges presented by a child recently diagnosed with ASD may be especially difficult as caregivers learn about ASD and the multitude of potential treatments for their child. Notably, Siklos and Kerns (2007) reported that 80% of parents rated the diagnostic transition of ASD as stressful. This seems potentially problematic since parents must make numerous decisions about treatment and services for their child and family soon after the diagnosis. Factors associated with greater parental distress included having a lengthy ASD diagnostic process and not knowing what to do after diagnosis. Factors associated with more satisfaction included having professional support and being provided with resources and knowledge on how to proceed (Siklos and Kerns, 2007).

Recent work addressing this problem includes educational and/or coping skills trainings aimed at parents of children recently diagnosed with ASD. In a 2-day, 14-h onsite intervention called Acceptance and Commitment Therapy, 20 parents were successfully recruited from a mass mailing list and completed the intervention. They found that there were significant decreases in depressive symptoms after the therapy was completed (Blackledge and Hayes, 2006). Another intervention involved a professionally supported onsite workshop and 10 home visits focused on improving parenting skills in 17 families of children with ASD referred from local hospitals and community health clinics. The intervention was completed by 77.0% of families and found greater increased parental self-efficacy and decreased parental stress in comparison to 22 families of children with ASD who completed selfdirected home videos and worksheets. Despite having a control group, randomization of the families into the two different types of interventions were limited due to travel distance (Keen et al., 2009). Both studies found that these

interventions decrease parental distress and may facilitate overall adjustment to the difficulties of raising a child with ASD. However, these two interventions were feasibility studies with small sample sizes and limited randomization, which supports the fact that this field remains largely unexplored and clearly the above interventions are quite demanding of parental and professional time. It is clear that skills-based interventions (i.e. coping skills) offer the potential to help families.

Another group of parents who also display considerable distress subsequent to a diagnosis are parents of children recently diagnosed with cancer (Sahler et al., 2005, 2013). Similar to parents of children with ASD, distress and decreased well-being may hinder parents' ability to adapt to their child's diagnosis and the challenges of treatment. Note that while parents of children with cancer are provided clear protocols and the majority of children with cancer are treated on randomized phase III clinical trials within a well-organized cooperative trials network (i.e. Adamson, 2013), parents of children with ASD must often seek out and arrange a broad array of services for their child and family, often from numerous agencies, with minimal guidance (Lord et al., 2005; National Academy of Sciences, Institute of Medicine, 2003; Shattuck and Grosse, 2007). There is no well-organized clinical trials network.

"Give a man a fish and you will feed him for one day. Teach a man to fish and you will feed him for the rest of his life." This old Chinese proverb embodies one set of strategies that have been used to alleviate distress in mothers of children recently diagnosed with cancer: problem-solving skills training (PSST). PSST is a revised form of problem-solving therapy (PST), a cognitivebehavioral intervention that has been found to be effective in decreasing depressive symptoms in many groups of individuals who are distressed (Bell and D'Zurilla, 2009; Mynors-Wallis et al., 1995). By teaching parents general problem-solving skills, they may be better able to adapt to the challenges presented by their child's diagnosis, experience reduced distress, and possess improved problemsolving skills which they can apply to all aspects of their life even after the intervention is concluded. Sahler et al. (2005) used PSST with mothers of children recently diagnosed with cancer in an eight-session intervention. Compared to standard psychosocial supportive care provided at eight pediatric cancer centers, PSST increased constructive problem-solving skills, and this increase in skills led to reduced distress.

More recent work by Sahler et al. (2013) compared PSST to nondirective supportive therapy. Results from this work demonstrated that both PSST and nondirective supportive therapy were equally effective at the end of treatment. However, significant differences emerged 3 months after the two treatments ended. Specifically, mothers who were taught problem-solving skills reported significantly less distress 3 months after treatment ended. These data suggested that both PSST and nondirective supportive therapy alleviate distress, but providing coping tools can lead to long-term effects.

We speculated that PSST may also be useful in helping mothers of children recently diagnosed with ASD. Literature on coping mechanisms of parents of children with ASD suggests that improved problem-solving skills may result in decreased distress, increased positive mood, and increased maternal well-being (Abbeduto et al., 2004; Folkman and Lazarus, 1988; Kuhn and Carter, 2006). A questionnaire conducted during intensive home-based behavioral interventions found that parents of children with ASD stated that adaptive coping strategies such as task-oriented coping were most effective in lowering their stress (Hastings and Johnson, 2001). It would make sense that a problem-solving intervention such as PSST had the potential to help parents of children with ASD better use problem-solving coping, be more task-oriented, and feel more empowered to complete their tasks for everyday living. In addition, PSST aims to be as convenient as possible for parents in both time and location, possibly making it more accessible to families who do not have the ability to make the travel and time commitment than the two former mentioned interventions for parents of children with ASD, Acceptance and Commitment Therapy and parenting strategies intervention, require (Blackledge and Hayes, 2006; Keen et al., 2009).

The primary purpose of this study is to ascertain whether PSST can be provided to mothers of children recently diagnosed with ASD (i.e. pilot feasibility trial). We hypothesize that since the PSST sessions were made to be as convenient as possible to participants with multiple meeting places and flexible scheduling, greater than 80% of mothers of children recently diagnosed with ASD will agree to participate. This hypothesis was based on the recruitment rates of mothers of children with cancer. Second, we hypothesize that levels of self-reported distress in mothers of children recently diagnosed with ASD will be similar to the levels of distress reported by mothers of children recently diagnosed with cancer from Sahler et al. (2013). Third, we will explore whether distress is reduced in mothers of children with ASD who receive PSST. Finally, at the suggestion of reviewers, we include a fourth post hoc hypothesis regarding engagement. We hypothesized that 70% of participants would complete a minimum of six face-to-face sessions.

Methods

Participants

Participants were recruited from a local outpatient developmental clinic that is part of a university department of pediatrics. Eligibility criteria were as follows: (a) primary caretaker of a child between 2 and 5 years old who was diagnosed with any form of ASD within the past 4–24 weeks, (b) child had no preexisting genetic conditions (i.e. Down syndrome, Fragile X), (c) child had no sibling with a ASD diagnosis, and (d) residence within a 50-mile radius of the site. There was no attempt to stratify the sample population to any particular demographic (i.e. age and ethnic background) except that African American mothers were specifically recruited to ensure a more diverse sample population that represents the population of children with ASD. Notably, PSST has been shown to be especially effective for single, low socioeconomic status (SES), or minority caregivers (Sahler et al., 2005; Seid et al., 2010).

Procedures

Subsequent to learning their child had a diagnosis of ASD, the caregiver of child with ASD was asked for permission to release their name and phone number to this research study. Release of the phone number allowed for contact to be made to determine interest in participating in this research. If the caregiver was interested, a time was scheduled for a face-to-face visit to review the project and obtain informed consent. Caregivers signed informed consent forms that provided them information regarding the nature of the study as approved by the local institutional review board. After giving consent, caregivers were asked to complete baseline assessments (T1). There were two additional assessments, one immediate post evaluation (T2) and one 6 months after T1 (T3). Upon completion of T3, each subject received a US\$100 stipend.

PSST

The PSST used for this project and the earlier pediatric oncology studies was a modified version of PST (Nezu, 1986) that teaches participants a systematic approach to solving problems. During the PSST sessions, participants identified and chose problems most relevant to their lives. These problems ranged from emotion-based problems to logistical-based problems; designated problems might focus on challenges related to their child with ASD or other life problems. Eight sessions were provided to ensure sufficient time for participants to learn how to isolate and identify specific problems, generate solutions, solve problems, and to be given the opportunity to master each step of PSST. Because these sessions are focused on specific problems that are raised by caregivers, rather than a trainer's agenda, PSST sessions have been carried out in many different settings (i.e. pediatric hospital room with more than one family). Our experience has been that participants can make their own decisions, so that their privacy is not compromised regarding sensitive issues.

The materials used to work with caregivers of children with cancer were modified for caregivers of children with ASD by changing any reference of "cancer" to "ASD." The trainers who provided PSST had post-graduate levels of education and had received intensive training to be providers of PSST. The training for this project was exactly the same as what had been provided to research assistants in the cancer studies. The principal investigator (PI; R.B.N.) of this study had been involved in training numerous research assistants to provide PSST. This training workshop is now being offered to larger groups of professionals in pediatric oncology using the same standardized format.

PSST clinicians met regularly for supervision, but the resources were not available for fidelity checks, since this research represented a pilot feasibility trial of PSST for caregivers of children recently diagnosed with ASD. All project trainers met weekly for 2 h with the project PI to review cases in a group setting. Because PSST is so manualized at this time, maintaining fidelity has not been a problem. Note that experience in pediatric oncology for the PSST cancer trials or with pediatric ASD for this trial was not considered when identifying potential trainers. PSST focuses on caregivers and whatever problems they reveal. Often the problems that are mentioned have nothing to do with their child's health problems.

Participants received eight 1-h sessions. These sessions were conducted at the caregiver's home, convenient public places such as local coffee shops or the public library, or by phone following the manual and parent's guide, which were slightly modified as noted above, from previous studies. During these sessions, participants were first introduced to the steps of PSST and then taught how to master the steps by using problems caregivers described from their everyday life. To help participants remember and master the steps of PSST, the Bright IDEAS acronym system that had been used in pediatric oncology was maintained in this study (Sahler et al., 2005). Specifically, first, remain bright and optimistic when faced with a specific obstacle. Then follow the five steps of PSST: (a) Identify the problem, (b) Determine the options, (c) Evaluate and chose the best option, (d) Act according to the best option, and (f) See if it worked (IDEAS).

Caregivers of children with cancer

We used the data from the Sahler et al.'s (2013) article as a comparison point. This cohort was selected because these data were collected just prior to the beginning of the ASD project and data were available at all three time points. The Sahler et al.'s (2005) article only reported data from T1 and T2. Caregivers in the cancer project had a child who had been diagnosed in pediatric cancer 4–16 weeks prior to consent at one of four participating sites. Eligibility criteria included (a) the ability to speak and read English or Spanish and (b) residence within 50 miles of the cancer center. Because this study was comparing PSST to nondirective

supportive psychotherapy, we only used the data from the group of mothers who were randomized to receive PSST.

Of the 402 mothers of children with cancer who consented to the study, 152 participants were randomly assigned to receive PSST and 138 participants began PSST sessions. Eighty-eight participants (58.0%) completed 6+ sessions of PSST. Of the 152 participants at T1, 96 completed assessments at T2 and 93 completed assessments at T3. In total, 11 participants withdrew between T1 and T2, primarily due to medical crisis (death or disease progression) and three withdrew between T2 and T3. The study reported that the primary reason for missing assessments and interventions was "passive refusal," that is, no reason was given, and not associated with demographics.

Measures

Measures were administered at three time points: (a) at baseline prior to receiving PSST (T1); (b) immediate post evaluation (T2, 10–12 weeks after baseline—after the last session of PSST); and (c) 3 months post T2 (T3). The demographic information was obtained only at T1 (Sahler et al., 2005, 2013).

Demographic questionnaire. This measure asks basic demographic information about the mother, child with ASD, and family. Questions include education, occupation, marital status, and so on. Participants' SES was determined using a socioeconomic index (SEI), which assigns numbers to various occupations based on prestige (Entwisle and Astone, 1994; Shavers, 2007). Use of occupation as a measure of SES in health-related research provides one measure that links education and income but is less volatile than income over time and has far fewer nonresponses.

Social Problem-Solving Skills Inventory-Revised. The Social Problem-Solving Skills Inventory-Revised (SPSI-R) is a 52-question self-report questionnaire that measures five dimensions of problem-solving skills (D'Zurilla et al., 1997). These five dimensions include two problem orientation dimensions (positive problem orientation (PPO) and negative problem orientation (NPO)) and three problemsolving dimensions (rational problem solving (RPS), impulsivity carelessness style (ICS), and avoidance style (AS)) which all measure how an individual strategically approaches a situation. PPO and RPS are considered constructive dimensions while NPO, ICS, and AS are considered dysfunctional dimensions. The inventory uses a 1 (not at all true) to 5 (extremely true) Likert scale. A total score is calculated using the five sub-scores while taking into account whether it is a constructive or dysfunctional dimension. A higher total score indicates better problemsolving skills. The internal consistency of SPSI-R is adequate (Cronbach's $\alpha = 0.96$); the test-retest reliability is r=0.68–0.91 (D'Zurilla et al., 2002).

Variable	No. (n=24)	%
Education		
<high school<="" td=""><td>4</td><td>17</td></high>	4	17
High school	3	13
Postsecondary	12	50
Graduate school	5	20
Marital status		
Single	5	21
Married	14	58
Divorced-single	I	4
Unmarried with partner	4	17
Ethnicity		
Black, not Hispanic	6	25
American Indian	I	4
Asian/Pacific Islander	3	13
White, not Hispanic	14	58

 Table I. Demographic characteristics of participating mothers.

Beck Depression Inventory–Revised. The Beck Depression Inventory–Revised (BDI-R) includes 21 items to measure cognitive, affective, and behavioral symptoms of depression (Beck et al., 1996). The internal consistency of BDI-R is adequate (Cronbach's α =0.91; Beck et al., 1996).

Profile of Mood States. The Profile of Mood States (POMS) is a 65-question self-reported mood questionnaire (McNair et al., 1992). The assessment uses a 1 (not at all true) to 5 (extremely true) Likert scale to measure seven moods and affective states: (1) Tension, (2) Depression, (3) Anger, (4) Fatigue, (5) Confusion, (6) Vigor, and (7) Friendly. A total score (Total Mood Disturbance) can be calculated. The internal consistency of POMS is adequate (Tension: Cronbach's α =0.91; Depression: Cronbach's α =0.95; Anger: Cronbach's α =0.93; Vigor: Cronbach's α =0.88; Fatigue: Cronbach's α =0.94; Confusion: Cronbach's α =0.86; Barker-Collo, 2003).

Impact of Event Scale–Revised. The Impact of Event Scale–Revised (IES-R) is a 22-question self-reported questionnaire of symptoms of post-traumatic stress. The questionnaire includes three subscales: (a) Intrusion, (b) Avoidance, and (c) Hyperarousal. Sub-scores were calculated for each subscale, and total score was calculated by adding the sub-scores. The internal consistency of IES-R is adequate (Intrusion: Cronbach's α =0.87–0.94; Avoidance: Cronbach's α =0.79–0.91; Creamer et al., 2003).

Data analysis

The demographic data for parents of children with ASD were analyzed using descriptive analysis. The SPSI-R, BDI-R, POMS, and IES-R data were analyzed using mixed

We hypothesized that mothers of children recently diagnosed with ASD will accept PSST and that greater than 80% will agree to participate. To test our first hypothesis, we calculated the percentage of mothers who were contacted and agreed to participate.

We hypothesized that levels of self-reported distress in mothers of children recently diagnosed with ASD will be similar to the levels of distress reported by mothers of children recently diagnosed with cancer. To test our second hypothesis, we did a descriptive comparison of the baseline scores on the BDI-R, POMS, and IES-R between mothers of children with ASD and mothers of children with cancer. This comparison group comprised 152 mothers of children with any form of cancer within 4–16 weeks after diagnosis from four sites across the United States. These mothers of children with cancer received the exact PSST intervention and outcome measure assessments as the mothers of children with ASD (Sahler et al., 2013).

We predicted that for mothers of children with ASD receiving PSST, distress will be reduced similarly to what has been reported for mothers of children recently diagnosed with cancer. To test our third hypothesis, we did a descriptive comparison of scores at T1, T2, and T3 on the BDI-R, POMS, and IES-R between mothers of children with ASD and mothers of children with cancers comparing the mean and standard error (SE).

Finally, we added an ad hoc hypothesis that predicted that the participant attendance to the eight intervention sessions will be similar to that of mothers of cancer patients. To test our ad hoc hypothesis, we did a descriptive comparison of the percentage of participants who attended \geq 3 sessions, 4–5 sessions, and 6+ sessions.

Results

Demographics

The average participant finished high school and is married (Table 1). The average SEI score for the participants was 36.85 (sales cashiers) with a range from 15.00 (unemployed) to 79.81 (secondary schoolteachers and school counselors). The average SEI score for the participants' spouses was 71.35 (office managers and librarians) with a range from 23.33 (factory workers and machine operators) to 90.83 (engineers).

Recruitment and retention

A total of 30 mothers of children with ASD were referred to us by physicians and psychologists from two local outpatient developmental clinics. Of the 30 mothers who were approached and contacted with further details about



Figure 1. Comparing Social Problem-Solving Inventory–Revised mean scores and standard errors between mothers of children with ASD and mothers of children with cancer at T1 (baseline), T2 (10–12 weeks after T1), and T3 (3 months after T2).

the study, 6 chose not to participate in the study. We started with 24 participants at T1. Of them, 6 participants (25.0%) completed \geq 3 sessions of PSST, 1 participant (4.2%) completed 4–5 sessions of PSST, and 17 participants (70.8%) completed 6+ sessions of PSST. Of the 24 participants at T1, 15 completed the measures at T2 and 11 completed the measures at T3. One participant opted out of completing the IES-R measure at T1, T2, and T3 but completed all the other measures. There was a combination of participants who dropped out and participants who were inconsistent in attending sessions. Participants who were inconsistent in attending sessions. Participants who dropped out did so due to personal reasons, and many cited "being too busy" as the main reason. We made an effort to keep in touch with families who dropped out or who were inconsistent in order to obtain measures for T2 and T3.

Measures of problem solving and distress

Problem-solving skills. Over the course of PSST, we expected SPSI-R scores to increase, suggesting that mothers are learning techniques to help them better solve problems. The SPSI-R data show that initially, mothers of children with ASD (T1: total score mean=8.35, SE=0.33) in our sample have lower problem-solving skills than in our comparative sample of mother of children with cancer (T1: total score mean=13.3, SE=0.15). Mothers of children with cancer followed this trajectory of increasing positive problem-solving skills (T2: total score mean=14.40, SE=0.22; T3: total score mean=14.60, SE=0.22). However, the scores of mothers of children with ASD decreased between T2 and T3 (T2: total score mean = 14.07, SE=0.71; T3: total score mean=9.30, SE=0.85) (Figure 1). For this sample of SPSI-R scores from mothers of children with ASD, the Cronbach's $\alpha = 0.962$.

Depression, mood, and symptoms of post-traumatic stress. The BDI-R data show that both samples of mothers show similar levels of depression (T1: ASD: mean=3.93, SE=0.29; Cancer: mean=3.94, SE=0.07) with symptoms of depression decreasing over the course of PSST (Figure 2). The POMS data show that mothers of children with ASD (T1: mean=49.25, SE=7.79) initially show lower levels of total mood disturbance than mothers of children with cancer (T1: mean=55.70, SE=2.36). In addition, their level of total mood disturbance saw a quicker decline than mothers of children with cancer (T2: mean=33.60, SE=3.55; T3: mean=24.20, SE=3.28) resulting in mothers of children with ASD (T2: mean = 18.90, SE = 5.74; T3: mean = 18.00, SE = 4.87) having lower levels of total mood disturbance than mothers of children with cancer at T2 and T3 (Figure 3). The IES-R data show that mothers of children with cancer (T1: mean=35.50, SE=1.07; T2: mean=28.20, SE=1.62; T3: mean=24.20, SE=1.53) exhibit greater levels of post-traumatic stress symptoms than mothers of children with ASD (T1: mean=23.37, SE=4.02; T2: mean = 9.71, SE = 1.63; T3: mean = 10.30, SE = 1.91) at all times during PSST and a significant difference at T1 of PSST. Both groups displayed a decrease in post-traumatic stress symptoms across the course of the intervention (Figure 4). For this sample of mothers, the POMS Cronbach's $\alpha = 0.961$, BDI-R Cronbach's $\alpha = 0.903$, and IES-R Cronbach's $\alpha = 0.943$.

Problem-solving skills and distress of mothers of children with ASD over time. A positive direction of change is desired which would indicate an increase in ability to perform specific problem-solving steps. We found scores were significantly different between T1 and T2 (p=0.000) and T1 and T3 (p=0.010), indicating that over the course of



Figure 2. Comparing Beck Depression Inventory–Revised mean scores and standard errors between mothers of children with ASD and mothers of children with cancer at TI (baseline), T2 (10–12 weeks after TI), and T3 (3 months after T2).



Figure 3. Comparing Profile of Mood States mean scores and standard errors between mothers of children with ASD and mothers of children with cancer at T1 (baseline), T2 (10–12 weeks after T1), and T3 (3 months after T2).

PSST, mothers of children with ASD are increasing in their effectiveness to solve problems (Table 2). The BDI-R scores decreased between T1 and T2 (p=0.005) and between T1 and T3 (p=0.002), suggesting fewer depressive symptoms over the course of this study (Table 2). The IES-R scores decreased between T1 and T2 (p=0.007) and between T1 and T3 (p=0.004), indicating less post-traumatic stress symptoms (Table 2). The POMS scores decreased between T1 and T2 (p=0.003) and between T1 and T3 (p=0.005), indicating less disturbance of mood (Table 2).

Discussion

The purpose of this research was to determine whether mothers of children recently diagnosed with ASD were receptive to receiving PSST, and whether PSST could be an effective tool to alleviate distress in mothers of children recently diagnosed with ASD (i.e. pilot feasibility trial). The intervention teaches caregivers problem-solving skills. The design of the project allowed for comparisons of the mother's emotional well-being (i.e. depression, post-traumatic stress symptoms, etc.) at baseline, immediately after intervention, and post-intervention. The design of the project also allowed for comparisons with mothers of children with cancer who also received PSST (Sahler et al., 2013).

Since the work with PSST was to be done at times and locations convenient to the caregivers (i.e. homes), we hypothesized that greater than 80% of mothers of children recently diagnosed would agree to participate, and we post hoc hypothesized that greater than 70% of mothers of



Figure 4. Comparing Impact of Event Scale–Revised mean scores and standard errors between mothers of children with ASD and mothers of children with cancer at T1 (baseline), T2 (10–12 weeks after T1), and T3 (3 months after T2).

Table 2.	Comparison of	mean score	changes at	TI–T2 and T	1–T3.
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Variable	TI-T2		TI-T3	
	Mean	Þ	Mean	Þ
Social Problem-Solving Inventory–Revised (total)	5.72	0.000	0.95	0.010
Beck Depression Inventory–R (SQRT)	-1.10	0.005	-1.37	0.002
Profile of Mood States (total)	-30.35	0.003	-31.25	0.005
Impact of Event Scale–Revised (total)	-13.66	0.007	-13.07	0.004

Lower scores indicate healthier functioning for Beck Depression Inventory–Revised, Profile of Mood States, and Impact of Event Scale–Revised. Higher score indicates healthier functioning for Social Problem-Solving Inventory–Revised. T1 (Time 1) is baseline, T2 (Time 2) is 10–12 weeks after T1, and T3 (Time 3) is 3 months after T2.

children recently diagnosed would attend 6+ sessions of PSST. The data show that 24 of 30 mothers (80.0%) agreed to participate, and the retention rate as measured by the percentage of participants that attended 6+ sessions of PSST was 70.8%. Upon further investigation, we found that there is a trend of dropout participants having lower SES and higher negative affectivity which is consistent with a study that shows that higher levels of depression, emotional disturbances, and lower SES are common salient factors of maternal dropout rates in intervention studies (Reyno and McGrath, 2006). Both the hypotheses were supported by the data, and in addition, the retention rate of this study was greater than those reported for PSST for mothers of children with cancer (58.0%) (Sahler et al., 2005, 2013).

We also hypothesized that levels of self-reported distress in mothers of children recently diagnosed with ASD will be similar to the levels of distress reported by mothers of children recently diagnosed with cancer. The data suggest that mothers of children with ASD selfreported similar levels of depressive symptoms as mothers of children recently diagnosed with cancer. We also found that mothers of children with cancer consistently report higher levels of total mood disturbance (tension, confusion, fatigue, etc.) and post-traumatic stress symptoms than mothers of children with ASD. This may be because ASD is not life-threatening disorder and mothers of children diagnosed with ASD are not focused on their child's survival. Mothers of children diagnosed with cancer may live with the fear of cancer relapse and possible death.

Finally, we hypothesized that distress will be reduced in mothers of children with ASD throughout the intervention. Our results show that for mothers of children with ASD who completed the PSST intervention, there were significant decreases in depressive symptoms, total mood disturbance, and post-traumatic stress symptoms. The results also show that mothers of children with ASD who completed PSST were better able to effectively problem solve after the intervention in comparison to baseline. However, the data also suggest a decrease in effective problem solving between T2 and T3. Reasons for this decrease may be due to random variation, participants not practicing the skills they obtained during the PSST intervention sessions, or due to the loss of support that the PSST intervention sessions provided. Overall, data suggest that PSST may be an effective way to alleviate

distress in mothers of children recently diagnosed with ASD by helping them solve problems they may face in their daily lives more effectively. Further research is needed to ascertain how to effectively implement PSST with these mothers along with higher retention rates.

We aimed to make PSST sessions as convenient as possible for the caregivers. This study had higher retention rates (70.8%) in comparison to mothers of children with cancer (58.0%). We speculate that improved retention rates reflect our ability to make home visits, but there were still a number of mothers who did not complete PSST. Possible reasons for the dropout rates in mothers of children with ASD include embarrassment or stigma, less structured daily schedules, and more personal resources spent on finding therapies for their diagnosed child. A recent study that used an adapted depression therapy called problem-solving education (PSE) offered six 30-min workbook sessions to mothers and PSE supplemental school services to the child if not already enrolled in an early intervention program had a 91.0% retention rate (Feinberg et al., 2014). A combination of a shorter meeting period and additional incentive of supplemental services for the child may have been a factor in higher retention rate.

Another area that could be focused on in further studies is to increase engagement with participants by making PSST more geared toward the participants' most pressing problems about their child. We could rearrange PSST interventions to focus on problems directly related to helping their child with ASD, such as helping them problem solve on how to receive services for their child and family (advocacy training). Also, PSST interventions might be carried out by research assistants with background in ASD. Focusing PSST to ASD-specific challenges may increase retention, especially if PSST is being provided by a trainer who has experience with ASD. We believe that it would further engage participants and increase attendance.

This study had several limitations. First, we included a small sample from one center; retention rates were moderate. We acknowledge that the study had a small sample size and was underpowered to detect small to moderate differences. However, none of the major conclusions are based on nonsignificant differences except the qualitative comparison to historical controls. This cohort may not adequately represent the larger population of mothers of children with ASD. Second, this study had no control group of mothers of children with ASD who did not receive PSST (no randomization). Future work with PSST and ASD might consider randomization of caregivers to PSST versus standard of care. Third, given the moderate retention rates, additional strategies (Feinberg et al., 2014) might be explored to see whether there are more effective ways to retain participants. Possible ideas include linking up with caregivers when the diagnosis is made to establish a system of care, resources for respite care, trainers with experience working with children with ASD, focusing PSST on ASD-specific issues, and so on. In summary,

results from this pilot feasibility study suggest that PSST has potential to alleviate distress in caregivers of children with ASD and supports further investigation.

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Declaration of conflicting interests

To the best of our knowledge, no conflict of interests exists.

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