A Pilot Study Examining the Feasibility and Preliminary Efficacy of Problem Solving Therapy in College Students with Autism Spectrum Disorders

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Abstract

College students with Autism Spectrum Disorder (ASD), though academically capable, can have serious difficulty adapting to the college environment. There is a growing need for the identification and development of efficacious interventions and supports for these young adults. The present study sought to address this need by adapting and piloting a group-based cognitive-behavioral intervention program, Problem-Solving Skills: 101 (PSS:101), to promote problem solving ability in college students with ASD. Primary aims of the study were to adapt a well-established problem solving treatment for college students with ASD into a treatment manual, and to collect data on the feasibility of PSS:101. An exploratory aim was to collect preliminary data on the short-term efficacy of this intervention. Five students with ASD from a public, technology and engineering focused university participated in this nine-week, group-based program. Therapists met all treatment integrity objectives across sessions. Four of the five participants completed at least 8 of the 9 sessions and assigned between-session assignments were generally completed (83% completion rate), indicating a high level of treatment adherence. Independent evaluators’ ratings of participant engagement, therapeutic relationship, and group process were relatively high. Preliminary efficacy data suggested mixed results across participants. Further evaluation of the program appears warranted.
# Table of Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abstract</td>
<td>ii</td>
</tr>
<tr>
<td>List of Tables</td>
<td>iv</td>
</tr>
<tr>
<td>List of Figures</td>
<td>v</td>
</tr>
<tr>
<td>List of Appendices</td>
<td>vi</td>
</tr>
<tr>
<td>Chapter 1: Introduction</td>
<td>1</td>
</tr>
<tr>
<td>- Practical Relevance</td>
<td>1</td>
</tr>
<tr>
<td>- Background and Significance</td>
<td>4</td>
</tr>
<tr>
<td>- Problem Solving Deficits in HFASD</td>
<td>5</td>
</tr>
<tr>
<td>- Problem Solving Therapy</td>
<td>8</td>
</tr>
<tr>
<td>- Rationale for Using a Group Modality</td>
<td>12</td>
</tr>
<tr>
<td>- Treatment Development</td>
<td>14</td>
</tr>
<tr>
<td>- Development of Empirically Supported Treatments</td>
<td>16</td>
</tr>
<tr>
<td>- Current Study</td>
<td>18</td>
</tr>
<tr>
<td>Chapter 2: Method</td>
<td>19</td>
</tr>
<tr>
<td>- Design</td>
<td>19</td>
</tr>
<tr>
<td>- Procedure</td>
<td>21</td>
</tr>
<tr>
<td>- Participants</td>
<td>23</td>
</tr>
<tr>
<td>- Measures</td>
<td>24</td>
</tr>
<tr>
<td>- Data Analyses</td>
<td>32</td>
</tr>
<tr>
<td>Chapter 3: Results</td>
<td>36</td>
</tr>
<tr>
<td>- Qualitative Results</td>
<td>36</td>
</tr>
<tr>
<td>- Feasibility</td>
<td>40</td>
</tr>
<tr>
<td>- Efficacy</td>
<td>44</td>
</tr>
<tr>
<td>Chapter 4: Discussion</td>
<td>48</td>
</tr>
<tr>
<td>References</td>
<td>62</td>
</tr>
</tbody>
</table>
List of Tables

Table 1. Definitions of the Problem Orientation Components .................................................. 77
Table 2. Goals of Problem Solving Skills .................................................................................. 78
Table 3. Timeline for Administration of Measures Throughout the Study ............................ 79
Table 4. Participant Demographics .......................................................................................... 80
Table 5. Participant Characterization Data ................................................................................ 81
Table 6. Internal Consistency Across Baseline Administrations for the SPSI-R:L and OQ 45.2  82
Table 7. Consumer Satisfaction for Each Participant ............................................................... 83
Table 8. Consumer Satisfaction Ratings by Session................................................................. 84
Table 9. Consumer Satisfaction at Endpoint: Endpoint Satisfaction Questionnaire ......... 85
Table 10. Qualitative Consumer Satisfaction: Endpoint Satisfaction Questionnaire .......... 86
Table 11. Reliable change indices for the SPSI-R:L from Baseline to Endpoint ................... 88
Table 12. Reliable change indices for the SPSI-R:L from Baseline to Follow Up ................... 89
Table 13. Reliable change indices for the OQ 45.2 from Baseline to Endpoint ..................... 90
Table 14. Reliable change indices for the OQ 45.2 from Baseline to Follow Up ................... 91
Table 15. SMA: Mean Level Changes Between Baseline and Treatment for the SPSI-R:S  
and OQ 45.2 ....................................................................................................................... 92
Table 16. Best Fitting Slopes for the SPSI-R:S Total Score and Subscales ........................... 93
Table 17. Best Fitting Slopes for the OQ 45.2 Total Score and Subscales ............................. 94
Table 18. P-MEPS Scores for Each Participant ........................................................................ 95
Table 19. P-MEPS Story Scores for Each Participant .............................................................. 96
List of Figures

Figure 1. Schematic Representation of the Social Problem Solving Process .................................. 97
Figure 2. Hypothesized Relationships Between the Major Components of the Relational/Problem Solving Model of Stress and Well-Being ........................................ 98
Figure 3. Simulation Modeling Analysis Slope Vectors .................................................................. 99
Figure 4. Brian’s SPSI-R:S scores over the course of the study ...................................................... 100
Figure 5. Michael’s SPSI-R:S scores over the course of the study .................................................. 101
Figure 6. Daniel’s SPSI-R:S scores over the course of the study ....................................................... 102
Figure 7. Kevin’s SPSI-R:S scores over the course of the study ....................................................... 103
Figure 8. Steven’s SPSI-R:S scores over the course of the study ...................................................... 104
Figure 9. Brian’s OQ 45.2 scores over the course of the study ....................................................... 105
Figure 10. Michael’s OQ 45.2 scores over the course of the study .................................................... 106
Figure 11. Daniel’s OQ 45.2 scores over the course of the study ..................................................... 107
Figure 12. Kevin’s OQ 45.2 scores over the course of the study ...................................................... 108
Figure 13. Steven’s OQ 45.2 scores over the course of the study ...................................................... 109
## List of Appendices

Appendix A. Relevant Definitions ........................................................................................................ 110  
Appendix B. Treatment Fidelity: Therapist Rating Form for Each Participant .......................... 112  
Appendix C. Treatment Fidelity: Participant Rating Form ............................................................... 113
A Pilot Study Examining the Feasibility and Preliminary Efficacy of Problem Solving Therapy in College Students with Autism Spectrum Disorders

**Practical Relevance**

“Our internal needs and motivations are often at odds with the physical environment of the university and many of its social and emotional demands...as promising students with special needs, we find ourselves being pushed from the one place that can maximize our potential and give our lives meaning” (Prince-Hughes, 2004, xviii; excerpted from her autobiography ‘Songs from a Gorilla Nation: My Journey Through Autism’).

It is apparent from narratives of prominent individuals with ASD that the college experience can be a significant source of stress. Intelligent students who choose to attend college possess the capacity to make worthwhile societal contributions, but may drop out due to an inability to cope with social and emotional problems (Prince-Hughes, 2004). Advocates for students with disabilities insist that supports through postsecondary education are essential to improving the chance of securing employment, achieving financial independence, participating in the community, and gaining social acceptance (Stodden, 2003). Without support, graduation rates of college students with disabilities are considerably low and, in turn, prospects for finding meaningful and substantial employment are significantly limited; these individuals are more likely to face increased poverty, higher unemployment rates, poor opportunities for job advancement, and discrimination (Stodden, 2003). Young adults with ASD have indicated that major challenges in their daily lives include deciding if, how, and to whom to reveal their diagnostic status, how to build effective relationships, and how to gain successful employment
(White & Pugliese, 2009). Many of these individuals stated that they had abandoned pursuing romantic interests or jobs aligned with their career goals because they did not know how to address these problems. Certain characteristics of ASD, such as deficits in executive functioning and cognitive inflexibility contribute to poor problem solving skills on experimental tasks (e.g., Hill, 2008) as well as in their daily environment (Channon, Charman, Heap, Crawford & Rios, 2001).

There is an urgent need to find efficacious interventions to help these individuals lead fulfilling and productive lives. Without targeted intervention, youth with ASD often exhibit problematic social behavior and can become socially withdrawn or isolated, which can exacerbate social difficulties (Bauminger, Shulman, & Agam, 2003; White et al., 2010). Individuals with ASD self-report not fitting in socially, being excluded, and being misunderstood by their peers (Portway & Johnson, 2005), and are often aware of and distressed by their social interaction difficulties (Ochs, Kremer-Sadlik, Solomon & Sirota, 2001). Because of these experiences, individuals with ASD may lose motivation to work at effectively coping with problems related to their social world. Cognitive-behavioral therapy (CBT) with individuals who have high functioning ASD (HFASD), a term used to describe those without co-occurring intellectual disability, has been demonstrated to be a probably efficacious treatment for many associated problems such as anxiety, depression, and anger (e.g., Bauminger, 2002; Reaven et al., 2009; Sofronoff, Attwood, Hinton & Levin, 2007; White et al., 2010; Wood et al., 2009). In the current study, it is proposed that group-based Problem Solving Therapy (PST), a cognitive-behavioral intervention, may be particularly effective in helping college students with ASD cope with problems they encounter in the university environment by developing appropriate problem solving skills. A core facet of PST focuses on one’s problem orientation, a motivational process
that addresses both constructive and destructive roles of emotions in social problem solving (D’Zurilla & Nezu, 2007). Instruction in this domain may help to counteract apprehensions regarding social involvement or maladaptive cognitive schemas resulting from past social failures and negative peer experiences (e.g., Gaus, 2011). The group format of PST could offer students with ASD the opportunity to interact with peers who have similar challenges and provide them with essential skills and strategies to cope with problems they encounter on a daily basis.

The practical relevance of this intervention goes beyond the psychological benefits that individuals may glean from it and extends to services that colleges could provide to support their students. Section 504 of the Vocational Rehabilitation Act of 1973, the Americans with Disabilities Act of 1990, and the Americans with Disabilities Act Amendments of 2008 requires that postsecondary institutions that enroll students with disabilities provides some level of services, supports, or accommodations to assist their access to education (AHEAD, 2008; AHEAD, 2009; Rao, 2004). Once a diagnosis is disclosed to the appropriate university office that serves students with disabilities, the university is required to provide the student with accommodations if testing indicates the student is substantially limited in an academic area (Glennon, 2001). The law requires academic accommodations to ensure access for all students. However, the needs for students with ASD are unique and they may require specialized support due to their social and communication deficits, which can affect academic progress (Farrell, 2004; Hughes, 2009; Smith, 2007). Based on anecdotal observations made by university personnel, further complications include student noncompliance with support systems like counseling, accommodations, or even registering with the disabilities services office. Extending beyond academic accommodations, it is likely that students will need additional instruction in
developmentally appropriate social abilities, such as how to negotiate peer and teacher interactions inside of the classroom as well as how to access extracurricular activities. Students with ASD entering college face a new set of social demands in an unfamiliar environment, necessitating the use of flexible problem solving skills. The time-limited group-based nature of PST may be a cost effective way to increase these skills in multiple students simultaneously in order to reduce psychological distress (Bannan, 2010). Additionally, a fundamental purpose of PST is to teach individuals to develop the skills necessary to make their own decisions and become self-determined, allowing them to gradually reduce the amount of support they require from others and build their self-efficacy (D’Zurilla & Nezu, 2007).

Background and Significance

Within the past 20 years, increased attention has been given to students with ASD transitioning from high school to college (VanBergeijk, Klin, & Volkmar, 2008). Evidence suggests the prevalence of diagnosed ASD has risen most sharply among children with HFASD, (e.g. Honda, Shimizu, Imai, & Nitto, 2005; US CDC, 2012), which likely influences the increased attention paid to youth with HFASD seeking to attend college. Currently, we do not know exactly how many students with ASD are in college (Farrel, 2004), but with the increase in identification rates, the number of students with ASD attending postsecondary institutions is likely to increase (Adreon & DuRocher, 2007; Smith, 2007). Historically, college was not an option for these students, but more youth with ASD are presently identifying college as their primary desired option (Graetz & Spampinato, 2008). College students, with or without disabilities, are faced with numerous stressors when transitioning to the university environment. For those diagnosed with ASD, this shift may be much more stressful due to difficulty with lack of order and routine of university life, increased academic demands, difficulty with organization
and time management, and problems with making new friends (Glennon, 2001). These obstacles can contribute to college drop out, even if students demonstrate exceptional academic skills (Adreon & Durocher, 2007; Harpur, Lawlor, & Fitzgerald, 2004). Additionally, regardless of academic performance, social difficulties can impact students’ perceptions of personal success and may impact their choice to remain enrolled in college (Harpur, Lawlor, & Fitzgerald, 2004). Based on data collected from this university’s Services for Students with Disabilities (SSD) office, 11 students with ASD were registered with SSD in the 2009-10 school year. This number increased to 22 total students in the 2010-11 school year, but approximately 1/3 of the 11 students from the previous year did not return due to either academic or behavioral problems, or because they could not handle the stress of the college environment. Faced with a growing population of individuals with HFASD (USCDC, 2012), and an increase in the number of students on college campuses with ASD (U.S. Government Accountability Office, 2009) there is tremendous need for the development of effective clinical treatment approaches for adults (Lord et al., 2005), such as students with ASD attending college. An extensive review of the literature suggests there is no empirically supported treatment designed specifically to help these individuals successfully adapt to the college environment. The present study seeks to address this need by adapting and piloting a group-based cognitive-behavioral intervention program to promote problem solving ability in college students with ASD.

**Problem Solving Deficits in HFASD**

Problem solving is the ability to identify problem situations, decide whether the problem is under one’s control, and determine appropriate means to respond to problem situations (e.g., through mastery of goals or the use of coping strategies) depending on how a particular problem situation is defined or appraised (D’Zurilla & Nezu, 2007; Channon et al., 2001). Problem
solving involves advanced cognitive activities, such as the ability to identify the existence of a problem, understand the nature of a problem, generate solutions, enact a chosen solution, evaluate the adequacy of a solution, and consolidate the experience gained from problem solving (Hayes, 1989). Early research indicated that individuals with ASD (both high- and low-functioning) had dramatic deficits in verbal and nonverbal problem solving tasks and also exhibited disorganized search approaches, inflexibility and perseveration in employing methods, a focus on irrelevant details, and failure to integrate information and draw correct inferences (Pascualvaca, Fantie, Papageorgiou & Mirsky, 1998; Prior & Hoffman, 1990; Rumsey & Hamburger, 1988; Rumsey & Hamburger, 1990; Szatmari, Tuff, Finlayson & Bartoluccie, 1990). Certain characteristics of HFASD may predispose individuals towards poor problem solving skills. For example, pervasive deficits in executive functioning and cognitive flexibility in HFASD are related to difficulty with hypothetical thinking, generating novel responses, generalizing skills from one context to another and interacting with others flexibly (Dunlop, Knott, & MacKay, 2008; Hill, 2008; Meyer & Minshew, 2002; Ozonoff et al., 2004; Rinehart, Bradshaw, Moss, Brereton, & Tonge, 2001; Turner, 1999). Cognitive inflexibility can lead to inappropriate social responses, while difficulties with generativity may predispose individuals towards carrying out previously learned problem-solving strategies in inappropriate contexts (Hill, 2008). However, research investigating the remediation of executive deficits in ASD is almost nonexistent (Ozonoff, South, and Provencal, 2005). With respect to problem solving ability, the majority of research has assessed these individuals’ problem solving and strategic behaviors through neurocognitive tests or in laboratory experiments. In these settings, the variables under investigation are more constrained, and the tasks are isolated, making the ability to generalize findings from such tasks to everyday problem situations uncertain. In real life
problem situations, the problems confronted are often ill defined and require flexibility in
strategic behaviors to be solved successfully (Jausovec, 1994).

Early studies with individuals diagnosed with ASD concluded that they lacked the ability
to use visual search strategies (Shah & Frith, 1983) and had difficulty categorizing information
based on abstract representation. However, more recent research by Channon and colleagues
(2001) has demonstrated that individuals with ASD do not necessarily lack problem solving
strategies altogether, but rather use them in an inefficient way. Channon and colleagues (2001)
investigated “real world” problem solving performance in adolescents with HFASD compared to
a typically developing group of same aged peers through the use of video vignettes describing
everyday problem scenarios (e.g., social relationships including strangers, work colleagues, and
families). It was concluded that the HFASD group was impaired in several aspects of problem
solving, including recounting pertinent facts, generating possible high-quality problem solutions
and selecting optimal and preferred solutions. Youth with HFASD did not differ on the number
of solutions they generated, but the average quality of their solutions was poorer than that of the
control group. Youth with HFASD chose more socially inappropriate responses, but did not
differ on their degree of satisfaction with their solution or their ratings of its practical
effectiveness, suggesting that they had difficulty evaluating the success of their selected problem
solving strategy. Channon and colleagues (2001) observed that individuals with HFASD also
lacked coping skills to generate and implement effective solutions to relieve stress.

Difficulties with problem solving can have profound implications for social competency.
Gaus (2011) observed that for individuals with HFASD, frequent negative life events, such as
social rejection, are likely to reinforce negative beliefs about themselves, others, and their own
problem solving efficacy. Rosbrook and Whittingham (2010) found that social problem solving
ability was a significant mediator of the relationship between autism spectrum traits and depressive symptoms and autism spectrum traits and anxiety symptoms in a sample of typically developing (non-ASD) young adults. The authors suggested that how an individual attempts to solve a problem should be investigated to enhance intervention strategies for ASD. Klin, Volkmar, and Sparrow (2000) have also recommended that problem solving skills should be explicitly targeted for intervention in HFASD, and should focus on strengthening the ability to recognize problematic situations and applying learned strategies across a variety of different situations. Though a manualized therapy specifically directed at problem solving has, to the author’s knowledge, never been used with college students with ASD, several empirical studies have successfully targeted this skill as a component of a larger intervention. Youth with HFASD have been shown to make gains in problem solving abilities after time-limited interventions in clinic and school settings, and within individual and group formats (Bauminger, 2002; Solomon, Goodlin-Jones & Anders, 2004; Stichter et al., 2010).

**Problem Solving Therapy**

PST is an evidence-based, cognitive-behavioral intervention designed to promote the adoption and effective application of adaptive problem solving attitudes and skills in order to reduce psychopathology, enhance psychological functioning, and maximize quality of life (D’Zurilla & Nezu, 2007). This process incorporates overt, purposeful, and conscious efforts to change one’s reactions to a problem, to change the problem or situation itself, or both, depending on the nature of the problem (Nezu & Nezu, 2003). The goals of problem solving can include changing a problem that may be under one’s control through the use of problem-focused coping (e.g., improving one’s personal hygiene) or increasing coping skills where a problem is not under one’s control through the use of emotion focused coping (e.g., reacting to social rejection). PST
helps individuals adopt more realistic coping strategies, better understand the impact of negative emotions on problem solving, and create, implement, and monitor an effective solution plan (D’Zurilla & Nezu, 2007). PST endeavors to reduce psychological distress and enhance well-being through guided discussion, interactive problem-solving, and motivational homework assignments (D’Zurilla & Nezu, 2007). These aims are particularly important for individuals with HFASD who lack cognitive flexibility, have poor emotion regulation skills, and may be unmotivated to cope with social problems due to past negative peer interactions and failures.

PST focuses on social problem solving, the process by which individuals attempt to identify or discover adaptive means of coping with a wide variety of stressful problems (D’Zurilla & Nezu, 2007), and is ideal for students with ASD who are likely to be struggling with social demands that affect academic and emotional functioning in college (i.e., Adreon & Durocher, 2007). The first half of PST is dedicated to training in problem orientation, which focuses on a person’s general awareness and appraisal of real world problems, as well as how they view their own problem solving ability (see Table 1). Importantly, PST attempts to attenuate a negative problem solving orientation, which can inhibit problem-solving attempts. Simultaneously, it seeks to foster a positive problem orientation, which can lead to greater positive affect and approach motivation in order to facilitate adaptive problem solving efforts. PST also focuses on building problem solving skills, such as recognizing problems when they occur, generating alternative solutions to cope with the problem, selecting the most effective strategy, implementing the chosen strategy effectively, and observing and evaluating the outcome (see Table 2). By doing so, PST reduces the usage of impulsive (e.g., narrow or incomplete) and avoidant problem solving styles (e.g., procrastination, passivity, and over-dependence on others to provide solutions; see Figure 1).
The major assumption that underlies PST is that psychopathology can be understood as ineffective or maladaptive coping behavior and its consequences, where individuals are unable to resolve stressful problems in their lives (D’Zurilla & Nezu, 2007). Inadequate problem solving attempts produce negative effects, such as anxiety, depression, anger, physical symptoms, and the creation of new problems (D’Zurilla & Goldfried, 1971). The theoretical underpinning of PST is represented in two models; the social problem solving model (Figure 1) and the relational/problem solving model of stress (Figure 2; see D’Zurilla & Nezu, 2007). In the former model, problem orientation focuses on the generalized cognitive-affective-behavioral set with which a person assesses a problematic situation (D’Zurilla, 1990). This is influenced by the individual’s past experiences with problems and their problem solving process. One’s general problem orientation can influence the problem solving outcome directly or indirectly through an individual’s problem solving style. A negative problem orientation is formed when a person appraises a problem as a significant threat to their well-being, doubts their ability to solve the problem effectively, or becomes frustrated with the problem solving process. These negative emotions can lead to a maladaptive outcome independently, or through an impulsive and careless problem solving style (i.e., the application of impulsive and incomplete problem solving strategies) or an avoidant problem solving style (i.e., procrastination or reliance on others to solve one’s problem). Conversely, through optimism regarding one’s ability to solve problems successfully, a positive problem solving orientation can lead to a positive problem solving outcome alone or in conjunction with a rational problem solving style, in which one is knowledgeable about and able to implement problem solving strategies in a deliberate, systematic, and effective manner.

The latter model integrates the social problem solving model with Lazarus’s relational
model of stress (Lazarus, 1999; Lazarus & Folkman, 1984). Stress is viewed as a function of the reciprocal relationships among stressful life events, emotional stress response, and coping strategies. Problem solving and coping style is assumed to be an important mediator of the relations between stressful life events and personal-social functioning, as well as a moderator of the impact of stress on psychological well-being and adaptive functioning. Daily life events are expected to influence each other; a major negative event can create new daily problems, and an accumulation of many unresolved problems may eventually result in a major negative event. Both types of problems can impact well-being independently, as well as indirectly through problem solving coping (D’Zurilla, 1990; D’Zurilla & Nezu 2007). Positive appraisals (i.e., viewing a problem as an opportunity for benefit or gain) and effective coping are assumed to reduce the negative impact of stress, whereas negative appraisals and ineffective coping are assumed to increase the negative impact of stress. Additionally, the relationship between daily problems and problem solving is reciprocal; effective coping leads to a decrease in daily problems, whereas ineffective coping leads to an increase. The ultimate expected outcome of problem solving is to reduce and minimize the negative effects of stressful life events on well-being.

PST has been used in a variety of clinical settings to treat diverse forms of psychopathology (see D’Zurilla & Nezu, 2007). A meta-analysis of 31 studies that examined the efficacy of PST across a variety of mental and health problems demonstrated that PST is significantly more effective than no treatment \((d = 1.37)\), treatment as usual \((d = 0.54)\), and attention placebo \((d = 0.54)\) and as effective as other psychosocial treatments, though not significantly more so \((d = .22)\), in improving mental and physical health (Malouff, Thorsteinsson & Schutte, 2007). PST has been used as a clinical intervention, part of an overall treatment
package, a maintenance strategy, and as a prevention program for individuals with schizophrenia, depression, suicidal ideation, social phobia, generalized anxiety disorder, posttraumatic stress disorder, mental retardation, and difficulty with stress management, but not specifically for individuals with ASD (see Malouff et al., 2007 for a review). There is also evidence to suggest that a time-limited, group-based, problem solving intervention is effective in reducing psychological distress (Bannan, 2010). Malouff et al. (2007) found no significant difference in the efficacy of PST when it was implemented as an individual therapy as opposed to a group therapy.

**Rationale for Utilizing a Group Modality**

Social support and discussion groups have been demonstrated to have positive effects on the social lives of individuals with HFASD and have contributed to improvements in the understanding and expression of emotions, self-perception, and generalizing learned skills to new situations and experiences (Hillier, Fish, Cloppert & Beversdorf, 2007; Howlin & Yates, 1999; MacLeod & Johnston, 2007; Mesibov, 1984; Ozonoff & Miller, 1995; Weidle, Bolme & Hoeyland, 2006). Other benefits have included social-cognitive skill improvements (Ozonoff & Miller, 1995), improvements in the ability to initiate and maintain conversations (Howlin & Yates, 1999; Mesibov, 1984), and increased ability to directly and appropriately respond to questions (Howlin & Yates, 1999). Support groups also demonstrated significant improvements in individuals’ awareness of other peoples’ thoughts, feelings, and perspectives (Hillier et al., 2007), feelings of belonging and reassurances, and incidental learning experiences (McLeod & Johnston, 2007). Satisfaction with the social group experience was also noted as high or very high among individuals with ASD receiving this type of support (Weidle et al., 2006).
One of the disadvantages to conducting therapy in a group format with people who have ASD is the heterogeneous nature of the disorder itself, which can produce different symptoms among different individuals. Another consideration is confidentiality among the group members, since they are not bound by professional obligations to keep the contents of the group private. Finally, some group members may feel intimidated by the group format itself, fearing rejection from other members. Although there are some pragmatic considerations (i.e., scheduling around classes and other commitments), for various reasons it is felt that a group modality is preferable to individual (i.e., therapist-client) intervention and confers several unique benefits. Despite diverse symptomatology of ASD, many individuals in the group may have similar problems in the college environment (e.g., with organization, forming social relationships, etc.) and group therapy can create a forum for participants to offer advice, strategies, and insight to other group members. Regarding confidentiality, White et al. (2010) indicated, “dedicated time for building group cohesion and establishing group rules agreed upon by all participants helps to instill a sense of safety and comfort in the group environment” (p. 81). Whereas an individual with ASD may feel like an outsider in a group of typically developing peers, the group therapy modality provides the opportunity to feel accepted and understood by a group of peers who struggle with the same disorder and offers the chance to practice problem solving skills in a relatively naturalistic, but safe and supportive environment. White et al. (2010) also emphasize that an essential element for interventions in HFASD is the importance of corrective and positive social learning experiences. By the time they have reached college, many students are likely to have experienced substantial social failure, rejection, and exclusion by peers (e.g., Chamberlain, Kasari & Rotheram-Fuller, 2007; Glennon et al., 2001). For many college students, participation in the proposed PST group may be the first time meeting peers with ASD. Group members may
be more likely to be sympathetic and understanding of behaviors associated with ASD that typically developing individuals may find off-putting (e.g., poor social skills, self stimulatory behavior, bluntness). Group therapy also allows the opportunity for role-playing, and observers can provide constructive feedback on other individual’s problem solving processes. Additionally, observing maladaptive behavior in others can help the student observe the effects of their own similar behavior.

**Treatment Development**

The goal of the present study was to develop and evaluate a treatment for college students with ASD. Following a review of relevant treatment manuals and empirically supported intervention strategies, a manual was assembled based on empirically supported techniques used in the treatment of HFASD as well as from the PST literature. The authors of PST gave explicit permission for the modification of PST for this study. Treatment was primarily adapted from the manual outlined by D’Zurilla and Nezu (2007), “Problem-solving therapy: A positive approach to clinical intervention (3rd edition)”. The process of problem solving is directive and teaches techniques and skills to overcome obstacles and to attain goals in an effective and empowered manner (D’Zurilla & Nezu, 2007), which can help college students with ASD become more independent and autonomous.

Wood, Fujii and Renno (2011) offered several recommendations for enhancing the efficacy of CBT interventions in HFASD to produce more robust treatment models. Wood and colleagues (2011) asserted that the use of verbally mediated methods could promote conceptual development and generalization. Socratic questioning can guide students toward correct answers while eliciting sufficient thinking and reflection to promote insight, conceptual development, and perspective taking and discouraging superficial rote learning. This recommendation is also an
integral therapeutic delivery method in PST (D’Zurilla & Nezu, 2007). Wood et al. (2011) also recommended adapting CBT based on concepts of graded hierarchies and explicit, objective goals for individuals with ASD. The authors recommended that these goals focus on behaviors outside the therapy room, with an emphasis on selecting situations where dysfunction actually manifests to promote skill generalization. This method aligns quite well with PST, which focuses on problems that are most relevant to the participant. In the first session, participants are presented with the rationale and overarching training goals, which should be directly linked to the participants’ own treatment goals and reasons for seeking treatment. Weekly homework assignments can also promote generalization of skills. Lindsay et al. (2011) adapted PST to a population with intellectual disabilities by emphasizing role-plays and practice rather than written work and discussion. Other additional recommendations are given by Nezu, Nezu, and Gill-Weiss (1992) such as incorporating strategies to maintain attention, using participants as teaching models, repetition of information across sessions, use of multiple concrete examples, and including reinforcement for newly learned skills.

Other considerations that were given to the adaptation of PST to ASD came from the social skills intervention literature, such as using multiple teaching modalities, incorporating roles plays, building on past successes, including visual aids, and increasing structure and predictability during therapy sessions (White et al., 2010). Given that individuals with HFASD display difficulties with attention switching, often fail to pick up on subtle cues, and have problems distinguishing essential from irrelevant details (Klin, Jones, Schultz, & Volkmar, 2003; O’Hearn, Asato, Ordaz, Luna, 2008), intervention techniques have highlighted the importance of providing immediate and specific constructive feedback (e.g., White et al., 2010). Another challenge for individuals with ASD is facilitating the transfer of skills from simple acquisition in
the treatment setting to their consistent use in the community (Rao, Beidel, & Murray, 2008). Delivery of PSS:101 used modeling of new skills, a technique that is helpful because it demonstrates what should be done in a given situation and increases the likelihood that the individual will learn the skill and use it outside of the therapeutic session. Additionally, structured delivery of treatment can reduce anxiety related to unpredictability in the session by helping participants know what to expect and shift between activities (e.g., White et al., 2010) as well as help individuals with ASD stay on task and shift between tasks purposefully (Ozonoff, 1997). Finally, White et al. (2010) emphasize the importance of integrating creative and varied teaching strategies by integrating verbal explanation with visual supports and role-play to teach concepts and skills.

**Development of Empirically Supported Treatments**

Although there is ongoing debate concerning the clinical utility of manual based interventions (Ollendick, King, & Chorpita, 2006), both the American Psychological Association Division 12 Task Force (Woody & Sanderson, 1998) and the National Institute of Mental Health working group for ASD (Smith et al., 2007) noted the importance of developing and testing empirically derived treatment manuals for psychosocial interventions for individuals with ASD. Treatment manuals are fundamental to empirical evaluation of an intervention and for later replication and dissemination to practitioners (White et al., 2010). The development of a structured psychosocial intervention is conceptualized as a stepwise process (Carrol & Nuro, 2002), with the first stage focusing on manual writing, development of therapist training procedures, initial pilot testing, and identification of measures to track adherence to protocol.

The first step in designing successful interventions for youth with ASD is to conduct initial feasibility and efficacy studies (Smith et al., 2007). Treatment feasibility is described as a
combination of treatment integrity (i.e., delivery of the intervention’s key elements), treatment adherence (i.e., participant attendance and engagement with treatment), and consumer satisfaction (i.e., participant ratings of satisfaction; Pavuluri et al., 2004; White et al., 2010). Treatment integrity can be demonstrated by observing a sample of intervention sessions and recording occurrence or nonoccurrence of relevant intervention techniques (Smith et al., 2007). Treatment adherence can be accomplished by collecting information on the extent to which participants follow through on assignments and attend group sessions. Finally, on-site supervision, frequent case reviews, and periodic re-training are necessary to maintain adherence throughout a study and handle issues that were not anticipated in the manual (Albano, 2004; Hibbs et al. 1997). For the current study, a Licensed Clinical Psychologist (LCP) with over ten years of experience in ASD treatment research (SW) provided ongoing supervision. This scientist, and a second LCP with previous experience in PST treatment research (GC), served as the expert panel and provided periodic training, reviewed the treatment manual and provided feedback before the intervention began.

Prior to testing the efficacy of an intervention, feasibility must be established to ensure the intervention can be practically implemented in real-world conditions (APA, 2006; Smith et al., 2007). Feasibility studies demonstrate that an intervention yields information about the acceptability of the manual to clinicians and participants regarding whether they view the manual as relevant, helpful, complete, and user friendly (Smith et al., 2007). Treatment efficacy is the systematic and scientific evaluation of whether a treatment works (APA, 2006). Pilot studies must demonstrate feasibility of recruitment, retention, assessment procedures, and implementation of the novel intervention before larger studies are undertaken (Leon, Davis, & Kraemer, 2011). Additionally, a need has been expressed for procedural fidelity to be measured
more frequently than is currently being done by clinical intervention literature (Reichow & Volkmar, 2010). Given the frequent drop of fidelity when implementing treatments in natural settings, not knowing the precision with which an intervention must be implemented to be effective makes recommending the treatment to practitioners and consumers difficult.

In accordance with these principles the primary aims of this project were:

(1) To develop an adapted PST manual for college students with ASD

(2) To collect data on the feasibility of the treatment manual and its delivery to college students with ASD

Additionally, an exploratory aim of the study was:

(3) To collect preliminary data on the short-term efficacy of the intervention

It was hypothesized that (1) it would be possible to adapt PST for group therapy with college students diagnosed with ASD, and (2) the treatment would be feasible to deliver and acceptable to group participants. Specifically, it was expected that treatment integrity would reach an 80% benchmark, participant engagement ratings would be moderately high, and participants would attend at least 80% of the sessions and complete 80% of their homework assignments. It was expected that convergence ratings, (i.e., ratings made by raters not involved in the treatment), would also follow this benchmark. Additionally, it was expected that treatment satisfaction would be moderately high across participants. The intent of the project was to develop and pilot this new treatment program for feasibility, expressly to determine if further evaluation of efficacy is warranted. Such an approach is consistent with recommendations on the utility of pilot studies and the structured approach to treatment development (Leon, Davis, and Kraemer, 2011). As such, we investigated preliminary results on efficacy in an exploratory
fashion, though we expected that students would improve from pre-treatment to post-treatment on trait based problem solving skills and in the amount of self-reported symptom distress. With respect to treatment efficacy, it was expected that both endpoint and follow-up scores on the Positive Problem Orientation and Rational Problem Solving subscales of the Social Problem Solving Inventory-Revised would be significantly higher when compared to baseline scores, and that the Negative Problem Orientation, Impulsivity/Carelessness Style, and Avoidance subscale scores would be significantly lower. Finally, it was expected that scores on the Outcome Questionnaire 45.2 would decline across treatment.

Method

Design

The current study employed an A-B [pre- to post-treatment] single subject design. Unlike group designs, which compare experimental to control groups, the single subject design entails a comparison between time periods for a single participant including a pre-intervention phase, intervention phase, and post-intervention phase, which allows the participant to act as his or her own control (Bloom, Fischer, & Orme, 2006). While single subject designs are limited in their control of extraneous factors that are not part of the treatment, and, hence, their generalizability and external validity (Perdices & Tate, 2009), Guyatt and colleagues (2000) assert that single subject designs are a powerful source of information in treatment research due to the variability and heterogeneity across individuals in group based research designs. According to Guyatt and colleagues, the aim of evidence-based medicine is to inform decisions about individual patients: a clinician should not be as interested in whether a treatment works on average, but whether a treatment works for a particular individual. Moreover, single subject design can be utilized in exploratory phases of clinical trial development to advance knowledge of an intervention
Features of strong single subject designs include a large series of repeated measures (Johnston & Smith, 2010), a minimum of three to four baseline and outcome measurement occasions (Portney & Watkins, 2008), and masked independent baseline and outcome evaluations to reduce expectation bias (Edlund et al., 2004; West et al., 2002), all of which were incorporated into the current design.

**Experimental Treatment: Manual Development for PSS:101**

The final treatment protocol involved nine weekly sessions, each of which was approximately 90 minutes in length. The manual included an explicit description of the goals and content for each session, and standard handouts were included. Group leaders were master’s level graduate clinicians in an American Psychological Association (APA) approved program in clinical psychology. Both therapists had experience in the treatment of anxiety and social skills deficits in adolescents and young adults with ASD and were supervised by SW.

Adaptations for ASD included the use of psychoeducation about ASD related to the problem solving process, immediate, direct, and specific feedback on performance, modeling of new skills by the group leaders, direct instruction of skills, structured delivery of the program, the use of shaping to teach skills, and multi-modal practice. As suggested by White (2011) a confidentiality clause was included in the written consent form indicating that personal information shared during group sessions was not to be shared with individuals outside of the group. During the beginning of PSS:101, students selected a problem they wished to work on for the remainder of the program. The purpose of the first session, “Orientation to PSS:101/Psychoeducation about ASD”, was to provide an overview of, and rationale for, PSS:101 and to establish a positive therapeutic relationship. Therapists provided psychoeducation on ASD in relation to problem solving and introduced the acronym “ADAPT”
(Attitude, Define, Alternatives, Predict, Try Out) to define the problem solving process. Sessions two through four focused on the importance of a positive problem orientation in relation to problem solving, particularly in viewing problems as challenges rather than threats. Students were taught how to recognize problems when they occur, how to challenge dysfunctional attitudes toward problem solving, how to regulate negative emotions, and how emotions can be used to facilitate problem solving effectiveness. Sessions five through eight focused on practicing discrete skills of the problem solving process, such as problem definition and formulation (e.g., gathering relevant and factual information about the problem to set a realistic problem solving goal), using brainstorming techniques to generate alternative solutions to maximize the likelihood of an effective solution, decision making (e.g., screening out ineffective solutions, predicting possible consequences, evaluating solution outcomes, and developing a solution plan), and solution implementation including self-monitoring and self-evaluation of the solution outcome. In session nine, students evaluated their attempts to implement their chosen solution and re-worked their solution plans, if necessary.

Procedure

Recruitment of participants primarily occurred through the SSD office. Students identified as receiving services for an ASD were sent recruitment information from the director of SSD and academic coaches directing the students to contact the investigator if they were interested in participating in PSS:101. Table 3 provides a timeline for the administration of measures throughout the current study. After providing informed consent, students participated in an extended baseline evaluation, with the first in-person session lasting approximately two hours. During this session, participants were administered a battery of measures to determine if they met enrollment criteria. To be included in the study, participants were required to have met
criteria for ASD based on the Autism Diagnostic Observation Schedule, Module 4 (Lord et al., 2000; Lord, Rutter, DiLavore, & Risi, 1999) and/or the Autism Spectrum Quotient (Baron-Cohen, Wheelwright, Skinner, Martin, & Clubley, 2001). Exclusionary criteria included the presence of severe psychopathology, such as suicidal intent or a thought disorder, assessed through clinical interview and the Outcome Questionnaire 45.2 (OQ 45.2; Lambert et al., 1996). Participants also completed a demographics questionnaire, a brief clinical interview discussing problems they currently encounter, and measures of problem solving (i.e., the Social Problem Solving Inventory-Revised: Long form [SPSI-R:L] and the Personal Means-Ends Problem-Solving Procedure [P-MEPS]) and general symptom distress (i.e., the OQ 45.2). In order to establish a stable baseline, participants completed two additional weekly administrations of the SPSI-R:L and the OQ 45.2 online. One participant only completed one additional administration of these questionnaires due to a delay in contacting the investigator.

Participants were to attend nine weekly group sessions of Problem Solving Skills:101 at the SSD office on campus, lasting approximately 1.5 hours each. Group therapy sessions were co-led by two graduate students in the clinical psychology program who had experience delivering cognitive-behavioral interventions for youth with ASD. Group leaders participated in weekly supervision with SW, which included video review of sessions and discussion of participants’ progress within PSS:101. All therapy sessions were video recorded for coding of treatment integrity and adherence. After each group session, participants were administered the Social Problem Solving Inventory-Revised: S (SPSI-R:S), OQ 45.2, and measures of consumer satisfaction. All consumer satisfaction ratings were completed when therapists were not present to reduce reporting bias. Questionnaires were placed in a sealed envelope and were not opened until the end of the treatment phase. Approximately one week after the last treatment session,
participants were administered measures of problem solving (i.e., the SPSI-R:L and the P-MEPS) and general distress (i.e., the OQ 45.2) along with a program satisfaction questionnaire. After the in-session endpoint evaluation, participants completed two weekly administrations of the SPSI-R-L and the OQ 45.2 online to establish a stable endpoint measurement. Approximately two months later, participants completed follow-up administrations of the SPSI-R:L and the OQ 45.2 online, along with questions regarding treatment satisfaction, for two consecutive weeks (see Table 3 for a timeline of measure administration throughout the study).

A graduate student ‘independent evaluator’ (G-IE) (i.e., not involved in treatment delivery or familiar with its content) in the clinical psychology department trained to reliability on the coding process evaluated treatment integrity and treatment adherence. The G-IE was made familiar with PST and the PSS:101 manual through a didactic training process. Specifically, the G-IE read Problem-solving therapy: A positive approach to clinical intervention by D’Zurilla and Nezu, the creators of PST, as well as the PSS:101 manual and discussed the core concepts and theoretical mechanisms of change with the investigator. The G-IE then coded video recorded treatment sessions from White and colleagues’ (2010) treatment study according to the fidelity protocol until she reached > 85% agreement rate for two consecutive sessions. Subsequently, the G-IE coded the first PSS:101 session and achieved 100% agreement with codes assigned by the investigator. Two undergraduate research assistants (U-IEs) recorded, transcribed, and coded responses on objective measures of problem solving ability (e.g., the P-MEPS and P-MEPS Story). U-IEs were trained to reliability (e.g., 90% agreement on three consecutive stories) on the coding procedure outlined by Spivack et al. (1985).

Participants
Five undergraduate students identified as receiving academic support services for a diagnosis of an ASD (e.g., Autistic Disorder or Asperger’s Disorder) from the university’s SSD office participated in this study (see Table 4 for participant demographics). All participants were Caucasian males between 18 and 23 years of age ($M = 21.27$ years of age) who attended the university for a period of time ranging from 1 month to five years ($M = 2.22$ years). All participants had a previous diagnosis of an ASD by a mental health professional (i.e., LCP, psychiatrist, or medical doctor) and scored in the ASD range on the ADOS (Lord et al., 2000) or met cut off criteria on the Autism Spectrum Quotient (Baron-Cohen et al., 2001) to be included in this study (see Table 5 for participant characterization data). Four students were previously diagnosed with Asperger’s Disorder and one student with Autistic Disorder. To prevent bias, the ADOS was administered to all participants by a graduate student clinician who was not involved with the present study and was a research-reliable ADOS administrator. The specific characteristics and identified problem domains identified by the five participants are described in the results section.

Measures

Inclusion

Autism Diagnostic Observation Schedule (ADOS; Lord et al., 1999; Lord et al., 2000).

The ADOS is a semi-structured, observational assessment that is considered to be a “gold standard” diagnostic measure. Participants are rated based on their responses to social presses and scored for communication, reciprocal social behavior, and repetitive behaviors and stereotyped interest patterns. An algorithm score that combines the communication and reciprocal social interaction domains is the basis for diagnostic classification. Participants were required to meet the ASD ‘spectrum cutoff’ (cutoff = 7) to qualify for the study. The ADOS
Module 4 takes approximately thirty minutes to administer and is designed for verbally fluent adults and adolescents who are not interested in playing with toys and action figures. Sensitivity for an autism and pervasive developmental disorder diagnosis versus a nonspectrum diagnosis is 90% and specificity is 93% (Lord et al., 2000).

*Autism Spectrum Quotient (AQ; Baron-Cohen et al., 2001).* The AQ is a 50-item self-report questionnaire that measures the degree to which adults have traits associated with ASD. Each AQ item is a brief statement followed by four possible ratings: *definitely disagree, slightly disagree, slightly agree,* or *definitely agree.* The AQ items are scored in a binary manner, such that a response is scored as a one if it is in the direction of autism and zero if in the opposite direction. Item scores are then summed to yield a total score that ranges from 0 to 50 with higher scores indicative of more symptoms of ASD. Using this scoring approach, Baron-Cohen and colleagues (2001) determined the optimal cutoff to be 32 or higher for identifying individuals with clinically significant levels of autistic traits. However, Woodbury-Smith, Robinson, Wheelwright, and Baron-Cohen (2005) found that a threshold of 26 resulted in the correct classification of the greatest numbers in a clinic referred adult sample. For the current study, the cut-off of 26 was used for inclusion, given that students had prior ASD diagnoses. The AQ has demonstrated good diagnostic validity (sensitivity = 0.95, specificity = 0.52, positive predictive value = 0.84, negative predictive value = 0.78; Woodbury-Smith et al., 2005) and adequate internal consistency (α = .72; Ingersoll, Hopwood, Wainer, & Donnellan, 2011). In the present study, the AQ demonstrated good internal consistency (α = 0.90) and stability over the course of 15 weeks (r = 0.99).

**Feasibility**

*Treatment integrity.* Treatment integrity is conceptualized as the delivery of the
intervention’s key elements (White et al., 2010). Treatment integrity was assessed via ratings completed by the therapists, jointly, at the end of each treatment session. Specific components intended for every session included posting of the group agenda, discussing homework assignments, and completing treatment goals during each session. The G-IE also completed ratings of treatment integrity for each session from video recordings.

*Treatment adherence.* Adherence is comprised of a participant’s attendance and engagement during the treatment (Pavuluri et al., 2004). In this study, treatment adherence was comprised of attendance during the treatment program, engagement ratings of group members during each session (1 = “uninvolved”, 3 = “average”, 5 = “very involved”), the average minutes participants were late to group sessions, and the percentage of homework assignments completed or discussed by participants (Smith et al., 2007; White et al., 2010). Therapeutic process variables can also be viewed as an index of the participants’ involvement and the therapeutic relationship between the participant and therapists and the group process were rated on a 5-point scale where 1= “poor”, 3 = “average”, and 5= “very good”. The G-IE also completed ratings of treatment integrity for each session from video recordings.

*Consumer satisfaction.* Consumer satisfaction was assessed after every session by asking participants to answer a questionnaire assessing how helpful they believed the session to be on an 11-point scale (0 = “not at all helpful”, 10 = “definitely helpful”), how helpful they believed the homework to be on an 11-point scale (0 = “not at all helpful”, 10 = “definitely helpful”), whether they learned anything during the session and which components of each session were helpful or unhelpful.

**Efficacy**

*Social Problem Solving Inventory-Revised: Short Form (SPSI-R:S) and the Social
Problem Solving Inventory-Revised: Long Form (SPSI-R:L; D’Zurilla, Nezu, & Mayeu-Olivares, 2002). The SPSI-R:S is a 25-item self report measure that assess how people think, feel, and act when faced with problems. It takes 15 minutes to administer and respondents are asked to rate items on a 5-point Likert type scale ranging from 0 (not at all true of me) to 4 (extremely true of me). This measure produces a weighted total social problem-solving score, with a higher total indicating greater problem solving ability and five subscales scores. Because the SPSI-R:S and SPSI-R:L were created by the authors of PST, the measured constructs align with the problem solving orientations and problem solving styles presented in Figure 1. The Positive Problem Orientation subscale (PPO) reflects a constructive problem solving orientation to problems. People with higher scores on this scale are more likely to (a) view a problem as a “challenge” rather than a threat, (b) have positive expectancies of optimism about problems, (c) have confidence in their abilities to solve problems successfully, (d) believe that successful problem solving takes time, effort, and persistence, and (e) commit themselves to solving problems rather than avoiding them (e.g., “when I have a problem, I usually believe that there is a solution for it,”). The Negative Problem Orientation subscale (NPO) measures a dysfunctional or inhibitive cognitive-emotional problem-solving set. People with higher scores on this scale are more likely to (a) view a problem as a threat to well-being, (b) have doubts about their problem-solving ability, and (c) become frustrated when faced with problems (e.g., “I feel nervous and unsure of myself when I have an important decision to make” and “difficult problems make me very upset”). The Rational Problem Solving subscale (RPS) assesses a person’s knowledge of effective problem-solving strategies and also reflects a person’s ability to implement the strategies in a way that is rational, deliberate, and systematic. Higher scores on this scale indicate that an individual is likely to respond effectively in situations where problem solving is called for.
The Impulsivity/Carelessness Style subscale (ICS) reflects a deficient problem-solving style that is characterized by active attempts to apply narrowed, impulsive, careless, hurried, and incomplete problem-solving strategies (e.g., “after carrying out a solution to a problem, I do not usually take the time to evaluate all of the results carefully”). Individuals with higher scores on this scale are likely to consider only a few solutions to a potential problem, to react impulsively to consider alternatives and consequences quickly and carelessly, and to monitor and evaluate outcomes inadequately. The Avoidance subscale (AS) measures problem solving patterns characterized by procrastination, passivity, and dependency (e.g., “I put off solving problems until it is too late to do anything about them”). The SPSI-R:S has strong internal consistency for the total score ($\alpha = .95$), test-retest reliability for the total score ($r = .84$) and its subscales ($r = 0.72 - .84$) over three weeks, strong convergent and discriminant validity, as well as research demonstrating its sensitivity to treatment effects for individuals in problem solving therapy (D’Zurilla et al., 2002; Hawkins, Sofronoff, & Sheffield, 2009; Nezu, Nezu, & Lombardo, 2003).

The SPSI-R:L contains 52 items (including all items presented on the SPSI-R:S), and measures the same constructs as the SPSI-R:S, with the addition of breaking down the RPS subscale further into four specific problem solving areas: problem definition and formulation (PDF), generation of alternative solutions (GAS), decision making (DM), and solution implementation and verification (SIV). The SPSI-R:L has demonstrated good internal consistency ($\alpha = .95$ for the total score and $\alpha = .75 - .95$ for its subscales) and adequate reliability over a three week period ($r = .72$ for the total score and $r = .73 - .88$ for its subscales). Internal consistency for the SPSI-R:L at each baseline assessment is presented in Table 6. The SPSI-R:S and SPSI-R:L were used as the primary outcome measure for this study to measure gains in problem solving skills during the treatment program. The SPSI-R:L was used to gather
more information at baseline and endpoint, while the SPSI-R:S was used during the treatment program to reduce the amount of time participants spent answering questionnaires after treatment sessions.

*Outcome Questionnaire (OQ 45.2; Lambert et al., 1996; Lambert, Hansen & Finch, 2001).* The OQ 45.2 is a brief self-report instrument, designed for repeated measure of client status through the course of therapy and at termination. It has 45 items that use a five-point Likert-type response format, with anchors of 0 (never) and 4 (almost always). Individuals are instructed to respond to the items in terms of how they felt in the past week. The OQ 45.2 consists of three scales: Symptomatic Distress (SD), Interpersonal Relationships (IR), and Social Role Performance (SR). High total scores indicate a large number of symptoms of distress (e.g., anxiety, depression, somatic problems and stress) as well as interpersonal difficulties in social roles and in quality of life (clinical cut-off = 63). Extremely low scores (< 20) are an uncommon occurrence in clinical populations and such scores may indicate the respondent is admitting to little disturbance or that they have a problem that is so specific and limited that it causes them little difficulty and is, therefore, reflected accurately by their score. Elevated SD scores (cut-off = 36) reflect symptoms of anxiety disorders, affective disorders, adjustment disorders, and stress-related illness. The IR subscale assesses loneliness, conflict with others and marriage and family difficulties. High scores (cut-off = 15) indicate concerns in those areas, and low scores suggest both the absence of interpersonal problems and satisfaction with the quality of intimate relationships. Finally, the SR scale measures the extent to which difficulties fulfilling workplace, student, or home duties are present. High scores (cut-off = 12) indicate conflicts at work, overwork, distress, and inefficiency, while low scores indicate adequate social role satisfaction. The OQ 45.2 has good test-retest reliability over three weeks ($r = .84$), internal consistency ($\alpha =$
.93), and convergent and divergent validity and is sensitive to change in all domains (Lambert et al., 2001). Internal consistency for the OQ 45.2 at each baseline assessment is presented in Table 6.

**Personalized Means-End Problem-Solving Procedure (P-MEPS).** The Means-End Problem-Solving Procedures (MEPS) is a measure of means-ends thinking, which has three major components: (1) the ability to conceptualize the sequential steps or *means* that are necessary to satisfy a need or achieve a particular goal, (2) the ability to anticipate obstacles to goal attainment, and (3) the ability to appreciate that successful solution implementation requires time and effort. This measure is more likely to reflect state dependent changes in social problem solving, rather than tapping into trait-like social problem solving performance. Participants are given the beginning and end of a social scenario and asked to identify the sequence of steps necessary to reach a successful resolution across ten hypothetical scenarios. The MEPS uses a quantitative scoring system that computes separate frequency scores for *relevant means* (i.e., the number of discrete steps that are judged by the rater as being relevant to enabling the protagonist to reach the solution), *obstacles* (i.e., whether the respondent reports an actual or potential interference with goal attainment), and *time* (i.e., whether the respondent states that a successful solution requires time and effort). The MEPS was used as the basis for the creation of the P-MEPS Story procedure described below.

In the current study, the Personalized-MEPS (P-MEPS), adapted from the methodology used by Schotte and Clum (1987), with the addition of a variation of the MEPS social scenario procedure described above was used as an exploratory measure to gain additional information about the problem solving process. In the present study, participants were asked to (A) select as many different problems that they struggle with in their daily lives from a list of common
problems faced by college students and individuals with ASD, with the option of adding additional problems that were not on the list; (B) generate as many as six different solutions to the problem the participant reported being the most problematic on the list; (C) rate the subjective probability of success on an 11-point scale ranging from 0 = “definitely unsuccessful” 10 = “definitely successful”; (D) identify as many as six reasons for the use of each strategy (pros) or against the use of each strategy (cons); and (E) and complete a P-MEPS Story based on the identified problem. For part E, participants were presented with the beginning of a story (e.g., their identified problem) and the end of a story (e.g., when they solved their identified problem) and instructed to think about the actions that should be taken to solve their specified problem and use that information to fill in the middle of the story.

As outlined by Schotte and Clum (1987), part (A) provides a quantitative index of respondent’s ability to identify problems when they occur and the score is represented by the number of problems generated plus the number of problems identified on the checklist. Part (B) provides a quantitative index of the respondent’s ability to generate potential solutions for a problem from their own life, and is represented by the total number of solutions generated (0-6). Solution effectiveness was also rated on an 11-point scale ranging from definitely unsuccessful (0) to extremely successful (10). Part (C) provides a quantitative index of the respondent’s perceived subjective probabilities of success for each of the potential alternatives they generated, and is represented as the sum of ratings across solutions divided by the number of solutions generated. Part (D) provides a quantitative index of the number of pros and cons, which the respondent believes, would be associated with potential solutions and is represented as the mean number of pros and the mean number of cons across alternative solutions. Finally, part (E) of the
The original MEPS provides satisfactory levels of test-retest reliability for 2 weeks \((r = .59)\) and 5 weeks \((r = .64)\) and high levels of internal consistency \((\alpha = .84)\) (Platt & Spivack, 1975; Spivack et al., 1985). Adaptations of this measure have also been used in populations of young adults with HFASD (i.e., Goddard, Howlin, Dritschel, & Patel, 2007) with good inter-rater reliability for relevant means and effectiveness \((r = .86\) and \(.81,\) respectively). Schotte and Clum (1987) reported that their modified version of the MEPS correlated significantly with scores on the original MEPS procedure proposed by Platt and Spivack (1975). For the present study, an additional modification was added such that relevant means were also rated for social inappropriateness on a 7-point likert scale \((1 = “inappropriate”, 7 = “appropriate”)\). Responses were recorded, transcribed, and coded by U-IEs.

Data Analyses

Results include qualitative summaries of the five participants’ treatment progress and involvement in the program (using pseudonyms and disguising potentially revealing information), indicators of feasibility – both qualitative and quantitative, and outcome, or preliminary efficacy.

Feasibility

Treatment integrity. Treatment integrity was calculated by both the therapist and the G-IE as a percentage \([(\text{number of objectives met}/ \text{total number of objectives}) \times 100]\) (Pavuluri et al., 2004). Therapists jointly completed one rating at the end of each session and the independent coder completed her rating individually. Reliability, in the form of kappa coefficients and Pearson correlations as well as percentage agreement between the therapists and G-IE, was
calculated for three objectives (i.e., whether the treatment goals were met, the agenda was posted, and homework was assigned).

*Treatment adherence.* Engagement ratings were averaged across sessions to provide a total engagement score. The percentage of sessions participants attended and the number of completed homework assignments were reported as a percentage (see above) and the amount of time a participant was late to session was averaged across sessions. The correlation coefficient between the therapists and G-IE were calculated for attendance and homework completion in the form of Pearson correlations and kappa coefficients. The therapeutic relationship between the participant and therapists and the group process were also averaged across sessions and inter-rater reliability between the therapists and the G-IE were calculated through the use of Pearson correlations.

*Consumer satisfaction.* Treatment satisfaction ratings were averaged across objectives for each participant. Additionally, satisfaction ratings were averaged across participants to derive an average per session. Consumer satisfaction at endpoint and follow up was assessed qualitatively.

**Efficacy**

Results were analyzed with a combination of statistical approaches used in the single-case design and clinical replication literature. In order to calculate clinical significance of the change in SPSI-R:L (primary outcome measure), the approach recommended by Jacobson and Truax (1991) was used, which entails calculating a Reliable Change Index (RCI) in order to determine the amount of change from the treatment, accounting for the possibility that such change may be due to imprecise measurement \( \frac{X_{EP} - X_{BL}}{S_{DIFF}} \). The recommended cutoff of the RCI is 1.96 to infer statistically significant and meaningful change. The scores on the SPSI-R:L were averaged for the baseline, endpoint, and follow up period separately, and these scores were used
to calculate the RCI. This method was also used to calculate RCI scores for the OQ 45.2.

The second approach used for single-case analysis was Simulation Modeling Analysis (SMA; version 9.9.28), a freely available software package designed for analyzing time series data (www.clinicalresearcher.org; Borckardt et al., 2008). SMA allows for the examination of changes in the level of symptoms and the slope of symptom change from the pretreatment baseline condition to the treatment condition as well as the significance of the effect. SMA uses bootstrapping methods that take the phase (i.e., baseline, treatment) lengths and autocorrelation of the data stream into account, which generates much lower Type I and Type II errors than visual inspection of the data (Borckardt et al., 2008). Accounting for autocorrelation is important in treatment studies because, when repeated measures of an outcome assessment are administered, the value of one outcome measure depends, in part, on the value of immediately preceding observations. If autocorrelation is ignored in time-series analysis, there is a greater risk of making a Type I error (Borckardt et al., 2008). SMA tests the data stream for each participant against five different slope vectors: (1) increasing baseline, decreasing treatment [1 2 3 3 2 1 0 -1 -2 -3 -4 -5]; (2) flat baseline, increasing treatment; [0 0 1 2 3 4 5 6 7 8 9]; (3) increasing baseline, flat treatment [1 2 3 4 4 4 4 4 4 4]; (4) increasing from baseline through treatment [1 2 3 4 5 6 7 8 9 10 11 1 2]; and (5) increasing during baseline with return to pre-treatment level at the start of treatment and increasing throughout treatment [1 2 3 4 5 6 7 8 9] (see Figure 3 for a visual depiction of vectors). Additionally, SMA allows testing for level change, or significant difference between the baseline and treatment phase [0 0 0 1 1 1 1 | 1 | 1]. A significant correlation indicates that the slope of the obtained data matches the slope of a particular vector. Specifically, SMA calculates the correlation between the outcome variable and
the phase vector along with the autocorrelation. It then generates a null autocorrelated distribution for one data stream at a time and compares the correlation between each null and autocorrelated data stream and the phase vector with the original correlation between the outcome variable and phase vector. A table is then generated that gives the probability that a given effect size will occur by chance in a null distribution of data streams.

Given the small sample size and lack of normal distribution, the non-parametric Wilcoxon Signed Rank Test was used to analyze individual components of the P-MEPS and MEPS story procedure by comparing participants’ baseline and endpoint scores. The Wilcoxon Signed-Rank Test is the nonparametric equivalent of the dependent t-test and is used to compare two sets of scores that comes from the same participants. Ratings from the U-IEs were averaged together for baseline and endpoint separately to create two “matched-pairs” groups, and reliability estimates were calculated between their ratings.

Results related to preliminary efficacy are presented in a stepwise process starting with the reliable change indices to describe pre- to post-treatment change from baseline to endpoint and the two month follow up (see Tables 11-14). Next, mean level change using SMA was used to describe changes in mean scores between the baseline phase and the treatment phase (see Table 15). Process change was inferred from SMA analyses to determine the best-fitting pattern to describe each participant’s scores, based on significant correlations with pre-specific slope vector(s) described above (see Tables 16 and 17). It should be noted that Borckardt et al. (2008) recommend the use of 5-8 data points per phase to conduct SMA. Borckardt (personal communication, April 25, 2012) has tested this procedure using shorter baselines (e.g., three administrations) with similar results. However, Type I error rates may exceed .05 and power may fall below .8 (J. Borckardt, personal communication, April 25, 2012). Because baseline
administrations of outcome measures ranged from 2-4 points in the present study, SMA results should be interpreted with caution. Finally, changes on the P-MEPS and the P-MEPS Story components were interpreted as an objective measure of problem solving using non-parametric tests (see Tables 18 and 19).

Results

**Qualitative**

Participant one, Brian, was an 18 year-old male in his first semester of college who planned to major in engineering. He was diagnosed with Asperger’s Disorder and received accommodations from the SSD office, including extended time on tests, quiet testing rooms, use of a word processor for essays and for use in the classroom, and use of notes taken by a student note taker. His primary reason for taking part in PSS:101 was to take advantage of the opportunity to participate in the program rather than “regret it later.” He reported having no significant problems in his first month of college, but he wanted to improve his overall problem solving process. During PSS:101, he chose to work on reducing performance anxiety related to his grades. During the problem orientation modules, he endorsed maladaptive attitudes towards problem solving (e.g., he was prone to assuming the worst, believed that most people do not have similar types of problems as he did, and often chose the first solution that came to mind) and cognitive distortions (e.g., all or nothing thinking, catastrophizing, overgeneralization, fortune telling, and mind reading). Initially, he volunteered much information about himself, but often interrupted the group members with tangential information and monologue speech. As treatment progressed, he waited for his turn to talk, became more aware of his cognitive distortions and
actively attempted to challenge them during group sessions, and frequently helped other group members challenge their negative problem orientation.

Participant two, Michael, was a 21-year-old male in his third year of college majoring in chemistry. He was previously diagnosed with Asperger’s Disorder as well Major Depressive Disorder, recurrent, and Generalized Anxiety Disorder. At the time of the study he met with an LCP weekly for anxiety related to achieving high grades and a history of self-mutilation. He took Abilify (1 mg daily) and Zoloft (100 mg daily) throughout the program with no change in dosage. Michael had a history of suicidal ideation and suicide attempt in the semester prior to the program, prompting a family member to move to the area to help manage his care. At the time of the study he no longer experienced suicidal ideation or intent. His stated his rationale for participating in PSS:101 as “seeming like a fun thing to do.” During PSS:101, Michael identified mistrust of others as being problematic. Initially, he was displeased with a family member’s romantic relationship and wanted this relationship to end. Michael displayed an overly formal interaction style, paranoid thinking, and reported that he had difficulty managing anxiety and maintaining a positive problem orientation. He also endorsed maladaptive attitudes towards problem solving (e.g., ‘most people do not have similar types of problems as me,’ ‘all of my problems are entirely caused by me,’ and ‘people cannot change’) and cognitive distortions (e.g., all or nothing thinking, catastrophizing, overgeneralizing, fortune telling, mind reading, and filtering). Initially, he believed that his anxiety was productive because it motivated him to excel academically even though it interfered with his quality of life. As the treatment progressed, he made gains in using emotion focused coping and utilized anxiety reduction techniques.

Participant three, Daniel, was a 22-year-old male in his third year of college, considering a major in political science. He was diagnosed with Asperger’s Disorder, Generalized Anxiety
Disorder with depressed features, Attention-Deficit Hyperactivity Disorder, Obsessive Compulsive Disorder, Reading Disorder, Disorder of Written Expression, and Learning Disorder Not Otherwise Specified due to generalized fluency problems. He took Vivance (40 mcg daily) throughout the program to treat inattentive symptoms with no change in dosage. He also received academic coaching from the SSD office, which focused on increasing his planning and organization abilities and making social contacts. His academic accommodations included alternative text format, extended time on tests, quiet testing rooms, tape recorded lectures, and use of notes taken by a student note taker. His primary reason for participating in PSS:101 was to gain problem solving skills, improve his academic organization, increase the frequency of his social interactions, and work on “anything anybody else brings up”. He also expressed interest in balancing his competing desires for friendship and solitude. During PSS:101, Daniel chose to work on increasing his academic organization and concentration and decreasing his procrastination in order to improve his grades. Over the course of the program, it was apparent that his maladaptive attitudes towards problem solving (‘most people do not have similar problems as me,’ ‘all of my problems are caused entirely by me,’ ‘only someone who is experiencing the same things of me can understand,’ ‘people cannot change,’ and ‘average people cannot solve problems on their own’) and cognitive distortions (e.g., all or nothing thinking, catastrophizing, overgeneralizing, fortune telling, and emotional reasoning) were an obstacle and treatment focused on promoting a positive problem orientation. During the first half of group, he had significant difficulty verbalizing his thoughts, frequently monopolized the conversation by sharing details of his negative experiences, and interrupted others when they were speaking. He frequently appeared hypersensitive to perceived rejection and criticism and consequently avoided social situations. During the second half of group, he appeared more
willing to receive encouragement from other group members and demonstrated a willingness to challenge his negative thoughts.

Participant four, Kevin, was a 20-year-old male in his second year in college pursuing a double major in computer science and philosophy. He was previously diagnosed with Asperger’s Disorder but was not receiving academic accommodations at the time of this study because he did not feel he needed any. His primary reason for participating in PSS:101 was to “help institutions build specialized programs for students with ASD in order to have more personalized help for coping in the university environment and elsewhere in life.” He expressed interest in using the program to help manage academic stress and select a future career. Kevin demonstrated formalized speech, was regimented in his behavior, and became upset when other group members made off-topic comments. His rigidity in response to off-topic speech limited his social participation with other group members at times. He endorsed maladaptive attitudes related to problem solving (e.g., ‘most people do not have similar types of problems as me,’ ‘all of my problems are entirely caused by me,’ ‘there is only one perfect solution,’ and ‘only someone who is experiencing the same thing as me can understand’) and cognitive distortions (e.g., all or nothing thinking, overgeneralizing, fortune telling, emotional reasoning, and mind reading). He stated that he frequently struggled with holding a positive problem orientation and had very limited insight into identifying cues to his own anxiety. As the program progressed, he often asked questions to clarify his understanding of the skills being taught and attempted to practice them outside of session. During the program he endeavored to set more realistic academic goals for himself and actively tracked his anxiety levels and implemented coping strategies.

Participant five, Steven, was a 23-year-old male in his fifth year in college majoring in business information technology. He was previously diagnosed with Asperger’s Disorder and
Attention Deficit Hyperactive Disorder and received academic accommodations from the SSD office in the form of extended deadlines, extra time on tests, use of a quiet room for testing situations, use of notes taken by a student note taker, and use of a word processor for essays. He received academic coaching at the SSD office, though he had difficulty arriving to meetings on time. His primary reason for taking part in this study was to find ways to make himself more employable, particularly related to improving his interpersonal skills for job interviews, interacting with new people in a job setting, and dating. Initially, Steven appeared aloof and disengaged during sessions. He was frequently late to group meetings, and often forgot when they were scheduled, disrupting the continuity of treatment. He endorsed a few dysfunctional attitudes towards problem solving (e.g., ‘most people do not have similar types of problems as me,’ and ‘only someone who is experiencing the same things as me can understand’) and cognitive distortions (e.g., all or nothing thinking). As the program progressed, he freely offered advice to other group members related to their problem solving skills and actively helped them to generate solutions. He appreciated feedback from others and implemented suggestions the group leaders and group members provided.

**Feasibility**

*Treatment integrity.*

Overall, treatment integrity was high. Sessions lasted approximately 93.33 minutes ($SD = 4.77$). Group leaders posted the agenda and provided an overview of the session structure, discussed homework assignments, and delivered all the treatment objectives at every session. Agreement between therapist and G-IE ratings on these integrity components was uniformly high, at 100% agreement ($\kappa = 1.00$).

*Treatment adherence.*
Two participants attended all nine sessions (Michael and Daniel), two participants
attended eight sessions (Brian and Kevin), and one participant (Steven) attended six
sessions. Overall, attendance for participants across sessions averaged 88.89%. Participants were, on
average, 2.35 minutes late per session (SD = 5.04; inter-rater r = 0.94), and were noted to be
actively engaged during the session (M = 4.23 out of a possible engagement rating of 5, SD =
0.83; inter-rater r = 0.89). Participants brought in or discussed their completed homework in
session approximately 83% of the time during the program (κ = 0.88). Therapeutic process
variables can also be viewed as an index of the participants’ involvement and were rated on a 5-
point scale (1 = “poor”, 5 = “very good”). The therapeutic relationship between the participant and
therapists was rated to be good (M = 4.08, SD = .76; inter-rater r = .93), as was the group process
(M = 4.33, SD = .71; inter-rater r = 1.00).

Consumer satisfaction.

Tables 7 and 8 present results from the consumer satisfaction questions answered after
each treatment session. All components of consumer satisfaction on the endpoint questionnaire
were rated on an 11-point scale with higher scores indicating greater helpfulness (0 = “not a all
helpful”, 10 = “definitely helpful”). Results indicated that participants generally found the
sessions to be helpful (M = 7.40), and rated the homework assignments to be somewhat helpful
(M = 4.57). Additionally, participants indicated they had gained new knowledge during
approximately 97% of the sessions. When consumer satisfaction was assessed across modules,
participants generally found learning the discrete problem solving steps (e.g., sessions five
through nine) to be most helpful. Session four, Use and Control of Emotions in Problem Solving,
was given equivalently high ratings. A similar trend was found for homework helpfulness, with
the exception of the last session. Ratings were lower for this session because several students
forgot to complete this assignment.

Results from the consumer satisfaction survey completed at the end of treatment are presented in Table 9. Qualitative responses to the endpoint consumer satisfaction are presented in Table 10. All participants answered these questions on an 11-point scale, with higher scores indicating greater satisfaction (0 = “not at all [satisfied]”, 10 = “very much [satisfied]”). In general, Daniel provided the lowest ratings, reducing the average score on several of the responses. Overall, participants indicated they liked the PSS:101 program ($M = 7.60$, range = 5-9), found it to be helpful ($M = 7.00$, range = 5-9), and were satisfied with the topics of the meetings ($M = 8.00$, range = 6-10). Using a forced choice response format, four participants identified the group meetings as being the ‘most helpful’ component of the program, whereas one found learning about how to improve problem solving style as being the most helpful. Two participants also identified learning about the actual problem solving process as being helpful. Anecdotally, participants appreciated learning new problem solving skills to promote a systematic approach to problem solving, the potential to apply these strategies outside of sessions, the opportunity to talk with others with ASD, and discussing how attitudes toward problems can affect the problem solving process. Two participants indicated that they found nothing unhelpful about the PSS:101 program, whereas one participant believed that homework did not seem to be helpful, one participant stated he had specific problems PSS:101 could not relate to, and one participant found the repetition of topics drawn out to multiple meetings to be unhelpful.

Four of the five participants indicated that participating in the PSS:101 program was a good use of their time ($M = 6.20$, range = 1-10), and would suggest this program to another student ($M = 6.20$, range = 1-10). Daniel, who gave ratings of 1 on both of these questions, did
not believe it to be a good use of his time, nor would he suggest the program to another student. Participants indicated that they had continued to work on identified problems after the program ended ($M = 6.75$, range = 3-10) and felt that they made progress ($M = 8.20$, range = 5-10) on the problem they chose to work on during PSS:101. Brian did not rate whether he had continued to work on the same problem he chose during PSS:101 because he determined that his problem had been resolved and required no further effort. Qualitatively, Brian, who had significant anxiety related to academic matters, indicated that he used problem solving techniques to resolve his stress management problem. Michael reported that he was more aware of his problem solving attitude and better able to accept problems that he cannot change. Daniel, who worked on the problem of academic organization, reported that he had made progress by becoming more organized. Kevin, who worked towards finding an internship during the program, obtained one at follow-up. Additionally, participants indicated that they continued to apply the skills they learned from the program to other areas of their life ($M = 7.00$, range = 5-9). Participants also indicated that their problem solving skills changed as a result of PSS:101 ($M = 7.20$, range = 5-9) and that their problem solving orientation had become more positive ($M = 7.60$, range = 5-10).

Participants also noted that PSS:101 had been somewhat helpful in meeting other students with ASD ($M=5.80$, range = 3-10) and building more positive social relationships ($M = 5.40$; range = 1-10). Qualitatively, two participants appreciated the opportunity to meet others in similar situations with similar problems. A common sentiment shared by all participants was that it was helpful to see that others with ASD share very similar problems and obtain feedback from others about their problem solving process. One participant indicated he felt less isolated as a result of the program, while another stated he enjoyed the inclusive environment and social interaction. One participant felt it was unnerving to meet others with ASD at first, but was able
to get used to it. Two participants also indicated that attending PSS:101 had not helped them to become more accepting of their ASD, whereas three indicated that it helped them to become somewhat more accepting of their diagnosis. Brian, who provided a rating of 0 for this question, anecdotally stated that he was already very accepting of his diagnosis at the beginning of the study.

**Efficacy**

*Pre- to Post-Change: RCI Analyses*

Significant improvement in problem-solving was only observed for two participants. Based on RCI calculations for the SPSI-R:L, Brian demonstrated reliable change from baseline to endpoint on the RPS (RCI = 3.32), PDF (RCI = 2.75), GAS (RCI = 2.25), DM (RCI = 2.43), SIV (RCI = 2.86), and ICS (RCI = -2.47) subscales, as well as on the total SPSI-R:L (RCI = 2.75) score, suggesting significant improvement on these indices. From baseline to the two-month follow up, reliable change was noted for the RPS (RCI = 2.61), GAS (RCI = 2.31), and DM (RCI = 2.19) subscales, and total SPSI-R:L score (RCI = 1.97) indicating sustained improvement from baseline. For Kevin, RCI calculations on the SPSI-R:L indicated that NPO scores (RCI = -2.41) significantly decreased from baseline to endpoint and total SPSI-R:L scores (RCI = 2.12) increased from baseline to endpoint, which were in the expected direction. Significant changes in the same direction on the NPO (RCI = -2.22) and SPSI-R:L (RCI = 2.16) subscales were also noted from baseline to follow-up. There was not significant improvement or worsening in problem-solving, based on RCI scores, for Michael, Daniel, and Kevin from baseline to endpoint and follow up.

On the OQ 45.2, Brian demonstrated reliable change on the total score (RCI = -2.21) and the SR subscale (RCI = -2.42) from baseline to endpoint, indicating significant improvement.
Gains on the SD subscale (RCI = -2.19) were also significant from baseline to the two-month follow up. Kevin demonstrated reliable change on the total score (RCI = -2.20) and SD subscale (RCI = -2.21), characterized by lower scores (i.e., improvement) at endpoint. Kevin’s scores did not indicate reliable change at follow up. No significant reliable changes were noted for Michael, Daniel, and Kevin on any of the OQ 45.2 subscales. Michael’s SD and SR subscale scores were clinically elevated at baseline, endpoint, and follow up. Furthermore, his total OQ 45.2 score (which was close to clinical cut-off at baseline) was clinically elevated at endpoint and follow up. Additionally, Daniel’s scores on the SD scale were clinically elevated at baseline and remained elevated through endpoint and follow up.

**SMA: Mean Level Change**

Significant mean level changes were found for Kevin on the total SPSI-R:S score \( r = 0.81, p < .05 \). His total score was higher during the treatment phase than the baseline phase, and his ICS subscale score \( r = -0.84, p < .05 \) was lower during the treatment phase than the baseline phase. No mean level change was demonstrated on any of the SPSI-R:S subscales between baseline and treatment phase for Brian, Michael, and Daniel. Steven’s total SPSI-R:S score \( r = -0.83, p < .05 \) was lower during the treatment phase than during the baseline phase. This direction in change is opposite of what was predicted.

On the OQ 45.2, Brian demonstrated mean level change for the OQ 45.2 total score \( r = -0.79, p < .05 \) and the IR \( r = -0.76, p < .05 \) and SR \( r = -0.66, p < .05 \) subscales, such that scores in the treatment phase were significantly lower than in the baseline phase. Kevin demonstrated significant mean level change between baseline and treatment phases on the IR subscale \( r = -0.85, p < .05 \), with lower scores occurring in the treatment phase. Changes for
Brian and Kevin were in the expected direction. No significant changes were found for Michael, Daniel, or Steven.

*SMA: Slope of Change*

Slope analyses revealed several statistically significant correlations, indicating that multiple vectors may fit the data for some participants. Because it is not possible to test the relative import of the vectors against one another, all significant vectors are reported beginning with the vector with the strongest correlation for each participant in Tables 16 & 17. Several significant slopes were found on the SPSI-R:S for Brian. On the NPO subscale, vectors 1, 2, 4, and 5 were significant, providing more evidence for a reduction in negative problem orientation during the intervention. Vector 1 was significant for his ICS score, indicating that the intervention may have been successful in decreasing impulsivity and carelessness in problem solving. Finally, vectors 1 and 2 were significant for Brian’s SPSI-R:S total score, demonstrating an increase in problem solving ability during treatment. Analyses for Daniel matched vector 3 on the NPO scale, indicating treatment may have prevented a further increase in negative problem orientation. For Kevin, multiple slope vectors were significant for the total SPSI-R:S score including vectors 2, 3, 4 and 5, providing mixed evidence for an increase in problem solving skills during treatment. Significant findings for vector 2 and vector 4 on the PPO subscale did not equivocally support change in the expected direction. However, vector 3 was significant for NPO, ICS, and AS scores, suggesting that treatment may have prevented further worsening on these subscales. Finally, vector 1 was significant for the RPS scale, providing support for a more rational approach to problem solving during treatment.

Brian’s total OQ 45.2 scores throughout treatment matched vector 2, reflecting a stable baseline and subsequent decrease in self-reported distress during treatment. Multiple slopes were
significant for the SD scale including vectors 2 and 4, providing mixed support for the efficacy of PSS:101. For Michael, results revealed two significant slope vectors on the IR subscale including vectors 3 and 4, providing limited support for a decrease in interpersonal during PSS:101. For Daniel, SMA slope analyses indicated that his IR scores matched vector 3, which did not support study hypotheses. For Kevin, significant slope level change matching vector 4 was noted for the OQ 45.2 total score, which decreased continuously during baseline and continued to do so through treatment. Multiple slopes were significant for the SD scale including vectors 2, 4, and 5 providing mixed support for treatment efficacy. Vectors 3 and 4 were significant for the IR subscale, and again, provided mixed support for treatment efficacy. Again, several slopes were significant for the SR scale including vectors 1, 2, 4 and 5, providing more support for a decrease in distress associated with academics during the intervention. Vector 5 was significant for Steven on the SD scale suggesting a reduction in symptom distress during treatment.

*Pre- to Post-Change: P-MEPS and P-MEPS Story*

Table 18 presents in P-MEPS scores for each participant from baseline to endpoint. Wilcoxon Signed Ranks Tests indicated PSS:101 did not elicit statistically significant change in the number of problems identified ($z = -1.29, p = 0.20$), number of solutions generated ($z = -1.86, p = 0.06$), solution effectiveness rated by participant ($z = -1.48, p = 0.14$), solution effectiveness rated by U-IEs ($z = -0.94, p = 0.35$; inter-rater $r = .66, p < .05$), or number of pros and cons generated for each solution ($z = -0.67, p = 0.50$). Table 19 presents the average of the P-MEPS Story scores coded by U-IEs for each participant with respect to relevant means, irrelevant means, appropriateness of means, obstacles, and time. Further Wilcoxon Signed Ranks Tests demonstrated there was also no statistically significantly change in the number of relevant
means generated ($z = -1.63, p = 0.10$; inter-rater $r = .96, p < .001$), irrelevant means generated ($z = -1.00, p = 0.32$; inter-rater $r = 1.00, p < .001$), appropriateness of generated means ($z = -0.92, p = 0.34$; inter-rater $r = .58, p = ns$), obstacles generated ($z = -1.63, p = 0.10$; inter-rater $r = .95, p < .001$), appreciation of time ($z = -1.73, p = 0.08$; inter-rater $r = 1.00, p < .001$), or the total MEPS score ($z = -1.83, p = 0.07$; inter-rater $r = .97, p < .001$) from baseline to endpoint.

Based on examination of raw data, many of the scores on the P-MEPS followed the anticipated direction, though changes were not statistically significant. Three out of five participants demonstrated a decrease in the number of problems they identified from the problem checklist, four of the five participants generated more solutions, rated their solutions as more effective, and generated more pros and cons for their solutions at endpoint compared to baseline assessment. U-IEs only rated three participant’s solutions as more effective at endpoint, though ratings were not statistically significant.

Though not significant, participants received scores in the expected direction at endpoint based on raw data for portions of the P-MEPS Story procedure, coded by the independent evaluators. At endpoint, the number of relevant means generated and the number of obstacles generated increased for three participants, and the MEPS total score increased for four participants. Furthermore, three participants demonstrated an appreciation that it takes time to solve a problem at endpoint than baseline. Ratings of appropriateness of means declined minimally for three participants, though it should be noted that there was low reliability for U-IEs on this item.

Discussion

This study serves as the first attempt to implement a novel, group-based program to improve problem solving skills in college students with ASD. We found support for the study’s
two primary hypotheses. We were able to manualize and implement the treatment program. Second, evidence for the feasibility of the new treatment, including treatment integrity, consumer satisfaction, and therapist fidelity, was found. With respect to the study’s exploratory aim to determine likely efficacy, evidence is mixed.

Pilot studies play a key role in the development of new interventions and serve as a small-scale test of the methods and procedures to be used on a larger scale (Porta, 2008). In keeping with recommendations on the methods and utility of pilot trials (e.g., Leon et al., 2011), the primary role of a pilot study is to examine the feasibility of a novel research endeavor and its treatment components, such as feasibility of recruitment, intervention implementation, assessment procedures, and treatment retention. An exploratory aim of the current study was to assess treatment efficacy through measures of problem solving ability and symptoms distress. It should be noted, however, that pilot studies should not be used to provide a meaningful effect size estimate for planning subsequent studies due to the imprecision inherent in data from small samples (Leon et al., 2011).

As part of the current study, a manual was created to adapt PST (D’Zurilla & Nezu, 2007) for college students with ASD. Much of the original concepts and content were kept intact, with the integration of promising strategies from CBT and social skill interventions used with individuals with ASD. Psychoeducation regarding ASD as it relates to problem solving was included across sessions and the use and emotion identification and regulations strategies were emphasized due to the high prevalence of anxiety in ASD (White et al., 2010). The method of delivery was adjusted to the needs of students with ASD evidenced by the use of immediate and specific feedback, modeling of new skills, use of role-plays, direct instruction, use of shaping to teach skills, and multi-modal practice. Content and examples were driven by the new challenges
students with ASD must independently endure at college without the support system, daily routines, or level of structure they previously had in their home environment. As such, PSS:101 was designed to teach students the general problem solving process while emphasizing problems related to social interaction, organization, and time management – challenges associated with impairments in ASD. PSS:101 was conducted in a group format to encourage the development of a social support network for students with ASD and to provide the opportunity to practice new techniques with same-aged peers in a safe environment. Additionally, out-of-session assignments and “cheat sheets”, which summarized session content, were created to reinforce practice of the content outside of session to increase generalization of skills. A secure URL was established to allow participants to access materials (e.g., out-of-session assignments), turn in assignments, and talk to other group members (via an online chat). Group members were also encourage to contact the group leaders during the week if they had any questions regarding PSS:101. Only one participant e-mailed the group leaders outside of session, and he did so due to concerns that his problems were more severe than could be handled once a week during a group treatment.

The second aim of the current study was to collect data on the feasibility of the treatment manual and its delivery. Despite broad recruitment efforts for PSS:101, few students responded. Five participants enrolled into the program and all five completed the full intervention. It should be noted, however, that four of the participants had previously participated in a support group for students with ASD co-led by the investigator a year prior. It is possible that this existing relationship positively influenced the participants’ willingness to participate in the present study. Alternatively, it is possible that most students with ASD are reluctant to volunteer for services or clinical research projects, despite need, and that those who do volunteer for extra help are the ones who participate in projects such as this. This speaks to the importance of face-to-face
contact, and, potentially, a pre-existing interpersonal relationship in recruiting adults with ASD. It also speaks to potential limitations in the generalizability of these findings. Additionally, due to confidentiality, recruitment was heavily facilitated by the use of SSD personal, with whom the students had already built rapport with, and use of the SSD office as a centralized point of communication to the students. Several challenges were also noted during the process of implementing PSS:101 that necessitated changes to the procedure. Participants had advanced notice of the schedule for PSS:101 session, but on the second group meeting, which happened to fall on a school holiday, none of the participants arrived to session. Although the schedule was confirmed in the previous session, many participants assumed that the holiday generalized to the PSS:101 group. The group leaders attempted to solve this issue through collaborative problem solving with the group members, and group members decided they would e-mail the group leaders if they could not attend group or if they had questions regarding the dates of future group sessions. This process worked well for the remainder of group sessions. The secure URL site was created to strengthen group cohesion through the use of communication outside of the session, but no group member used the website to converse with other members, and only one group member used the site to turn in his homework. Several participants did access the out-of-session assignments and cheat sheets if they lost them during the course of the week.

It was hypothesized that the treatment would be feasible to deliver and acceptable to group participants. Specifically, it was expected that participants would attend at least 80% of the session, treatment integrity would reach 80%, participant engagement ratings would be moderately high, participants would complete at least 80% of their homework assignments, and that treatment satisfaction ratings would be moderately high across participants. It was also expected that independent ratings (i.e., ratings made by raters not involved in the treatment)
would meet or exceed this benchmark. Overall, treatment integrity was high, sessions lasted approximately 90 minutes, as planned, and group leaders posted the agenda, reviewed and discussed homework assignments and met all of the treatment goals at every session. Regarding treatment adherence, all of the pre-established minimal benchmarks for attendance, participant engagement, homework completion, therapeutic relationship, group process, and convergence ratings (between therapist and independent evaluator) were met.

With respect to consumer satisfaction, helpfulness ratings of sessions were moderately high, though homework assignments were only rated as somewhat helpful on average. On the endpoint satisfaction questionnaire, one participant noted that homework did not seem to make much of a difference in increasing his knowledge of the problem solving skills process, while another participant stated that he would have liked less time to be spent on homework review. Some participants had difficulty completing their homework thoroughly given demands of other coursework during the week. Because homework assignments are an integral part of CBT (Helbig & Fehm, 2004; Kazantzis, Deane, & Ronan, 2000) it is possible that a lack of perceived importance or an inability to thoroughly complete homework negatively impacted the acquisition and implementation of targeted problem solving skills outside of the session.

Participants also indicated that they gained new knowledge at most of the sessions, with some evidence to suggest that they preferred learning the discrete problem solving steps. This may indicate some difficulty, or devaluation of, the importance of taking one’s attitude and emotions into account during the problem solving process. The beginning of therapy covered more abstract topics, such as challenging negative schemas and recognizing and controlling maladaptive emotions which may have been difficult for participants, considering that individuals with ASD have difficulty with emotion recognition and regulation (Mazefsky,
Pelphrey, and Dahl, 2012; Rieffe et al., 2007) and clinical observations demonstrate they often prefer discussing more concrete topics. For example, one person indicated that he wished the group leaders would have “helped with members’ problems directly rather than asking questions about emotions or other smaller things.” Another student feared that reducing his anxiety would reduce his academic motivation and lead to poor academic performance. Despite the abstract nature of thought challenging and emotion regulation, individuals with ASD have been shown to benefit from these components of CBT (Reaven et al., 2009; Sofronoff et al., 2007; White et al., 2010). Indeed, one participant demonstrated a significant reduction of negative problem orientation from baseline to endpoint, with three others demonstrating trends in the expected direction.

Most participants indicated that they liked the PSS:101 program, found it to be moderately helpful, and were satisfied with the topics of the meetings. Participants also indicated that their problem solving skills had changed as a result of PSS:101. One of the main goals of PSS:101 was to teach students how to adopt a positive attitude towards problem solving to increase their motivation to solve problems independently as well as to promote positive social interaction. It was thought that this orientation would be particularly important given the likelihood that many individuals had experiences substantial social failure and peer rejection in the past (e.g., Chamberlain, Kasari, & Rotheram-Fuller, 2007; Glennon et al., 2001). At endpoint, two participants indicated that their problem solving orientation had become somewhat more positive, while three indicated that it had become much more positive. Although no participants evidenced significant improvement of their problem orientations on questionnaires, four participants endorsed trends in the expected direction by follow-up.
Notably, most group members indicated that they found group meetings to be the most helpful component. During the third group session, all group members endorsed the specific cognitive distortion “most people do not have similar types of problems as I do” related to various difficulties with ASD. Qualitatively, every participant indicated that they had a positive experience meeting others with ASD on the endpoint consumer satisfaction questionnaire. Specifically, they stated that it was helpful to meet other students with ASD to have people in similar situations to talk with, to see that many of the group members share the same problems, and to learn how others with ASD solve their problems. While participants indicated that PSS:101 had only been somewhat helpful to meet others with ASD and building more positive social relationships, it may be that the group setting served to ‘normalize’ the existence of problems in one’s life. While four out of five participants indicated that PSS:101 was a good use of their time and would suggest the program to another student, another participant felt it was not a good use of his time and that he would not suggest the program to another student. This participant indicated that his problems went beyond the reach of the program in severity, and he often struggled with hopelessness during the PSS:101 program. Many symptoms of depression were noted in this participant, and it is possible that he needed more intensive treatment than the program could offer.

When asked about improvements they would make to the PSS:101 program, one participant indicated that the homework should be more interesting while another wanted more focus on specific problem solving skills. Two participants indicated that they had minimally continued to work on the same problem after PSS:101 had ended, while two indicated that they had put more effort towards working on the same problem. One participant indicated moderate success in making progress on the problem they chose to work on during PSS:101, while four
indicated that they had made significant progress. Qualitatively, Brian indicated that he used problem solving techniques to resolve his stress management problem and that he has attempted to generalize them to “learning how to be more socialized”. Michael reported that he was more aware of his problem solving attitude and is more able to accept problems that he cannot change. Kevin achieved his goal using his problem solving plan at follow-up. Daniel, who worked on the problem of academic organization, reported that he had made some progress by becoming more organized. Additionally, participants indicated that they have continued to apply the skills they learned from the program to other areas of their life. Importantly, participants anecdotally reported generalized change in their problem solving skills, though this was not wholly supported through self-report measures. It is possible that the self-report measures are not sensitive enough to capture discrete gains in problem solving. It is also possible that participants may have been reporting perceived, but not actual, change.

Finally, an exploratory aim of the current study was to collect preliminary data on efficacy in order to determine whether further evaluation of efficacy is warranted. It was expected that participants would improve from pre-treatment to post-treatment on trait-based problem solving skills and in the amount of symptomatic distress experienced. Overall, results from RCI and SMA analyses of the SPSI-R and OQ 45.2 are fairly inconclusive with respect to likely efficacy.

Specifically, three participants did not significantly improve on their social problem-solving from pre-treatment to post-treatment, while two participants significantly improved on several specific areas related to problem-solving, with this pattern holding true for the majority of subscales from baseline to follow-up. Of the participants who did not demonstrate reliable change, two exhibited trends in the expected direction on approximately half of the subscales,
including the total SPSI-R:L, from baseline to endpoint and follow-up. Another participant experienced subthreshold change in the opposite of the predicted subscales from baseline to endpoint. From baseline to follow-up, however, approximately half of that participant’s subscale scores were in the expected direction. Mean level change analyses also indicated baseline to treatment differences in the expected direction for one participant (Kevin) and in the opposite direction for another (Steven).

Similar patterns were found for the OQ 45.2; two participants significantly improved from baseline to endpoint on several subscales (Brian and Michael) with subthreshold change in the expected direction on all others, two participants exhibited subthreshold change in the expected direction for all subscales of the OQ 45.2, and one participant worsened for most subscales at a subthreshold level. At follow-up, only one participant was rated as having significant improvement on one subscale, though three participants reported scores in the expected direction on the total score and all subscales. Mean level analyses for Brian and Kevin also provided evidence for a decrease in scores during the treatment period.

Based on pre-to-post and SMA mean level analyses, it appears that Brian and Kevin benefitted from the treatment in some areas. Change scores for the other three participants were more variable. Results from the SMA slope analyses are more complicated, which may be indicative of heterogeneity in the shape of change among individuals during treatment. In cases where multiple slopes were significant for one participant, the variation often occurred in the slope of the baseline, potentially due to the relatively few number of data points in the baseline phase as compared to the treatment phase. Information derived from slope analyses provides more evidence for treatment effects for Brian (e.g., significant findings for vectors 1 and 2) and
mixed evidence for Kevin (e.g., significant findings for vectors 3 and 4 as well as vectors 1 and 2).

Based on standardized self-report measures of problem solving, it appears that Brian may have benefitted the most from the treatment, followed by Kevin. There is relatively little support indicating that Michael, Daniel, and Steven demonstrated changes as a result of the program on these self-report measures. A noted concern of using self-report questionnaires rests on the ability of individuals with HFASD to introspect (Johnson, Filliter, & Murphy, 2009). Research on the matter is limited, though some researchers attest that individuals with HFASD are able to report on their own emotions on questionnaires based on adequate validity and reliability of measures that were used (Capps et al., 1995; Hill et al., 2004; Meyer et al., 2006). Furthermore, Kuusikko et al. (2008) argue in favor of using self-report measures in adolescence and young adulthood because it is more difficult for others to accurately observe and report on their behaviors. Anecdotally, though, it was noted on several occasions during the treatment sessions that participants had difficulty recognizing and reporting on their own emotions. For example, one participant reported that the first cue that he noticed when he became anxious was when he was curled into a fetal position on his bed rocking back and forth. Additionally, during viewings of several video clips, participants were able to accurately identify cues to others’ emotions or problem solving skills in the clip, but did not recognize when they were experiencing the same problems in their own lives or during group sessions. In the current study, we explored the use of an objective measure of problem solving, the P-MEPS and the MEPS Story procedure specifically adapted for ASD. Although changes were not significant, this procedure demonstrated some utility as an objective measure of problem solving skills. It was not possible to thoroughly analyze this data using other methods (e.g., the RCI) because there was no
normative data on the measure as it was adapted for use in this study. Adding more MEPS stories in future studies may provide a more valid estimate of problem solving ability.

Another factor that may have accounted for the differences observed in treatment outcome is comorbidity. Michael and Daniel’s responses indicated minimal change on the SPSI-R:L and OQ 45.2. Both participants had several co-morbid problems, including symptoms of anxiety and depression. It is possible that the severity of these symptoms impacted the treatment process. While PST has been successfully used to treat anxiety and depression, the lack of insight present in individuals with ASD may affect their ability to identify how these symptoms affect their problem solving process. As individuals with ASD gain more insight into their difficulties, they may initially report worsening symptoms (White et al., 2009). This trend may explain Daniel’s curvilinear patterns of scores. Additionally, it is also possible that the treatment phase, nine weeks in length, was too short to lead to significant improvement. Many CBT treatments utilize at least 12 sessions to find an effect (e.g., Sofronoff et al., 2007), with some incorporating individual treatment along with group treatment (e.g., White et al., 2010). Extending the treatment past nine weeks may be problematic in conjunction with achieving an adequate baseline and endpoint phase within the confines of a 15-week semester. PSS:101 could potentially be run across two semesters, or bi-weekly with corresponding assessment periods.

Limitations

This study is not without its limitations. We attempted to ameliorate observer bias by establishing inter-rater reliability for rater-coded measures of target behaviors with an assessor independent from the therapists. Additionally, we attempted to control variability in behavior by establishing a baseline over three occasions and taking continuous measures of behavior through the treatment phase. However, declining baselines among participants, noted in several
significant slope vectors in the current study, weaken the causal inferences that can be drawn regarding the effect of treatment. Moreover, results from SMA slope analyses revealed that in many instances when multiple slopes were significant, there was considerable variability in the baseline period. Single-case designs require baseline stability in order to clearly document changes between the baseline and treatment phase. Future studies of PSS:101 should include more assessment administrations during the baseline phase.

Another limitation was low internal consistency for a majority of the SPSI-R:L subscales on at least one baseline administration, and for the IR and SR subscales in particular on the OQ45.2, indicating inconsistent responding. While the total scores on these measures were relatively high, low internal consistency on subscale scores may indicate that items are not adequately measuring the latent construct, and caution should be used when interpreting results.

There are important limitations with respect to generalization inherent in the nature of a single-subject design. We were limited in our ability to provide evidence of generalization beyond our specific target behavior, but the finding of significant change in symptom distress measured by the OQ 45.2 provided some evidence that the treatment program may have generalized beyond problem solving skills, for some individuals, which is consistent with theoretical mechanisms of change outlined by D’Zurilla and Nezu (2007). Furthermore, even very well conducted case studies have limitations in internal validity of findings as well as generalizability to different populations. This sample only consisted of five Caucasian males, four of whom completed the minimum recommended dosage of seven sessions. It is possible that females or individuals of other races and ethnicities may respond differently to PSS:101. Given that participants self-selected into the study, they could be seen as highly motivated to change
problems that were occurring in their lives, and results may differ if the program was delivered in a mandatory fashion.

Additionally, while single-case designs can provide initial evidence for the efficacy of an intervention, the inclusion of a control group in randomized controlled trials could provide stronger evidence for causal clarity of PSS:101, while simultaneously allowing for the examination of mediator and moderator variables, such as participant characteristics or environmental features through cross-site studies (e.g., Lord et al., 2005).

Finally, it should be noted that 300 models were tested for mean level change and slope analyses using SMA. Using a probability value of .05, we would expect that 15 results would be significant due to chance. It is important to consider any significant findings in such a trial in the context of the range of possible changes that could be found (De Los Reyes & Kazdin, 2006). In the current study, 42 vector models were found to be significant and it is possible that some of those may be an artifact of the number of tests conducted.

**Future Directions**

Preliminary findings indicate that PSS:101 was feasible to implement and may potentially be a cost-efficient and effective way for universities to support students with ASD. Future studies should identify sensitive, objective measures of problem solving skills to be used in conjunction with self-report measures in order to more accurately detect treatment change. This might include the use of expanding the P-MEPS and P-MEPS story procedure (Schotte & Clum, 1987; Spivack et al., 1985) across multiple problem situations or by obtaining naturalistic assessment of participant’s problem solving process when faced with a real-world problem scenario in vivo. Given the pervasive deficits of ASD, it is likely that more intensive treatment is necessary to produce consistent and pronounced treatment effects. A longer duration of treatment
or greater dosage (e.g., meeting multiple times per week) may yield a stronger impact. Anecdotally, the use of role-plays was enjoyed by all members and could be incorporated with greater frequency to generalize problem solving skills. Future research may also consider augmenting the procedure by incorporating the use of more frequent assessments to derive stable baseline and endpoint measures of symptom and skill levels.
References


Bauminger, N. (2002). The facilitation of social-emotional understanding and social interaction


research: The range of possible changes model. *Psychological Review, 113*, 554-583. doi:10.1037/0033-295X.113.3.554


Table 1

*Definitions of the Problem Orientation Components*¹

<table>
<thead>
<tr>
<th>Component</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Problem Recognition</strong></td>
<td>The general tendency or readiness to recognize problems when they occur, rather than ignoring or denying them</td>
</tr>
<tr>
<td><strong>Problem Attribution</strong></td>
<td>A person’s causal beliefs concerning problems</td>
</tr>
<tr>
<td></td>
<td>• Positive problem attribution: a belief that problems are normal and inevitable for everyone</td>
</tr>
<tr>
<td></td>
<td>• Negative problem attribution: a belief that problems are caused by stupidity, incompetence, or psychological disturbance</td>
</tr>
<tr>
<td><strong>Problem Appraisal</strong></td>
<td>A person’s evaluation of the significance of a problem for psychological, social, or physical well-being</td>
</tr>
<tr>
<td></td>
<td>• Positive appraisal: the view that the problem is a challenge or opportunity for benefit or gain</td>
</tr>
<tr>
<td></td>
<td>• Negative appraisal: the perception that a problem is a threat to well-being</td>
</tr>
<tr>
<td><strong>Perceived Control</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Problem Solving Efficacy</td>
</tr>
<tr>
<td></td>
<td>• Problem Solving Outcome Expectancy</td>
</tr>
<tr>
<td></td>
<td>• The belief that one is capable of solving problems and implementing solutions effectively</td>
</tr>
<tr>
<td></td>
<td>• The belief that problems are solvable</td>
</tr>
<tr>
<td><strong>Time/Effort Commitment</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• The likelihood that an individual will accurately estimate the time it will take to solve a problem successfully</td>
</tr>
<tr>
<td></td>
<td>• The likelihood that the individual will be willing to devote the necessary time and effort to problem solving</td>
</tr>
</tbody>
</table>

Table 2

Goals of Problem Solving Skills²

<table>
<thead>
<tr>
<th>Task</th>
<th>Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Problem Definition &amp;</td>
<td>• Gather relevant, factual information about the problem</td>
</tr>
<tr>
<td>Formulation</td>
<td>• Clarify the nature of the problem (i.e., identify demands,</td>
</tr>
<tr>
<td></td>
<td>obstacles, and conflicts)</td>
</tr>
<tr>
<td></td>
<td>• Set a realistic problem solving goal</td>
</tr>
<tr>
<td>Generation of Alternative</td>
<td>• Produce a list of potential solutions in such a way as to</td>
</tr>
<tr>
<td>Solutions</td>
<td>maximize the likelihood that the best solution will be among</td>
</tr>
<tr>
<td></td>
<td>them</td>
</tr>
<tr>
<td>Decision Making</td>
<td>• Evaluate (judge &amp; compare) the available solutions and</td>
</tr>
<tr>
<td></td>
<td>choose the best one(s) for implementation in the problematic</td>
</tr>
<tr>
<td></td>
<td>solution</td>
</tr>
<tr>
<td>Solution Implementation &amp;</td>
<td>• Assess the solution outcome and verify the effectiveness or</td>
</tr>
<tr>
<td>Verification</td>
<td>utility of the chosen solution in the actual problem situation</td>
</tr>
</tbody>
</table>

### Table 3

**Timeline for Administration of Measures Throughout the Study**

<table>
<thead>
<tr>
<th></th>
<th>ADOS</th>
<th>AQ</th>
<th>Feasibility</th>
<th>Consumer Satisfaction</th>
<th>SPSI-R:L</th>
<th>SPSI-R:S</th>
<th>OQ 45.2</th>
<th>P-MEPS &amp; MEPS Story</th>
</tr>
</thead>
<tbody>
<tr>
<td>BL 1</td>
<td>P</td>
<td>P</td>
<td></td>
<td></td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>P</td>
</tr>
<tr>
<td>BL 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>P</td>
</tr>
<tr>
<td>BL 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>P</td>
</tr>
<tr>
<td>Session 1</td>
<td>T</td>
<td>P</td>
<td></td>
<td></td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>P</td>
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<td>P</td>
<td>P</td>
<td>P</td>
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<tr>
<td>Session 3</td>
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<td>P</td>
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<td></td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>P</td>
</tr>
<tr>
<td>Session 4</td>
<td>T</td>
<td>P</td>
<td></td>
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<td>P</td>
<td>P</td>
<td>P</td>
<td>P</td>
</tr>
<tr>
<td>Session 5</td>
<td>T</td>
<td>P</td>
<td></td>
<td></td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>P</td>
</tr>
<tr>
<td>Session 6</td>
<td>T</td>
<td>P</td>
<td></td>
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<td>P</td>
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<td>P</td>
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<td>Session 8</td>
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<td>P</td>
<td></td>
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<td>P</td>
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</tr>
<tr>
<td>Session 9</td>
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<tr>
<td>EP 1</td>
<td></td>
<td></td>
<td></td>
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<td>P</td>
<td>P</td>
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<tr>
<td>EP 2</td>
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<td>P</td>
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<tr>
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<td></td>
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<td>P</td>
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<td>FU 2</td>
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<td>P</td>
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</tbody>
</table>

Note: P = completed by participant, T = jointly completed by therapists; all administrations occurred at weekly intervals; BL = baseline, EP = endpoint, FU = follow up; participant 1 completed four baseline administrations, while participant 5 completed two.
## Table 4

**Participant Demographics**

<table>
<thead>
<tr>
<th>ID</th>
<th>Age</th>
<th>Year</th>
<th>Months in College</th>
<th>Sex</th>
<th>Race</th>
<th>FSIQ</th>
<th>VCI</th>
<th>PRI</th>
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<tr>
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<td>18.25</td>
<td>First</td>
<td>1</td>
<td>Male</td>
<td>Caucasian</td>
<td>133</td>
<td>136</td>
<td>131</td>
</tr>
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<td>M</td>
<td>21.25</td>
<td>Third</td>
<td>25</td>
<td>Male</td>
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<td>123</td>
<td>114</td>
<td>126</td>
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<tr>
<td>D</td>
<td>22.83</td>
<td>Third</td>
<td>25</td>
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<td>Caucasian</td>
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<td>126</td>
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<tr>
<td>K</td>
<td>20.42</td>
<td>Second</td>
<td>13</td>
<td>Male</td>
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<td>136</td>
<td>141</td>
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<tr>
<td>S</td>
<td>23.58</td>
<td>Fifth</td>
<td>61</td>
<td>Male</td>
<td>Caucasian</td>
<td>135</td>
<td>125</td>
<td>137</td>
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</table>

Note: Participant’s initials will be used as their ID from this table onwards.
Table 5

*Participant Characterization Data*

<table>
<thead>
<tr>
<th>ID</th>
<th>ADOS - C</th>
<th>ADOS - S</th>
<th>ADOS - RSRI</th>
<th>ADOS Total</th>
<th>AQ</th>
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<td>9</td>
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<td>5</td>
<td>8</td>
<td>1</td>
<td>13</td>
<td>34</td>
</tr>
<tr>
<td>K</td>
<td>3</td>
<td>7</td>
<td>2</td>
<td>10</td>
<td>35</td>
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<tr>
<td>S</td>
<td>7</td>
<td>10</td>
<td>1</td>
<td>17</td>
<td>22</td>
</tr>
</tbody>
</table>

Note: ADOS-C = ADOS Communication Scale Total; ADOS-S = ADOS Reciprocal Social Interaction Scale Total; ADOS-SBRI = ADOS Stereotyped Behaviors & Restricted Interests Scale Total; ADOS Total = ADOS Communication Scale Total + ADOS Reciprocal Social Interaction Scale Total; AQ = Autism Spectrum Quotient Total
Table 6

*Internal Consistency Across Baseline Administrations for the SPSI-R:L and OQ 45.2*

<table>
<thead>
<tr>
<th>Scale</th>
<th>Mean</th>
<th>BL1 α</th>
<th>BL2 α</th>
<th>BL3 α</th>
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<tr>
<td>PPO</td>
<td>.73</td>
<td>.84</td>
<td>.48</td>
<td>.69</td>
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<td>NPO</td>
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<td>.58</td>
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<td>.90</td>
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<td>PDF</td>
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<td>GAS</td>
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<td>.78</td>
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<td>.46</td>
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<td>DM</td>
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<td>.86</td>
<td>.71</td>
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<td>.90</td>
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<tr>
<td>AS</td>
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<td>.67</td>
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<td>.91</td>
</tr>
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<td>SPSI-R:L Total</td>
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<td>.89</td>
<td>.83</td>
</tr>
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<td>.94</td>
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<td>.55</td>
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<td>.25</td>
<td>.56</td>
<td>.71</td>
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<td>OQ Total</td>
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<td>.90</td>
<td>.89</td>
<td>.96</td>
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</table>

Note: Five questionnaire administrations were used to calculate internal consistency BL1 and BL2, while four administrations were used in BL3. Items 11 and 45 were removed from the OQ SD scale at BL1 and BL3 because they had zero variance. Items 32 and 44 were removed from the OQ SR scale at BL1 because they had zero variance. Items 7, 11, 26, 32, 44, and 45 were removed from the OQ Total scale at BL1 due to zero variance. Items 7, 11, 17, 26, 27, 32, 34, and 44 were removed from the OQ Total scale at BL 3 because they had zero variance. Internal consistency was not calculated for BL4 because there was only one participant.
### Table 7

**Consumer Satisfaction for Each Participant (Averaged across Session)**

<table>
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<tr>
<th></th>
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<th>M</th>
<th>D</th>
<th>K</th>
<th>S</th>
</tr>
</thead>
<tbody>
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<td>7.38</td>
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<td>5.63</td>
<td>4.29</td>
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<td>Knowledge Gained</td>
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<td>100%</td>
<td>100%</td>
<td>88%</td>
<td>100%</td>
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Table 8

*Consumer Satisfaction Ratings by Session*

<table>
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<tr>
<th>Session</th>
<th>Session Helpfulness</th>
<th>Homework Helpfulness</th>
<th>Knowledge Gained</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: Orientation to PSS:101</td>
<td>6.40</td>
<td>4.25</td>
<td>100%</td>
</tr>
<tr>
<td>2: Fostering Self-Efficacy Beliefs</td>
<td>6.75</td>
<td>2.75</td>
<td>100%</td>
</tr>
<tr>
<td>3: Problem Recognition</td>
<td>6.80</td>
<td>3.75</td>
<td>80%</td>
</tr>
<tr>
<td>4: Use &amp; Control of Emotions in Problem Solving</td>
<td>7.50</td>
<td>5.00</td>
<td>100%</td>
</tr>
<tr>
<td>5: Problem Definition &amp; Formulation</td>
<td>7.25</td>
<td>5.75</td>
<td>100%</td>
</tr>
<tr>
<td>6: Generation of Alternative Solutions</td>
<td>7.25</td>
<td>5.75</td>
<td>100%</td>
</tr>
<tr>
<td>7: Decision Making</td>
<td>7.00</td>
<td>6.60</td>
<td>100%</td>
</tr>
<tr>
<td>8: Solution Implementation &amp; Verification</td>
<td>8.40</td>
<td>3.60</td>
<td>100%</td>
</tr>
<tr>
<td>9: Check Up &amp; Goodbye</td>
<td>7.80</td>
<td>N/A</td>
<td>100%</td>
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Table 9

**Consumer Satisfaction at Endpoint: Responses to Endpoint Satisfaction Questionnaire**

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<tr>
<th>Item</th>
<th>Mean</th>
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<th>M</th>
<th>D</th>
<th>K</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>How much did you like the PSS:101 program?</td>
<td>7.60</td>
<td>9</td>
<td>9</td>
<td>7</td>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td>Were you satisfied with the topics of the meetings?</td>
<td>8.00</td>
<td>10</td>
<td>9</td>
<td>7</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>How helpful was PSS:101 to you?</td>
<td>7.00</td>
<td>8</td>
<td>9</td>
<td>5</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>How likely would you be to suggest this program to another student?</td>
<td>6.20</td>
<td>7</td>
<td>10</td>
<td>1</td>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td>Was participating in the PSS:101 program a good use of your time?</td>
<td>6.20</td>
<td>7</td>
<td>10</td>
<td>1</td>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td>Has your problem solving orientation become more positive since attending PSS:101?</td>
<td>7.60</td>
<td>9</td>
<td>9</td>
<td>5</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>Have your problem solving skills changed as a result of PSS:101?</td>
<td>7.20</td>
<td>7</td>
<td>9</td>
<td>5</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>Have you noticed any changes in your behavior, attitude, or other changes in yourself since PSS:101?</td>
<td>5.00</td>
<td>6</td>
<td>7</td>
<td>4</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>Have you continued to work on the same problem you chose to work on during PSS:101?*</td>
<td>6.75</td>
<td>-</td>
<td>9</td>
<td>5</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>Have you made progress on the problem that you chose to work on during PSS:101?*</td>
<td>8.20</td>
<td>10</td>
<td>8</td>
<td>5</td>
<td>10</td>
<td>8</td>
</tr>
<tr>
<td>Have you applied the skills you learned from PSS:101 to other areas of your life?*</td>
<td>7.00</td>
<td>8</td>
<td>9</td>
<td>5</td>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td>Has attending PSS:101 helped you to build more positive social relationships?*</td>
<td>5.40</td>
<td>10</td>
<td>9</td>
<td>1</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Was it helpful to meet other students with ASD?*</td>
<td>5.80</td>
<td>6</td>
<td>5</td>
<td>5</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>Has attending PSS:101 helped you to become more accepting of your ASD?*</td>
<td>3.40</td>
<td>0</td>
<td>2</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

**Overall Mean for Each Participant**  | 7.46 | 8.14 | 4.36 | 7.29 | 5.43 |

Note: All questions were rated on an 11-point scale where 0 = not at all, 5 = somewhat, and 10 = very much; * indicates questions asked on questionnaires at follow up.
Table 10

Qualitative Consumer Satisfaction: Endpoint Satisfaction Questionnaire

How did you feel about meeting others with ASD?
- Brian: It felt nice to have people in similar situations to talk with; it was nice to see other people with ASD and I did feel I got some stuff out of those meetings with them; it made it feel more inclusive and I felt I could interact more with these people.
- Michael: It was good to meet other people with similar problems; it was helpful to see that many of them share very similar problems, and the feedback they provided was helpful.
- David: Not isolated; it was helpful to see what others with ASD deal with and how they solve their problems.
- Kevin: It helped that all but one had an interest in the sciences and with programming; it was also helpful we were able to identify with and solve each other’s problems.
- Steven: It was a bit unnerving at first, but I was able to get used to it later; it was helpful to know how others were struggling with various issues.

What, if anything, would be helpful to improve PSS:101?
- Brian: The homework honestly did not feel like it made much of a difference. Make the homework a bit more interesting.
- Michael: Nothing, it was a very well run group.
- David: Go into more specific problem solving skills.
- Steven: I can't think of anything at this time.

Have your problem solving skills changed as a result of PSS:101?
- Brian: They have become more structured and organized than they were before PSS group; It has helped me analyze situations more before going forth.
- Michael: My attitude towards problems; I plan my problem solutions out more.
- David: I’ve changed the ways I look at problems and I just think about stuff more.
- Kevin: I now have a systematic procedure to solve problems.

Have you noticed changes in yourself since PSS:101?
- Brian: Better organizational skills and more ways to deal with stress issues; I have been more organized while trying to solve problems.
- Michael: I need to be the one to cope with situations I cannot change; I approach certain problems from different directions.
- David: Only slightly.

Have you applied the skills you learned from PSS:101 to other areas of your life?
- Brian: I’ve applied them to solving problems and lessening stress in everyday life; I have now moved on to using it towards how to be more socialized; I am using the skills to live a better life and try to solve things without as much anger or stress.
- Michael: My outlook on other problems in life; with problems in general; I look at my attitude more in context to the problem.
- Kevin: I am still applying it to my internship problem.
Steven: I had been applying many of these skills already before the program started.

What, if anything, was helpful about the group leaders?
- Brian: They were nice and tried to keep the group on schedule.
- Michael: Very kind and thoughtful, very good at steering the conversation in the right direction; thank you for helping me with my problem; this group truly made a difference and I am truly grateful.
- David: They were very encouraging.
- Kevin: They taught us how to problem solve effectively and made sure we stayed on topic.
- Steven: No matter the demeanor of any of the members, the leaders always took a calm and assistive stance.

What, if anything, would you have liked the group leaders to do differently?
- Brian: Homework, like I said earlier, did not seem to make that much of a difference.
- Michael: Maybe balancing time in the group more evenly; we seemed to spend a good amount of time at the HW section, so less on the discussion section.
- David: Nothing.
- Kevin: Nothing.
- Steven: Perhaps focused on helping with the members' problems directly rather than asking questions about emotions or other smaller things.
### Table 11

**Reliable Change Indices for the SPSI-R:L from Baseline to Endpoint**

<table>
<thead>
<tr>
<th></th>
<th>PPO</th>
<th>NPO</th>
<th>PDF</th>
<th>GAS</th>
<th>DM</th>
<th>SIV</th>
<th>RPS</th>
<th>ICS</th>
<th>AS</th>
<th>Total</th>
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<td></td>
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<td>10.5</td>
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<td>16.5</td>
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<td>18.33</td>
<td>18.33</td>
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<td>2.43*</td>
<td>2.86*</td>
<td>3.32*</td>
<td>-2.47*</td>
<td>-0.19</td>
<td>2.75*</td>
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Note: Positive RCI scores on the SPSI-R:L scale and PPO, PDF, GAS, DM, SIV, RPS subscales and negative RCI scores on the NPO ICS, AS subscales indicate improvement; baseline averages are based on three administrations, except for participant four who received four administrations, and endpoint averages are based on three administrations; * = significant change.
### Table 12

**Reliable Change Indices for the SPSI-R:L from Baseline to Follow Up**

<table>
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<th>PPO</th>
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<th>GAS</th>
<th>DM</th>
<th>SIV</th>
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<td>6</td>
<td>4.5</td>
<td>7.5</td>
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<td>-0.79</td>
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Note: Positive RCI scores on the SPSI-R:L scale and PPO, PDF, GAS, DM, SIV, RPS subscales and negative RCI scores on the NPO ICS, AS subscales indicate improvement; follow up averages are based on two administrations; * = significant change.
Table 13

*Reliable Change Indices for the OQ 45.2 from Baseline to Endpoint*

<table>
<thead>
<tr>
<th></th>
<th>OQ SD</th>
<th>OQ IR</th>
<th>OQ SR</th>
<th>OQ Total</th>
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<tr>
<td><strong>Brian</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average BL</td>
<td>23</td>
<td>4.5</td>
<td>8.25</td>
<td>35.75</td>
</tr>
<tr>
<td>Average EP</td>
<td>11.33</td>
<td>0.67</td>
<td>3</td>
<td>15</td>
</tr>
<tr>
<td>RCI</td>
<td>-1.68</td>
<td>-1.23</td>
<td>-2.42*</td>
<td>-2.21*</td>
</tr>
<tr>
<td><strong>Michael</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average BL</td>
<td>40 C</td>
<td>9</td>
<td>13.67 C</td>
<td>62.67</td>
</tr>
<tr>
<td>Average EP</td>
<td>41.33 C</td>
<td>8.33</td>
<td>14 C</td>
<td>63.67 C</td>
</tr>
<tr>
<td>RCI</td>
<td>0.19</td>
<td>-0.21</td>
<td>0.15</td>
<td>0.11</td>
</tr>
<tr>
<td><strong>Daniel</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average BL</td>
<td>38 C</td>
<td>11.33</td>
<td>11.67</td>
<td>61.00</td>
</tr>
<tr>
<td>Average EP</td>
<td>37.33 C</td>
<td>9.67</td>
<td>11.33</td>
<td>58.33</td>
</tr>
<tr>
<td>RCI</td>
<td>-0.10</td>
<td>-1.48</td>
<td>-0.15</td>
<td>-0.28</td>
</tr>
<tr>
<td><strong>Kevin</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average BL</td>
<td>16.33</td>
<td>2</td>
<td>4.47</td>
<td>23</td>
</tr>
<tr>
<td>Average EP</td>
<td>1</td>
<td>0</td>
<td>1.33</td>
<td>2.33</td>
</tr>
<tr>
<td>RCI</td>
<td>-2.21*</td>
<td>-0.64</td>
<td>-1.53</td>
<td>-2.20*</td>
</tr>
<tr>
<td><strong>Steven</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average BL</td>
<td>15.5</td>
<td>7.5</td>
<td>12 C</td>
<td>35</td>
</tr>
<tr>
<td>Average EP</td>
<td>10.33</td>
<td>6.67</td>
<td>10.67</td>
<td>27.67</td>
</tr>
<tr>
<td>RCI</td>
<td>-0.74</td>
<td>-0.27</td>
<td>-0.61</td>
<td>-0.78</td>
</tr>
</tbody>
</table>

Note: Negative RCI scores on OQ total scores and subscales indicate improvement; baseline averages are based on three administrations, except for participant four who received four administrations, and endpoint averages are based on three administrations; C = met threshold for clinical cut-off; * = significant change, indicated by a value greater or less than 1.96.
Table 14

*Reliable Change Indices for the OQ 45.2 from Baseline to Follow Up*

<table>
<thead>
<tr>
<th></th>
<th>OQ SD</th>
<th>OQ IR</th>
<th>OQ SR</th>
<th>OQ Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Brian</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average FU</td>
<td>15.5</td>
<td>1</td>
<td>3.5</td>
<td>20</td>
</tr>
<tr>
<td>RCI</td>
<td>-1.08</td>
<td>-1.11</td>
<td>-2.19*</td>
<td>-1.68</td>
</tr>
<tr>
<td><strong>Michael</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average FU</td>
<td>46.5 C</td>
<td>5</td>
<td>16 C</td>
<td>67.5 C</td>
</tr>
<tr>
<td>RCI</td>
<td>0.94</td>
<td>-1.27</td>
<td>1.07</td>
<td>0.51</td>
</tr>
<tr>
<td><strong>Daniel</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average FU</td>
<td>37 C</td>
<td>9</td>
<td>10</td>
<td>56 C</td>
</tr>
<tr>
<td>RCI</td>
<td>-0.14</td>
<td>-0.74</td>
<td>-0.76</td>
<td>-0.53</td>
</tr>
<tr>
<td><strong>Kevin</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average FU</td>
<td>5</td>
<td>0</td>
<td>0.5</td>
<td>5.5</td>
</tr>
<tr>
<td>RCI</td>
<td>-1.63</td>
<td>-0.64</td>
<td>-1.92</td>
<td>-1.86</td>
</tr>
<tr>
<td><strong>Steven</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average FU</td>
<td>12</td>
<td>8</td>
<td>12 C</td>
<td>32</td>
</tr>
<tr>
<td>RCI</td>
<td>-0.50</td>
<td>0.16</td>
<td>0</td>
<td>-0.32</td>
</tr>
</tbody>
</table>

Note: Negative RCI scores on OQ total scores and subscales indicate improvement; follow up averages are based on two administrations; C = met threshold for clinical cut-off; * = significant change.
Table 15

*SMR: Mean Level Changes Between Baseline and Treatment for the SPSI-R:S and OQ 45.2*

<table>
<thead>
<tr>
<th>ID</th>
<th>SPSI-R:S Total</th>
<th>PPO</th>
<th>NPO</th>
<th>RPS</th>
<th>ICS</th>
<th>AS</th>
<th>OQ Total</th>
<th>SD</th>
<th>IR</th>
<th>SR</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-.79*</td>
<td>-</td>
<td>-.76*</td>
<td>-.66*</td>
</tr>
<tr>
<td>M</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>D</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>K</td>
<td>.81*</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-.84*</td>
<td>-</td>
<td>-</td>
<td>-.85*</td>
</tr>
<tr>
<td>S</td>
<td>-.83*</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Note: Participants one through four had three baseline administrations of questionnaires while participant five had two; * = p < .05.
### Table 16

**Best Fitting Slopes for the SPSI-R:S Total Score and Subscales**

<table>
<thead>
<tr>
<th>ID</th>
<th>Total</th>
<th>PPO</th>
<th>NPO</th>
<th>RPS</th>
<th>ICS</th>
<th>AS</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>- .93** (1)</td>
<td>-</td>
<td>-.80** (5)</td>
<td>-</td>
<td>.83* (1)</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>.88* (2)</td>
<td></td>
<td>-.74* (2)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>-.72* (4)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>.70* (1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>D</td>
<td>-</td>
<td>-</td>
<td>.49* (3)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>K</td>
<td>.96** (4)</td>
<td>.86* (2)</td>
<td>-.81** (3)</td>
<td>-.83* (1)</td>
<td>-.96*** (3)</td>
<td>-.71* (3)</td>
</tr>
<tr>
<td></td>
<td>.92* (2)</td>
<td>.85* (4)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>.85* (5)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>.84* (3)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Note: The number in parentheses indicates slope vector based on significance at p<.05. If missing data, no vector was statistically significant; * = p < .05, ** = p < .01, *** = p < .001.
**Table 17**

*Best Fitting Slopes for the OQ 45.2 Total Score and Subscales*

<table>
<thead>
<tr>
<th>ID</th>
<th>OQ total</th>
<th>OQ SD</th>
<th>OQ IR</th>
<th>OQ SR</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>-.76* (2)</td>
<td>-.74* (4)</td>
<td>-.73* (2)</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td></td>
<td></td>
<td>-.60* (3)</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-.57* (4)</td>
</tr>
<tr>
<td>D</td>
<td></td>
<td></td>
<td></td>
<td>-.62* (3)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>K</td>
<td>-.88** (4)</td>
<td>-.82* (5)</td>
<td>-.96*** (3)</td>
<td>-.83* (5)</td>
</tr>
<tr>
<td></td>
<td>-.82* (4)</td>
<td>-.82* (4)</td>
<td>-.82* (4)</td>
<td>-.83* (4)</td>
</tr>
<tr>
<td></td>
<td>-.78* (2)</td>
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<td>-.82* (2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.76* (1)</td>
</tr>
<tr>
<td>S</td>
<td></td>
<td>-.63* (5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: The number in parentheses indicates the best-fitting slope vector based on significance at \( p < .05 \) and having the largest correlation when multiple slopes were significant. If missing data, no vector was statistically significant.
<table>
<thead>
<tr>
<th>ID</th>
<th># Problems Identified</th>
<th># Solutions Generated</th>
<th>Solution Effectiveness (P)</th>
<th>Solution Effectiveness (IE)</th>
<th># Pros &amp; Cons Generated</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>6</td>
<td>3</td>
<td>3</td>
<td>6</td>
<td>5.30</td>
</tr>
<tr>
<td>M</td>
<td>23</td>
<td>23</td>
<td>4</td>
<td>4</td>
<td>6.20</td>
</tr>
<tr>
<td>D</td>
<td>23</td>
<td>24</td>
<td>4</td>
<td>5</td>
<td>4.00</td>
</tr>
<tr>
<td>K</td>
<td>10</td>
<td>8</td>
<td>2</td>
<td>5</td>
<td>4.00</td>
</tr>
<tr>
<td>S</td>
<td>12</td>
<td>11</td>
<td>3</td>
<td>4</td>
<td>6.33</td>
</tr>
</tbody>
</table>

Note. (P) refers to participants’ judgments of solution effectiveness and (IE) refers to the average of I-IEs’ judgments of solution effectiveness. Solution effectiveness was rated on an 11-point scale where 0 = definitely unsuccessful, 5 = moderately successful, and 10 = definitely successful.
Table 19

**P-MEPS Story Scores for Each Participant**

<table>
<thead>
<tr>
<th>ID</th>
<th>Relevant Means</th>
<th>Irrelevant Means</th>
<th>Appropriateness of Means</th>
<th>Obstacles</th>
<th>Time</th>
<th>Total Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>6.00</td>
<td>8.00</td>
<td>0</td>
<td>0</td>
<td>6.08</td>
<td>5.63</td>
</tr>
<tr>
<td>M</td>
<td>3.00</td>
<td>3.00</td>
<td>0</td>
<td>0</td>
<td>5.50</td>
<td>5.50</td>
</tr>
<tr>
<td>D</td>
<td>3.50</td>
<td>4.50</td>
<td>0.50</td>
<td>0</td>
<td>6.17</td>
<td>5.98</td>
</tr>
<tr>
<td>K</td>
<td>2.00</td>
<td>4.00</td>
<td>0</td>
<td>0</td>
<td>6.25</td>
<td>6.50</td>
</tr>
<tr>
<td>S</td>
<td>3.00</td>
<td>3.00</td>
<td>0</td>
<td>0</td>
<td>5.25</td>
<td>5.00</td>
</tr>
</tbody>
</table>

*Note. Appropriateness of means was rated on a 7-point scale where 0 = not appropriate and 7 = definitely appropriate.*
Figure 1. Schematic representation of the social problem-solving process

Orientation | Problem Solving Style | Outcome

---

3 Reproduced from:
Figure 2. Hypothesized relationships between the major components of the relational/problem solving model of stress and well-being.

Figure 3. Simulation modeling analysis slope vectors

Slope Vector 1

Slope Vector 2

Slope Vector 3

Slope Vector 4

Slope Vector 5

Note: Positive correlations correspond to the slopes presented here, while negative correlations reflect the mirror images of these slopes.
Figure 4. Brian’s SPSI-R:S scores over the course of the study
Figure 5. Michael’s SPSI-R:S scores over the course of the study
Figure 6. Daniel’s SPSI-R:S scores over the course of the study
Figure 7. Kevin’s SPSI-R:S scores over the course of the study
Figure 8. Steven’s SPSI-R:S scores over the course of the study
Figure 9. Brian’s OQ 45.2 scores over the course of the study
Figure 10. Michael’s OQ 45.2 scores over the course of the study
Figure 11. Daniel’s OQ 45.2 scores over the course of the study
Figure 12. Kevin’s OQ 45.2 scores over the course of the study
Figure 13. Steven’s OQ 45.2 scores over the course of the study
Appendix A
Relevant Definitions

Social problem solving: Social problem solving is defined as the “self-directed cognitive-behavioral process by which a person attempts to identify or discover effective or adaptive solutions for specific problems encountered in everyday living” (D’Zurilla & Nezu, p. 11). More specifically, this process “makes available a variety of potentially effective solutions for a particular problem, and increases the probability of selecting the most effective solution from among the various alternatives” (D’Zurilla & Nezu, p. 11). Depending on problem-solving goals, this process may be aimed at changing the problematic situation for the better, reducing the emotional distress that it produces, or both. The term “social” in “social problem solving” is not meant to limit the problem solving process to a particular type of problem” but refers to the fact that problem solving occurs within the natural social environment (D’Zurilla & Nezu, 2007). Social problem solving is thus viewed as a learning process, a general coping strategy, and a self-control method (D’Zurilla & Nezu, 2007).

Problem: A problem is defined as “any life situation or tasks (present or anticipated) that demands a response for adaptive functioning, but where no effective response is immediately available or apparent to the person due to one or more obstacles” (D’Zurilla & Nezu, 2007, p. 12).

Solution: A solution is conceptualized as “a situation specific coping response or response pattern (cognitive and/or behavioral) that is the product or outcome of the problem-solving process when it is applied to a specific problematic situation. An effective solution is one that
achieves the problem-solving goal, while at the same maximizing other positive consequences
and minimizing negative consequences” (D’Zurilla & Nezu, 2007, p. 13). An interpersonal
solution is defined as an effective solution that resolves conflict or dispute by providing an
outcome that is acceptable or satisfactory to all parties (D’Zurilla & Nezu, 2007).
Appendix B
Treatment Fidelity: Therapist Rating Form for Each Participant

ID: Date:
Session Name: Length of Session:

Treatment Integrity
1. How many objectives were completed?
   ______ out of ______

2. Was the agenda posted?
   Yes No

3. Did the therapists assign homework?
   Yes No N/A

4. How was the group process?
   1 = poor 2 3 = average 4 5 = very good

Treatment Adherence
1. Did the individual attend session?
   Yes No

2. How many minutes late was the individual for session?
   ______ minutes late

3. How involved was the individual in therapy?
   1 = uninvolved 2 3 = average 4 5 = very involved

4. Was homework from the previous session completed or discuss?
   Yes No

5. How was the therapeutic relationship?
   1 = not good 2 3 = somewhat good 4 5 = very good

Preliminary efficacy
1. How much has this participant improved?

   0 1 2 3 4 5 6 7 8 9 10
   no improvement some improvement definite improvement

If applicable, how have they improved?
Appendix C
Treatment Fidelity: Participant Rating Form

Session Name: ___________________________ Date: ___________________________

1. How helpful was the session?

<table>
<thead>
<tr>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>not at all helpful</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>definitely helpful</td>
</tr>
</tbody>
</table>

2. How helpful was the homework for this session?

<table>
<thead>
<tr>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>not at all helpful</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>definitely helpful</td>
</tr>
</tbody>
</table>

3. Did you learn anything during the session?  
   **Yes**  **No**

4. What was helpful during this session?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

5. What was unhelpful?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

6. Have you had any contact with other group members outside of session?  
   **Yes**  **No**

   If yes, place a check in the spaces below describing the kind of contact:
   _____ GAME  _____ Internet  _____ In-person  _____ Phone

Please place this form in the large manila envelope.