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Assessment of the Prerequisite Skills for Cognitive Behavioral Therapy in Children with and Without Autism Spectrum Disorders

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Abstract

The purpose of this study was to assess the cognitive skills of children with autism spectrum disorders (ASD) thought to be necessary for Cognitive Behavioral Therapy (CBT). Forty children with ASD and forty age-matched typically developing children between the ages of 7–12 years participated. Groups were comparable with regard to nonverbal IQ, but children with ASD had significantly lower verbal IQ. Children completed three CBT-related tasks requiring emotion recognition, discrimination among thoughts, feelings and behaviors, and cognitive mediation. With the exception of the emotion recognition task, children with ASD performed comparably to typically developing children and with a high rate of accuracy.

Keywords

Cognitive behavioral therapy; Autism spectrum disorders; Asperger's syndrome; Autism

Children with autism spectrum disorders (ASD) experience a higher rate of comorbid mental health problems, including anxiety, depression, attention deficit hyperactivity disorder (ADHD), and disruptive behavior disorders than children with other communication disorders (Gillott et al. 2004), children with intellectual disability (Steffenburg et al. 1996),

and typically developing children (Gillot et al. 2004). Cognitive behavioral therapy (CBT) has gained empirical support for psychiatric disorders observed in typically developing youth (Seligman and Ollendick 2011). Given that clinically significant levels of anxiety and depression are particularly prevalent among children and adolescents with ASD (Kim et al. 2000; Leyfer et al. 2006; Simonoff et al. 2008; White et al. 2009), the use of CBT approaches for this population has garnered increased empirical attention.

The available clinical trials and case studies generally support the usefulness of cognitive behavioral therapy for comorbid mental disorders in children with ASD (Cardaciotto and Herbert 2004; Chalfant et al. 2007; Greig and MacKay 2005; Hare 1997; Lord 1996; Ooi et al. 2008; Reaven and Hepburn 2003; Reaven et al. 2009; Sofronoff et al. 2005, 2007; Sze and Wood 2007; Wood et al. 2009). However, the effectiveness of CBT has been variable and it appears that many CBT interventions used for children with ASD emphasize behavioral procedures rather than cognitive aspects of treatment, thus raising questions concerning the treatment's mechanism of action (Lang et al. 2010). This may reflect the concern that the cognitive characteristics of ASD compromise the effectiveness of therapy operating from a cognitive behavioral framework (Anderson and Morris 2006; Attwood 2004; Haddock and Jones 2006; Klinger and Williams 2009; Sze and Wood 2007). Indeed, there is debate as to whether the use of CBT for children with ASD is appropriate given that participation in CBT hinges on particular cognitive abilities (Anderson and Morris 2006; Attwood 2004; Sturmey 2005).

Although CBT typically includes a variety of treatment components, the cognitive skills emphasized during participation in the range of cognitive behavioral procedures include emotion recognition, self-reflection and metacognition (i.e., thinking about thinking), perspective taking, verbal ability, short- and long-term memory, and causal reasoning (Ellis 1979; Grave and Blissett 2004; Safran et al. 1993). Accurate reporting of internal emotional states during CBT is dependent on the ability to recognize different emotions and accurately label and discriminate between emotions (Ellis 1979; Willner 2005). Further, cognitive skills such as self-reflection and metacognition allow an individual to examine the veracity of their own thoughts and beliefs with the intent of challenging irrational or catastrophic thinking. Causal reasoning is important in order for individuals to have insight into the meaning and importance of their own and others' behavior, thoughts, and feelings (Farber 1985; Willner and Hatton 2006). Accordingly, immature cognitive skills may result in difficulty understanding and benefiting from CBT.

Research related to typically developing children's ability to engage in CBT tasks is relatively limited; however, researchers have examined children's performance on several tasks meant to simulate CBT in a nontherapeutic context. This research indicates that, by age 7, typically developing children can accurately discriminate among thoughts, feelings, and behaviors (Quakley et al. 2003, 2004; Reynolds et al. 2006) and recognize the causal connection between thoughts, feelings, and behaviors in a manner consistent with the tenets of CBT (Doherr et al. 2005; Flavell et al. 2001; Quakley et al. 2004). Moreover, results from these studies suggest that there is a positive relationship between successful completion of CBT tasks with age and cognitive abilities (Doherr et al. 2005; Quakley et al. 2003, 2004).

To date, these CBT tasks have not been assessed in children with ASD. Children with ASD may struggle with CBT tasks to a greater extent than their typically developing peers, given their cognitive differences. For example, children with ASD have difficulty recognizing thoughts and feelings in themselves and others (Celani et al. 1999; Hobson 1986a, b; Yirmiya et al. 1992). Additionally, children with ASD have been shown to have reduced ability in understanding that emotions can be caused not only by physical events and situations, but also triggered by more complex mental states, such as beliefs (Baron-Cohen 1991). Cognitive characteristics associated with ASD might limit participation in the cognitive procedures (e.g., identifying negative emotions, self-reflection, refuting irrational beliefs) that are central to CBT. In fact, in a recent study examining CBT to treat anxiety in youth, Puleo and Kendall (2010) found that higher ASD symptoms (at a subthreshold level) independently predicted differential treatment outcome, suggesting core features of ASD may decrease the effectiveness of CBT.

In view of the potential issues surrounding the application of CBT for children with ASD and comorbid psychological disorders, understanding how children with ASD perform on CBT-related tasks has implications for designing and improving treatment programs for psychopathology in this population. The purpose of this study was to compare children with ASD and age-matched typically developing children on cognitive skills that are hypothesized to influence children's response to CBT, including the ability to recognize emotions, differentiate among behaviors, thoughts, and emotions, and understand cognitive mediation. It was predicted that there would be a positive association between IQ, and age, with performance on the three CBT tasks in both groups of children and that children with ASD would perform more poorly on the three CBT tasks, as compared to typically developing children.

Method

Participants

Of the 87 families who responded to a recruitment flier and agreed to participate in the study, four children with ASD and one typically developing (TYP) child did not meet the minimum IQ cutoff criterion and were not included in study. Two children, one in the TYP group and one in the ASD group, were also not included because they were not within the age range specified for the study. Overall, the participants were 80 children (40 children with ASD and 40 typically developing children) between the ages of 7–12 years. Children with ASD were recruited through healthcare and research clinics and community-based organizations (i.e., Autism Society of America). Children with ASD were also recruited with the assistance of the Interactive Autism Network (IAN) Project at the Kennedy Krieger Institute, Baltimore, Maryland. Typically developing children were recruited within the Rocky Mountain region, as well as, the greater Washington DC/Baltimore area through local elementary schools and word of mouth. Six TYP children were siblings of children with ASD who participated in the study. Data from these participants were not significantly different from the remaining TYP children (p 's $>.10$). Specific socioeconomic data were not collected.

Children in the ASD group had a confirmed previous diagnosis of Autistic disorder, Asperger's syndrome, or Pervasive Developmental Disorder—Not Otherwise Specified (PDD-NOS) by a psychologist or physician. In addition, children in the ASD group met current criteria for an ASD as evidenced by either exceeding the minimum autism spectrum cutoff score on the Social Communication Questionnaire (SCQ; Berument et al. 1999) and/or the ADOS-G Module III (ADOS; Lord et al. 1999, 2000).

To be included in the study, all children were required to have verbal or nonverbal IQ scores greater than or equal to 85 and be verbally fluent (as evidenced by either participating in Module III of the ADOS or parent report that the child uses complete sentences to communicate). At inception of the study, the minimum full-scale IQ was set at 85. However, eight children with ASD who were tested evidenced a significant verbal-performance IQ discrepancy, such that they had either a verbal or nonverbal IQ at or below 85, but evidenced average or above average abilities in the other area. These children were able to participate in a brief conversation with the examiner and were deemed to possess the language skills necessary to participate in the study. Therefore, the minimum IQ requirement was revised to verbal or nonverbal IQ greater than or equal to 85.

With respect to the sample, 28 of the children with ASD were male and 12 were female and 17 children in the TYP group were male and 23 were female. As expected there were significantly more males in the ASD group than the TYP group $\chi^2(1, N = 80) = 6.14, p = .02$. Independent samples *t* tests revealed that there were no gender differences in task performance within the ASD or TYP group (*p*'s > .05). Therefore, boys and girls scores were combined for all subsequent analyses. There was no significant difference between groups on age, $t = .91, df = 78, p = .36$, two-tailed. Participants were primarily Caucasian and there was no significant difference between groups with regard to racial distribution $\chi^2(1, N = 80) = 2.46, p = .65$. Children with ASD demonstrated significantly lower verbal IQ scores ($t = 4.27, df = 78, p > .001$, two-tailed), full-scale IQ scores ($t = 2.93, df = 78, p = .004$, two-tailed), and receptive language scores ($t = 3.69, df = 78, p > .001$, two-tailed) than the TYP children. Children in the ASD group and TYP group did not significantly differ on nonverbal IQ ($t = .68, df = 78, p = .49$, two-tailed). The means and standard deviations for these variables are presented in Table 1. Participants in both groups had normal vision and hearing, or vision or hearing that was corrected to within normal limits based on parental report.

Measures

Autism Diagnostic Observation Schedule (ADOS; Lord et al. 1999, 2000)—The ADOS is a semi-structured, standardized observational assessment used to elicit symptoms of ASD in four domains: social interaction, communication, play, and repetitive behaviors during a 30–45 min interaction with the child. Four modules of the ADOS are available to accommodate different language abilities and developmental levels. Items are scored on a 4-point scale, with 0 indicating “no abnormality of type specified” and 3 indicating “moderate to severe abnormality.” In this study, the ADOS was administered, or previous scores obtained, as part of the diagnostic qualification process. Participants received Module 3, given that they were verbally fluent. The ADOS-G was administered and scored by a

licensed psychologist, postdoctoral fellow, or master's level clinician trained to research reliability standards. Fifteen children in the ASD group were administered the ADOS and all 15 met the clinical cutoff score for an ASD.

Social Communication Scale (SCQ; Berument et al. 1999)—The SCQ is a 40-item “yes–no” parent report measure used to screen children for ASD. The SCQ was derived from critical items included on the Autism Diagnostic Interview-Revised (Lord et al. 1994), a validated and widely used research and diagnostic instrument. For the purposes of the present study, the “Current” version of the SCQ was used. SCQ scores greater than 15 indicate a possible ASD diagnosis. The SCQ was given to parents of all children in the study to confirm the presence or absence of ASD symptomology in the ASD and typically developing groups, respectively. All children in the ASD group were administered the SCQ and exceeded the clinical cutoff score for an ASD. None of the children in the TYP group was considered by any clinician, past or present, to have symptoms of an ASD. No one in the TYP group met or exceeded the clinical cutoff score for ASD on the SCQ.

Kaufman Brief Intelligence Test—Second Edition (K-BIT-2; Kaufman and Kaufman 2004)—The K-BIT-2 is a standardized, abbreviated measure of general cognitive ability used with individual's ages 6–90 years. The three subtests, two of which measure verbal ability (i.e., verbal knowledge, riddles) and one which measures nonverbal ability (i.e., matrices) yield estimates of verbal, nonverbal, and full-scale IQ. Ten children in the ASD group were administered a Wechsler Abbreviated Scale of Intelligence (WASI; Wechsler 1999) in the last 3 years. The K-BIT-II and WASI have shown good convergent validity (with correlation coefficients ranging from .80 to .86 across verbal components, and from .62 to .80 across nonverbal components; The Psychological Corporation, 1999), therefore these scores were used for the subsequent analyses.

Emotion Recognition Task—The ability to recognize emotions was assessed using the *Pictures of Facial Affect* system (Ekman and Friesen 1976) representing six basic emotions: happy, sad, fear (scared), anger (mad), disgusted, and surprised. The 36 stimuli consisted of 2 × 3 in black and white photographs including both male and female adult, Caucasian faces. Each item consisted of six photographs (one of each emotion) arranged on a card with mixed male and female faces. The experimenter read an emotion word and participants were asked to identify which of the six facial expressions represented on the card corresponded to the word that was read. The order in which the emotions were presented was counterbalanced across participants. The percentage of emotions correctly recognized served as the dependent measure.

The Thought/Feeling/Behavior (TFB) Discrimination Task (Oathamshaw and Haddock 2006)—This task, developed for adults with intellectual disability, was used to assess the participants' ability to differentiate among thoughts, feelings, and behaviors. The questionnaire consisted of 24 sentences, eight for each subtest (i.e., Thought, Feeling, or Behavior). Three items were changed to be more developmentally appropriate for the target population (i.e., “I achieved something” was changed to “I'm good at things,” “Gardening” was changed to “Riding a bike,” and “Playing darts” was changed to “Playing a game”). For

the present study, the examiner read each item aloud to the participant and simultaneously placed a card with the sentence written on it in front of the child. The child was asked if the sentence is “something you do,” “something you think,” or “something you feel.” The percentage of correct responses overall served as the dependent measures.

Cognitive Mediation Task (Dagnan et al. 2000)—This task, also developed for adults with intellectual disability, represents a simulation of the cognitive behavioral treatment model, where participants infer emotions or beliefs based on various situation-thought-emotion pairings. The first portion of the task required participants to choose the appropriate emotion when presented with a situation-thought pairing (e.g., “If A and B, choose C”). The second portion of the task required participants to choose the appropriate thought when presented with a situation- emotion pairing (e.g., “If A and C, choose B”). An example scenario read to participants was “You walk into a room and your friends start laughing... and you feel happy. Would you be thinking my friends are nice or my friends are mean?” If the child infers the belief from their feeling, rather than the event, then they would think that their friends are nice. Five scenarios were presented twice, once with a positive emotion, and once with a negative emotion. Each situation-thought and situation-emotion scenario pairing was presented to participants both visually (i.e., printed sentences) and verbally, followed by the pertinent question. Half of the emotion-thought scenarios were incongruent such that positive situations were paired with either a negative emotion or belief and a negative situation was paired with either a positive emotion or belief. This component was added to assess whether children based their decisions purely on the valence of the event, rather than considering the emotion-thought association. Verbal responses to each question were documented. Presentation of happy and sad scenarios was counterbalanced across participants. The percentage of correct responses served as the dependent measures.

Procedures—Human subject approval was obtained via Institutional Review Board (IRB) prior to data collection. Parents gave written informed consent and children gave written assent to participate in the study. All participants were assessed in a quiet room at their home or school. The K-BIT-2 was administered first to ensure that participants achieved the minimum IQ level required to participate. Parents completed a brief demographic form that captured their child’s age, gender, and race/ethnicity and the SCQ while children were administered the remaining tasks. The administration of the emotion recognition, TFB differentiation, and cognitive mediation tasks was counterbalanced to control for any potential order effects.

Results

CBT Tasks and Participant Characteristics

Intercorrelations Intercorrelations of the major variables in this study were calculated for the two groups separately to examine the relationship among cognitive ability, receptive language ability, age, and CBT task performance using Pearson correlation. The TYP group’s performance on the TFB task was related to verbal IQ ($r = .27, p = .042$) and nonverbal IQ ($r = .31, p = .030$). Conversely, verbal IQ and nonverbal IQ were not significantly correlated with the TYP group’s performance on the emotion recognition ($r =$

-.08, .09, respectively) or cognitive mediation task ($r = .17, .19$, respectively). With the exception of the TFB task, scores on the CBT tasks were independent of verbal IQ and nonverbal IQ among typically developing children.

For children in the ASD group, a different pattern of correlations emerged. Specifically, verbal and nonverbal IQs were significantly positively correlated with scores on the TFB task ($r = .41, p = .004$ and $r = .53, p < .001$, respectively). However, verbal IQ was not significantly correlated with scores on the emotion recognition task ($r = .07$) or cognitive mediation task ($r = .23$). Nonverbal IQ was significantly positively correlated with scores on the cognitive mediation task ($r = .32, p = .022$), but not with scores on the emotion recognition task ($r = .23$). These results provide support for the prediction that verbal and nonverbal IQ scores are related to scores on the CBT tasks for the ASD group; however the results were not consistent across tasks.

Age was significantly correlated with scores on the emotion recognition task ($r = .26, p = .047$), TFB task ($r = .60, p < .001$) and the cognitive mediation task ($r = .32, p = .021$) for the ASD group. In the TYP group, age was also significantly correlated with scores on the cognitive mediation task for ($r = .29, p = .03$), TFB task ($r = .30, p = .027$), but not on the emotion recognition task ($r = .07$). Thus, the prediction that age would be correlated with performance on the CBT tasks was supported for the ASD group, and not entirely for the TYP group.

Performance on the CBT Tasks

A between-subjects multivariate analysis of variance (MANOVA) was completed to examine between-group differences on the three CBT tasks (i.e., emotion recognition, TFB, and cognitive mediation tasks). Results of these analyses are summarized in Table 2. There was a statistically significant multivariate effect of group, $F(1, 78) = 5.96, p = .001$. Analysis of each individual dependent variable, showed that two groups differed in terms of emotion recognition $F(1, 78) = 8.41, p = .005, d = .65$, differentiating thoughts, feelings, and behaviors $F(1, 78) = 8.47, p = .005, d = .65$, and understanding cognitive mediation $F(1, 78) = 8.33, p = .005, d = .64$. Thus, the hypothesis that children with ASD would perform significantly poorer on the CBT tasks relative to a typically developing comparison group was supported.

Given the significant group differences on verbal IQ and the relation between verbal IQ and CBT task performance, we conducted a between-subjects multivariate analysis of covariance (MANCOVA) in order to examine group differences (ASD and TYP) on the three CBT tasks (i.e., emotion recognition, TFB, and cognitive mediation tasks) with verbal IQ used as the covariate. The adjusted group means for each CBT task are presented in Table 2. Results indicate that the combined dependent variables (i.e., CBT tasks) were significantly related to verbal IQ $F(3, 75) = 4.61, p = .005, \eta^2 = .15$. After adjusting for differences on the covariate, analyses showed that two groups continued to differ on emotion recognition $F(1, 79) = 6.47, p = .013, \eta^2 = .07$ with the ASD group scoring significantly lower than the TYP group. Differences between groups approached significance for understanding cognitive mediation $F(1, 79) = 3.20, p = .070, \eta^2 = .04$. Again, there was a trend toward lower scores on the cognitive mediation task for the ASD group. There was no group difference for the

TFB task after controlling for the effects of verbal ability $F(1, 79) = 1.56, p = .214, \eta^2 = .02$. Thus, while group differences on emotion recognition were robust, significant group differences were not found on the TFB task or cognitive mediation task after controlling for verbal IQ.

Discussion

Children with ASD were compared with typically developing children on tasks requiring emotion recognition, discrimination among thoughts, feelings and behaviors, and cognitive mediation. When differences in verbal intelligence were taken into account, children with ASD performed comparably to the TYP group on two of the CBT tasks. The data presented here are encouraging. With the exception of the emotion recognition task, a large percentage of children with ASD completed the CBT tasks with a high rate of accuracy. These data suggest that children with ASD possess, at a basic level, the ability to engage in CBT-related tasks.

The finding that children with ASD performed more poorly on the emotion recognition task is consistent with previous research showing emotion recognition difficulties in children with ASD (Celani et al. 1999; Hobson 1986a, b; Yirmiya et al. 1992). Accurate reporting of internal emotional states, as well as understanding the causes and consequences of emotional experiences during CBT is dependent on the ability to recognize different emotions and accurately label and discriminate between emotions (Ellis 1979; Willner 2005). Thus, based on the results of the present study and given previous findings that emotion recognition represents a challenge for children with ASD, providing children with ASD affective education may be necessary prior to initiation of CBT. Indeed, there is some evidence that emotion identification and awareness can improve with teaching in the ASD population (Golan et al. 2008). Several programs, materials, and games are available which aim to teach children with ASD about emotions and may be a useful adjunct to CBT packages for children with ASD (Golan et al. 2010). Alternatively, therapists could begin by verbally providing the affective label for the child who finds emotion identification challenging (i.e., “You felt *sad* when you thought your friends were laughing at you.”).

As hypothesized, age was significantly correlated with emotion recognition accuracy in the ASD group, suggesting that older children with ASD are more accurate at recognizing emotions. In contrast to previous studies (Chung and Thomson 1995; Herba et al. 2006; Tonks et al. 2007), age was not significantly correlated with ability to accurately recognize emotions in the TYP group. The reason for the lack of association between age and ability to recognize emotions among the TYP group is not readily apparent. However, there is some evidence that the development of emotion recognition follows a nonlinear trend with evidence of step-wise changes in facial recognition development across the lifespan (Lenti et al. 1999; Pons et al. 2004; Thomas et al. 2007).

Another central aspect of CBT is that individuals recognize that thoughts, feelings, and behaviors are distinct constructs. Ability to distinguish among these constructs prepares an individual to examine how their beliefs relate to their emotions. Most children with ASD in this study were able to distinguish thoughts, from behaviors and feelings. An important

finding was that children with ASD did not differ from TYP children on the TFB task after differences on verbal intelligence were covaried. However, given that the majority of children obtained near the maximum score possible on this task, the presence of a ceiling effect limits variability to determine if group differences exist. As hypothesized, children with ASD who were older and who demonstrated higher verbal intelligence were better able to recognize thoughts, feelings, and behaviors as distinct constructs. Some investigators and clinicians have suggested using specific adaptations in order to help children understand and distinguish among thoughts, feelings, and behaviors (for suggestions, see Quakley et al. 2003). These strategies may be helpful for children with ASD, particularly those who have lower cognitive ability. In fact, Kerr and Durkin (2004) showed that it is possible to teach children with ASD to understand intangible mental states by using more concrete, observable representations (e.g., thought bubbles, comic strips). These procedures may be a useful first step to treatment in teaching children with ASD to understand abstract mental concepts.

This study offers a preliminary assessment of how children with ASD understand the concept of cognitive mediation. Both children with ASD and TYP children had difficulty inferring beliefs and emotions based on an event. Overall, it appears that at this age children may not have yet developed the complex reasoning skills needed to fully recognize the causal connection between thoughts and feelings in a manner consistent with the tenants of CBT. Performance on this measure was largely related to age and nonverbal IQ to a greater extent in the ASD group than the TYP group. Based on these results, again specific adaptations such as making the relationship between mental states more concrete (i.e., by using visual cues such as thought bubbles), may be useful for younger children with and without ASD, particularly those who have lower language capacities and intellectual functioning.

The process of cognitive mediation is central to CBT in order to modify maladaptive thinking. More sophisticated treatment components, such as causal reasoning and cognitive restructuring, may therefore represent a challenge for children with ASD. The findings from this study support the notion that causal reasoning may be beyond the cognitive and developmental capacities of young children with ASD. The data also reinforce the tendency of therapists to deemphasize cognitive treatment components, with more focus being placed on providing children with developmentally appropriate cognitive coping statements (Kendall et al. 2005). The departure from purely behavioral interventions for children with ASD indicates progress, yet the need for additional evaluations of the efficacy of CBT for this population remains. Direct comparisons between CBT and behaviorally-based interventions are necessary. Systematic study of cognitive development as it relates to the ability to engage in CBT is only in its beginning stages relative to the adult field (Kendall and Choudhury 2003; Kingery et al. 2006; Stallard 2002). Continued research in this area will lead to a better understanding of developmental psychopathology in youth with ASD.

A potential limitation of the study is that two of the tasks were borrowed from studies on adults with intellectual disability and have not been used before with children and may explain why children performed at ceiling level on the TFB task. Although the tasks appear to have good face validity, the psychometric properties of these tasks have not been

established. Furthermore, to what extent children's performance of these tasks translates into success using CBT is unclear. Clinically it would be important to examine whether performance on tasks such as these predicts outcome from CBT. These assessment procedures may then be used in making treatment decisions, such as when to apply CBT procedures for a given child.

The generalizability of the findings is limited by our choice to examine cognitive skills essential for CBT at a developmentally important period among children functioning in the average range of intellectual abilities. Additionally, specific sociodemographic information was not collected. Therefore it may be useful to examine these skills in younger children and adolescents as a way to determine the margin of possibility to participate in CBT. Currently, there is little agreement among cognitive behavioral researchers and therapists as to the age at which children develop cognitive skills necessary for CBT (Sauter et al. 2009). Thus, further research examining cognitive capacities in youth of various ages and developmental levels is warranted.

This study demonstrates that children with ASD who have average cognitive abilities are able to perform tasks pivotal to CBT, and may therefore be able to benefit from validated cognitive behavioral interventions. The need for effective treatments for children with ASD and comorbid psychopathology is likely to increase given the growing ASD population (Charman 2002; Fombonne 2003; Wing and Potter 2009). Furthermore, effective treatments are apt to be in high demand considering evidence that children with ASD experience mental health problems at higher rates than other pediatric populations (Gillott et al. 2004; Steffenburg et al. 1996). Future research examining CBT for children with ASD would benefit from building upon the available research in several ways. First, comprehensive randomized controlled trials (RCTs) are necessary before implications of the effectiveness of CBT for people with ASD can be determined. Multisite randomized clinical trials are needed comparing CBT to another active form of treatment, including behavioral and pharmacological interventions. Second, examining how performance on tasks such as these predict treatment outcome using CBT would help inform best treatment practices. Finally, inclusion of children with below average cognitive abilities would also allow opportunity to examine the full range of ASDs to be included in the consideration of CBT.

Results of this study suggest that many children with ASD can participate in the basic cognitive tasks of CBT. The use of CBT among children with ASD is not without challenge. There are many factors which are likely to increase the complexity of using CBT for children with ASD, including limitations in emotional awareness, concrete thinking style, and difficulty reflecting upon their own and others thoughts, intentions and beliefs. Although several authors have provided recommendations to overcome some of the inherent obstacles of working with youth with ASD (Anderson and Morris 2006; Greig and MacKay 2005; Klinger and Williams 2009; Lang et al. 2010; Reaven 2009), how these changes influence the theoretical integrity of CBT remains an important consideration. Adaptations to cognitive behavioral procedures occur frequently in the child CBT field suggesting that modifications can be successfully implemented (Kendall 1993; Stallard 2002). In fact, contemporary cognitive behavioral models for youth incorporate a developmental perspective into the practice of CBT (Grave and Blissett 2004; Kendall 1993; Sauter et al.

2009; Stallard 2002). Modifications to CBT that incorporate developmental considerations in their application prove that adaptations can be made, while still maintaining the underlying theoretical base (Kendall et al. 1990). Tailoring the content and materials to be more developmentally appropriate for each child may make CBT accessible to children with a wider range of abilities. This will require careful assessment of cognitive level and language ability with adaptations to therapy being made accordingly. Success in working with youths with an ASD may necessitate an individualized approach which requires time, flexibility, and creative problem solving. Alternatively, for children who have not developed the appropriate prerequisite skills, behaviorally focused therapy may be more appropriate.

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Table 1

Participant characteristics by group

Variable	ASD ^a	TYP ^a
CA (in years)		
Mean	9.93	9.59
SD	1.6	1.7
Range	7.1–12.8	7.0–12.7
NVIQ		
Mean	103.28	105.55
SD	15.1	14.5
Range	70–129	75–143
VIQ		
Mean	96.70	111.55
SD	18.4	11.9
Range	65–151	81–141
Race (frequencies)		
Caucasian	34	37
African American	1	1
Asian American	1	1
Other	4	2
Gender ratio		
Males:Females	28:12	17:23
SCQ		
Mean	21.37	1.7
SD	6.3	1.9
Range	11–33	0–6

ASD autism spectrum disorder group, TYP typically developing group, CA chronological age, NVIQ nonverbal intelligence quotient, VIQ verbal intelligence quotient, SCQ Social Communication Questionnaire

^a n = 40

Table 2

Percentage correct on CBT tasks by group and after controlling for group differences in verbal IQ

Task	ASD ^a		TYP ^a	
	Mean	SD	Mean	SD
ER	65.17	18.7	77.25	18.4
Adjusted ER	65.29		77.13	
TFB	90.20	14.7	97.40	5.1
Adjusted TFB	92.19		95.40	
CM	61.75	12.6	70.25	13.6
Adjusted CM	63.03		68.96	

ASD autism spectrum disorder group, TYP typically developing group, ER emotion recognition task, TFB thought-feeling-behavior task, CM cognitive mediation task

^a
n = 40