



Treatment Response among Preschoolers with EBP: The Role of Social Functioning

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Abstract

The purpose of the study was to identify profiles of social functioning for preschoolers with externalizing behavior problems (EBP) and examine how profiles are predictive of response to a behavioral treatment program. 139 preschoolers with EBP participated in an 8-week Summer Treatment Program for Pre-Kindergartners (STP-PreK). Latent profiles of social functioning were created from parent and teacher rated atypicality and social skills scales, along with child performance on an emotion knowledge and hostile attribution task. Baseline and treatment outcomes included behavioral, academic, and executive functioning measures. Latent profile analyses resulted in two profiles (e.g., average and low) marked by differences in social skills, emotion knowledge and rates of atypical behaviors. Children in the low social functioning group had higher teacher rated hyperactivity and attention problems at baseline ($d = .44$ & 1.07), as well as lower IQ ($d = .39$). Children in the low social functioning group also had poorer treatment response as they had lower executive functioning scores ($\beta = -.17, p < .05$) at the completion of treatment. IQ moderated the association between social functioning profiles and behavioral treatment outcomes, such that lower social functioning was only associated with higher rates of attention problems for children with average IQ. Findings highlight the differential impact of social functioning in predicting treatment outcomes.

Keywords Externalizing behavior problems · Social functioning · Behavioral treatment · Preschoolers

Externalizing behavior problems (EBP), including aggression, oppositionality, inattention, and hyperactivity, are amongst the most prevalent mental health problems for preschool children (Keenan and Wakschlag 2000; Polanczyk et al. 2014). Children with EBPs, such as ADHD, typically experience impairment across a host of functional domains including academic achievement, behavioral maladjustment, and cognitive functioning (Campbell et al., 2000; Hinshaw, 1992; Nigg & Barkley, 2014). However, impairments in social functioning are especially evident in preschoolers with EBP (Campbell, 1994; Webster-Stratton & Hammond, 1998). As with normative samples (Bagwell, Schmidt, Newcomb, & Bukowski, 2001; Parker & Asher, 1987), social functioning is amongst one of the strongest predictors of short and long term prognosis for children with EBP

(Greene et al., 1997). Thus, substantial research has aimed to examine the nature of social functioning outcomes for this clinical population (see Nixon, 2001 for a review).

Theoretical conceptualizations of social functioning often refer to social competence, which includes the enactment of prosocial behaviors including helping, sharing, engaging in reciprocity during interactions (Eisenberg et al., 2006) or any other behavior that leads to positive social outcomes (Gresham, 1986). While previous conceptualizations of social functioning focused on social “skills” deficits and “performance” deficits (Gresham & Elliot, 1987), more recent models implicate the importance of not only the acquisition and performance of socially appropriate behaviors but also the contextual appropriateness of said behaviors (Dirks, Treat, & Weersing, 2007). A more multidimensional view of social functioning not only implicates behavioral aspects of social functioning (e.g., social skills, atypical behaviors) but also emotional (e.g., emotion recognition) and cognitive (e.g., social information processing) factors that are necessary to modulate behaviors for appropriate contextual responses.

While well documented social functioning deficits exist for children with EBP within distinct aspects of social functioning, limited work has taken a multidimensional view of social

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functioning by examining deficits jointly across domains of social functioning (i.e., behavioral, emotional, cognitive). A more comprehensive examination through a profile framework may shed light on individual differences in an effort to better classify heterogeneity within preschoolers with EBP. From a developmental perspective, the preschool period is marked by a considerable increase in exposure to peer interactions (Downer, Booren, Lima, Luckner, & Pianta, 2010), which may have implications for the development of social abilities. Within normative populations, various aspects of social functioning not only emerge during the preschool period but are also associated with later developmental outcomes (Gifford-Smith & Brownell, 2003). Thus, taking a multidimensional perspective of social functioning within the preschool period would be beneficial in better understanding the complex presentation of social abilities during a critical period when social functioning is emerging and highly predictive of outcomes. Examination of each of these domains of social functioning may be especially important for preschoolers with EBP, as social functioning seems to be relatively unmalleable (Abikoff et al., 2004) and a robust predictor of later functional outcomes (Nixon, 2001). Additionally, a comprehensive examination of social functioning within preschoolers may be of value given previous meta-analytic reviews documenting the largest deficits in social functioning exist for young children with EBP (Ros & Graziano 2017).

When considering a multidimensional view of social functioning it is most essential to consider the behavioral, emotional, and cognitive domains of social functioning. Within the behavioral functioning domain, overt behaviors such as poor social skills and the enactment of atypical behaviors may be most implicated as these represent readily observable behaviors often displayed by children with EBP. Within the emotional domain, competence of emotional stimuli, such as emotion recognition, is important for processing others' as well as own emotions, which is necessary for modulating social responses accordingly. Finally, within the cognitive domain, cognitive biases such as the hostile attribution bias are important for adaptive social information processing. The current paper will examine not only baseline profiles of preschooler's social functioning across these domains, but will also examine how initial social functioning profiles impact treatment response.

Markers of Social Functioning: Behavioral

Social Skills Studies examining the behavioral domain of social functioning in children with EBP often focus on deficits in the enactment of social skills and prosocial responding. Specifically, preschoolers with EBP, including children with Attention-Deficit/Hyperactivity disorder (ADHD), are rated by teachers as having poorer social skills and as less socially competent in classroom interactions (DuPaul et al., 2001).

Social deficits are also demonstrated during laboratory simulation situations involving social skills (Hoza et al. 2000). The social skills that are often reported as being most impaired in children with EBP include cooperation (DuPaul et al., 2001), turn-taking (Hubbard & Newcomb, 1991), and reciprocity in conversation (Clark et al., 1999).

Atypicality Recent efforts have identified atypical behavior as a possible marker for social difficulties for children with EBP. Atypicality has been commonly conceptualized as behavior perceived to be abnormal relative to a larger peer group (DeRosier & Mercer, 2009). Behavior rating scales such as the Behavior Assessment Scale for Children (BASC-2; Reynolds & Kamphaus, 2004) define atypicality as a tendency to behave in odd or strange ways that are perceived to be incongruent and disconnected from norms expected from larger peer groups. The BASC-2 classifies behaviors such as “acting strangely” or “seeming unaware of others” as atypical behaviors. While social skills refer to the enactment of desired prosocial behaviors, atypicality represents a more qualitative measure of oddness or discordance with group norms as well as a lack of integration/awareness with peers. Children with EBP tend to display higher rates of atypical behaviors than typically developing children (Manning & Miller 2001). In fact, atypicality has been deemed one of the strongest discriminators between children with ADHD and controls (Harrison et al., 2011) and has been shown to predict social functioning in children with EBP beyond ADHD symptoms (Graziano, Geffken, & McNamara, 2011). While considerable work has examined social skills deficits in preschoolers with EBP (DuPaul et al., 2001), much less is known about atypicality in preschool samples.

Markers of Social Functioning: Emotional

Emotion Recognition Emotional competence plays a role in social skill development and functioning in social situations (Saarni, 1999) as the ability to recognize other's emotions is conducive for children to subsequently control their own social behavior. Emotion recognition skills in particular may actually play a foundational role in the development of social functioning as studies have shown that emotion recognition is predictive of later social competence but not vice-versa (Mostow et al., 2002). Children with EBP tend to have poorer emotion recognition skills when compared with typically developing peers (Corbett & Glidden, 2000; Singh et al., 1998; Sjöwall et al., 2013) in varied contexts and through varied modalities (Da Fonseca et al., 2009; Norvilitis et al., 2000). Errors in emotion recognition, particularly those in recognizing anger, are predictive of social functioning deficits for children with EBP (Pelc et al., 2006). In fact, children with ADHD and co-occurring conduct problems tend to misinterpret emotions as angry more often (Cadesky

et al., 2000) further providing evidence for a hostile attribution bias. With regard to preschool samples, previous work has demonstrated that emotion recognition deficits in preschool are predictive of later aggression (Denham, et al., 2002). Interestingly, Yuill and Lyon (2007) found that children with ADHD perform poorly on emotion recognition tasks in comparison to similar tasks using non-emotional stimuli even when examiners are instructed to provide scaffolding throughout tasks (e.g., prompting to look carefully first). These findings imply that there is specificity about affective stimuli that is deficient in children with ADHD beyond cognitive or impulsive difficulties.

Markers of Social Functioning: Cognitive

Hostile Attribution Bias Cognitive factors, including social information processing biases, constitute an important domain of social functioning. While many components of social information processing, such as social cue detection and problem solving, are important for adaptive social functioning, considerable work has focused on examining the hostile attribution bias in children with EBP (De Castro, Veerman, Kooops, Bosch, & Monshouwer, 2002). The hostile attribution bias refers to a key cognitive distortion in which individuals attribute aggressive intent to neutral situations (Dodge, 1980), which is thought to impact the interpretation of social cues and lead to biased responding. Thus, the hostile attribution bias may be conceptualized as a precursor which impacts subsequent social information processing. Additionally, the hostile attribution bias is one of the more well studied social information processes in preschoolers with EBP as more advanced cognitive processes are often difficult to operationalize and examine in preschoolers. Indeed, developmental work has focused on the hostile attribution bias in preschoolers and documented its prediction of later problem behaviors (Runions & Keating, 2007).

The hostile attribution bias has been largely studied as it relates to aggressive behaviors. However, given the high levels of aggression in children with ADHD (Atkins & Stoff, 1993), many studies have also examined the role of the hostile attribution bias within clinical ADHD samples. Children with EBP, including ADHD and aggression, are more likely to interpret social cues with a hostile attribution bias (Mikami et al., 2007; Milich & Dodge, 1984). Specifically, children with ADHD and co-occurring aggression display more hostile responses to peer provocation situations (King et al., 2009) and tend to generate hostile responses during problem solving activities (Bloomquist et al. 1997; Mikami et al., 2008).

Social Functioning and Treatment Response

Longitudinal studies reveal that social functioning is not only stable across development but is also a robust predictor of long

term outcomes (Greene et al., 1997). While substantial work has demonstrated the effectiveness of behavioral treatments for improving EBP in children (Evans et al., 2014; Pelham & Fabiano, 2008), behavioral treatments remain limited in improving social functioning (Abikoff et al., 2004; Evans et al., 2014). Given its stability and resistance to treatment, social functioning may perhaps be better viewed as a risk or protective factor in predicting outcomes for children with EBP. More recent efforts have focused on moderators and mediators of treatment outcomes for behavioral interventions for EBP (Beauchaine et al., 2005; Hinshaw, 2007). While studies demonstrate demographic factors such as socioeconomic status and ethnicity moderate treatment response (Arnold et al., 2003; Jensen et al., 1999), limited work has examined initial social functioning as a potential moderator. Although considerable work has demonstrated the importance of social functioning in predicting functional outcomes, no work has examined how initial social functioning may work to differentially maximize or minimize treatment gains. Additionally, the majority of previous work has been conducted with elementary-aged children, with very few studies examining social functioning and treatment response within preschoolers.

Specifically designed for preschoolers with EBP, the Summer Treatment Program for Prekindergartners was associated with improvements in behavioral outcomes across an open trial (Graziano et al., 2014) and a randomized trial (Graziano & Hart, 2016). Specifically, the STP-PreK was effective in improving children's behavioral functioning and self-regulation. However, like most studies examining behavioral treatment programs, the role of social functioning in impacting treatment gains has not been examined. Given the initial efficacy of this intervention in improving outcomes for preschoolers with EBP, it may be important to examine moderators of treatment such as social functioning which are stable and salient predictors of later functional outcomes.

While traditional treatment outcomes for children with EBP focus on behavioral functioning, it is also important to note that more comprehensive treatments such as the STP-PreK also target academic and even executive functioning (EF) outcomes. Given the links between social functioning and EF skills (Diamantopoulou et al., 2007) as well as academic skills (Bagwell et al., 2001), it is important to examine these other functional outcomes after the completion of psychosocial treatments as they may also be impacted by social functioning deficits.

Social Functioning and Intelligence

When examining the stability and saliency of social functioning and EBP it may also be of importance to consider the role of cognitive abilities, including intelligence. For instance, children with intellectual delays are not only more likely to experience heightened levels of EBP (Baker et al., 2002; Baker et al., 2003;

Dekker et al., 2002) but also experience poorer social outcomes (Emerson et al., 2010). While evidence exists to suggest that behavioral treatments for EBP are effective in improving behavioral outcomes for children with intellectual delays (Bagner & Eyberg, 2007; McIntyre, 2008; Roberts et al., 2006), these improvements have not been compared with treatment response for children with normative levels of cognitive development. Additionally, lower IQ in samples with normative cognitive abilities is associated with poorer treatment response (Owens et al., 2003). Given the impact of intelligence in predicting treatment response it may be important to examine how cognitive developmental concerns are impacted by social functioning in the context of behavioral treatment. It is possible that lower IQ may exacerbate the effects that negative social functioning has on predicting poor treatment response, as children with lower IQ experience heightened social deficits.

The Current Study

In summary, deficits in distinct domains of social functioning have been identified for children with EBP. Considerably less work has examined the social functioning profiles of preschoolers despite evidence suggesting greater social impairment in young children (Ros & Graziano, 2017). However, more integrative approaches are necessary to better understand the profiles of social deficits for preschoolers with EBP. For example, it remains unclear whether profiles of poor social functioning are marked by differences across distinct domains (behavioral, emotional, or cognitive). Additionally, the role that social functioning may play in treatment response remains unclear.

The current study aimed to a) investigate the feasibility of creating latent profiles of social functioning based on indicators of social functioning including social skills, atypical behavior, emotion knowledge, and hostile attribution bias, b) extend the initial efficacy of a behavioral intervention by determining the extent to which profiles predict differences in baseline functioning as well as treatment response, and lastly, c) examine the role of IQ in moderating the association between social functioning and treatment outcomes. A recent meta-analytic review examining social functioning in children with ADHD documented significant heterogeneity across and within domains (i.e., peer, behavioral, and cognitive markers; Ros & Graziano, 2017). While we acknowledge that deficits within social functioning domains do tend to co-occur, given the significant heterogeneity within this population, we expect that children with EBP may present more significant impairments within certain domains relative to others. For instance, a child who displays poor social performance as evident by fewer social skills and higher rates of atypical behavior may still have appropriate social expectations and emotional awareness. Given this variability in presentation of social

dysfunction, we expected marked differences in profiles to emerge across domains. Specifically, we expected 4 profiles of social functioning to emerge with deficits pronounced in each respective area (e.g., one profile with poorer social skills, one profile with higher rates of atypical behavior, one profile with poorer emotion knowledge, and one profile with higher levels of hostile attribution biases). We expected that the initial social functioning profile marked by the lowest levels of emotion recognition, poorest social skills, and highest level of atypicality would be predictive of worse baseline functioning in other domains as well as poorer treatment outcomes. We also predicted that the effect of membership in the lowest social functioning profile on poorer treatment response would be larger for preschoolers with lower IQ.

Method

Participants and Recruitment

The study was conducted at a large urban university in the Southeastern United States with a large Hispanic/Latino population. Families were recruited from local preschools and mental health agencies through brochures, radio ads, and open houses/parent workshops to participate in an intensive summer treatment program, the Summer Treatment Program for Pre-Kindergartners (STP-PreK; Graziano et al., 2014; Graziano & Hart, 2016). Eligibility to participate in the STP-PreK was determined by (a) an externalizing behavior problems t-score of 60 or higher on the parent ($M = 64.93$, $SD = 12.64$) or teacher ($M = 66.29$, $SD = 13.63$) Behavior Assessment System for Children (BASC-2; Reynolds & Kamphaus, 2004), (b) enrollment in preschool the previous school-year, (c) an IQ of 70 or higher ($M = 89.58$, $SD = 14.36$) on the Wechsler Preschool and Primary Scale of Intelligence (WPPSI-IV; Wechsler, 2012); (d) no history of a primary diagnosis of an Autism Spectrum Disorder (ASD) or Psychotic Disorder, and (e) ability to attend an 8-week summer program.

The final sample consisted of 139 preschoolers ($M_{\text{age}} = 4.99$, 72% male) whose parents provided informed consent to participate in the research study and took part in the STP-PreK. Of note, a majority of the children in the sample participated in an either an open trial ($n = 30$; Graziano et al., 2014) or one of two randomized trials of the STP-PreK ($n = 30$, Graziano & Hart, 2016; $n = 30$, Hart & Graziano, in preparation). Of note, the current study sample ($n = 139$), included additional children who participated in the STP-PreK across two additional cohorts. Although all of the measures described in detail below were administered to all children as part of the open trial and RCTs, the treatment outcomes outlined (i.e., BASC-2, WJ, HTKS) were all examined as treatment outcomes within both previous manuscripts. The focus of the current paper was to examine social functioning measures as moderators of such treatment outcomes.

According to the NIMH Diagnostic Interview Schedule for Children Version IV (C-DISC; Shaffer et al., 2000), 47% of children in the sample met diagnostic criteria for Attention Deficit Hyperactivity Disorder (ADHD) and Oppositional Defiant Disorder (ODD) and an additional 38% met criteria for ADHD alone while 10% met criteria for ODD alone. Further demographic information for this sample is provided in Table 1.

Study Design and Procedures

This study was approved by the university's Institutional Review Board. All families completed a pre-treatment assessment where parents were asked to complete questionnaires about their child's behavior and social functioning. At the pre-treatment assessment children underwent IQ testing, academic achievement testing, a standardized EF battery, and tasks to assess their social functioning. All families also participated in a post-treatment assessment one week following the completion of the intervention where all study measures were re-administered, with the exception of IQ testing. The feasibility and initial efficacy of the STP-PreK, in improving children's EBP and school readiness outcomes, is reported elsewhere (Graziano et al., 2014; Graziano & Hart, 2016). For the purposes of this study, we examined how initial social functioning profiles were predictive of treatment outcomes.

All children participated in the STP-PreK, which is an 8-week summer treatment program to improve behavioral, socio-emotional, and academic readiness for children preceding the kindergarten transition. Parents of children in the summer program also attended eight 2-hour weekly group parenting sessions based on the School Readiness Parenting Program (SRPP; Graziano, Ros, Hart, & Slavec, 2017). A subset of children in this sample ($n = 15$) participated in a 4-week version of the summer camp,

however parents still completed the full parenting program. Children in the 4-week program did not differ significantly on any variables of interest with the rest of the sample.

Measures: Baseline Social Functioning

Atypicality Parents and preschool teachers rated children on levels of atypical behaviors based on the BASC-2 (2–5:11 form; Reynolds & Kamphaus, 2004) as part of the pre-treatment assessment. The atypicality scale of the BASC-2 includes questions such as “acts strangely” and “seems unaware of other children.” Other studies utilizing the atypicality scale of the BASC-2 have documented associations with other social functioning outcomes above symptoms of EBPs (Graziano et al., 2011). Gender and aged normed t-scores were examined for this study based on the Atypicality scale ($\alpha = .79-.86$).

Social Skills Parents and preschool teachers rated children on social skills based on the BASC-2 (2–5:11 form; Reynolds & Kamphaus, 2004) as part of the pre-treatment assessment. The social skills scale of the BASC-2 includes questions such as “makes friends easily” and “offers help to other children.” Examination of the social skills scale demonstrates convergent validity with other social functioning measures such as the Social Skills Rating System (SSRS; Flanagan et al., 1996). Gender and aged normed t-scores were examined for this study based on the Social Skills scale ($\alpha = .81$).

Emotion Knowledge Children completed a standardized emotion knowledge (EK) task (Denham, 1986) during the pre-treatment assessment, which required children to both expressively and receptively identify 8 different emotions (sad, happy, angry, afraid, surprised, disgusted, embarrassed, guilty) as presented visually via cartoon and human faces. Children scored 1 point for each correct expressive and subsequent receptive answer. A total of 32 points was possible with higher scores indicative of better emotional awareness/knowledge.

Hostile Attribution Bias During the pre-treatment assessment children were also administered the Challenging Situation Task (CST; Denham et al., 1994). Children were presented with hypothetical peer provocation scenarios and asked to choose from 4 behavioral responses (prosocial, avoidant, aggressive, and crying). Scenarios and responses were depicted with respective cartoon illustrations and standardized scripts. For the purposes of this study, aggressive responding (e.g., yelling, hitting, or destroying the other person's game) was examined as an index of children's hostile attribution bias.

Table 1 Demographics for sample

Characteristic	Percentage in sample
Child Race/ethnicity (%)	
Non-Hispanic/Latino White	11.51
African-American	5.75
Hispanic/Latino	81.29
Other	2.16
Family Status (%)	
Intact two-parent household	61.15
Living with a partner	4.32
Single parent household-divorced/separated	22.30
Single parent household-never married	12.23
Reporter of questionnaires (%)	
Mothers	85.61
Fathers	13.70
Other (grandmother)	.72

Measures: Intelligence

Children were administered the Wechsler Preschool and Primary Scale of Intelligence –Fourth Edition (WPPSI-IV; Wechsler, 2012) during the pre-treatment assessment. Core subtests (i.e., block design, information, matrix reasoning, bug search, similarities, and picture memory) were administered by trained graduate students and research assistants and used to calculate a full-scale IQ. A subset of children who participated in the earlier cohort were administered the Vocabulary and Block Design subtests of the Wechsler Preschool and Primary Scale of Intelligence –Third Edition (WPPSI-III; Wechsler, 2002) as these two subtests provide reliable estimates of full-scale IQ (Sattler & Dumont, 2004). There were no significant differences in any study measures between children who were administered the WPPSI-III from the rest of the sample. All children involved in the present study were required to be fluent in English as administration of standardized measures could only be conducted in English. Thus, all child testing was conducted in English.

Measures: Treatment Outcomes

Behavioral Functioning To assess children's behavioral functioning parents and preschool as well as kindergarten teachers were asked to complete the Behavior Assessment System for Children, 2nd Edition (BASC-2; Reynolds & Kamphaus, 2004) at the pre-treatment assessment as well as at the post-treatment evaluation one week after the completion of treatment. The BASC-2 has well established internal consistency, reliability and validity (Reynolds & Kamphaus, 2004). Items on the BASC-2 are rated on a four point scale (“never,” “sometimes,” “often,” “almost always”) and yield scores on broad internalizing, externalizing, adaptive and social functioning domains. The attention ($\alpha = .75-.80$) and hyperactivity ($\alpha = .85$) subscales were examined as indicators of children's behavioral functioning response. Gender and age normed t-scores were examined. While preschool teacher reports were used to examine baseline behavioral functioning, given the timing of the intervention, we were unable to examine changes in teacher reported behavioral functioning as kindergarten teachers provided post-treatment reports. Considerable work has demonstrated that the transition from preschool to kindergarten represents a considerable shift in behavioral expectations as well as decreased supervision (Rimm-Kaufman & Pianta, 2000). Given the changes in behavioral expectations for preschool versus kindergarten teachers along with the impacts of teacher characteristics on ratings of externalizing behavior problems (Mashburn, Hamre, Downer, & Pianta, 2006), we chose not to include discrepant teacher reports for post-treatment outcomes.

Academic Outcomes Children were individually administered six subtests of the Woodcock-Johnson Test of Achievement, 3rd Edition (WJ-III, Woodcock et al., 2001), a widely-used, norm-referenced measure of academic ability, at the pre-treatment assessment as well as at the post-treatment evaluation one week after the completion of treatment. Internal consistencies across subtests are generally high (.70–.90) along with good to excellent test-retest reliability (.70–.96; Mather & Woodcock, 2001). The six subtests administered were Applied Problems, Calculation, Writing Sample, Letter-Word Identification, Passage Comprehension, and Spelling. The current study examined the mean standardized scores of the derived composite scores: *Brief Reading* (Letter-Word Identification, Passage Comprehension), *Brief Math* (Applied Problems+ Calculation), and *Brief Writing* (Spelling + Writing Sample). However, given the high correlations among these composites (r 's = .57–.70, $p < .001$), an overall achievement was used by averaging the composite scores.

Executive Functioning (EF) Children were administered the Head-Toes-Knees-Shoulders task (HTKS; Ponitz et al., 2008) at the pre-treatment assessment as well as at the post-treatment evaluation one week after the completion of treatment. The HTKS is a widely-used and psychometrically sound task used with preschoolers to assess multiple aspects of EF (McClelland et al., 2007; Ponitz et al., 2009; Wanless et al., 2011). Previous work utilizing the HTKS task with preschoolers with EBP has established its validity not only with standardized working memory tasks but also with inhibitory self-control tasks within classroom settings (Graziano et al., 2015). Thus the HTKS task represents an ecologically valid EF task as it taps in to behavioral and cognitive EF domains. In the HTKS task children are provided with paired behavioral responses (“touch your head,” “touch your toes”) and then asked to perform in the opposite way (touches head when prompted to touch toes). The measure is scored such that 2 points are awarded for a correct opposite response, 0 points for an incorrect response, and 1 point if any motion to the incorrect response is made but then self-corrected. Scores range from 0 to 40, with higher scores indicative of better EF.

Data Analytic Plan

All analyses were conducted using SPSS 20.0 and Mplus 7. Preliminary data screening revealed a low percentage of missing data (less than 10%). Little's Missing Completely at Random Test revealed that missing data was missing completely at random ($\chi^2 (359) = 380.67$, $p = .21$). All available data were used for each analysis. Additionally, all variables of interest were screened for normality by ensuring that indices of skewness and kurtosis were within acceptable ranges. A latent profile analysis using maximum likelihood estimation was conducted in

Mplus 7.0 (Muthén & Muthén, 2012) using pre-treatment indicators of social functioning. Number of profiles was determined by the minimization of the Bayesian information criteria index and the minimization of cross classification probabilities (Sclove, 1987). Baseline functioning on other domains (i.e., behavioral, academic, cognitive) was compared using the profile membership determined by the latent profile analysis utilizing Analysis of Variance analyses. Next profile membership was used as a predictor of treatment outcomes (behavioral, academic, executive functioning) controlling for pre-treatment scores in a more traditional ordinary least squares regression framework. IQ was proposed as a moderator of treatment outcome. Significant interactions were probed following procedures outlined by Aiken et al. (1991) and the use of Hayes's macro (Hayes & Matthes, 2009).

Results

Preliminary Correlations between Variables

Preliminary correlations were examined between parent and teacher rated markers of social functioning. The correlation between atypicality and social skills was significant for parents ($r = -.40, p < .001$) and teachers ($r = -.33, p < .001$). Additionally, parent rated social skills were associated with teacher rated social skills ($r = .31, p < .001$). However, parent rated atypicality was not associated with teacher rated atypicality ($r = .09, p = .28$). Next, correlations between parent/teacher rated markers of social functioning and parent/teacher rated treatment outcomes were examined. Parent rated atypicality was associated with parent rated attention problems ($r = .36, p < .001$) and hyperactivity ($r = .38, p < .001$). Similarly, parent rated social skills were associated with parent rated attention problems ($r = -.26, p < .05$) but not hyperactivity ($r = -.10, p = .22$). Teacher rated atypicality was also associated with teacher rated attention problems ($r = .53, p < .001$) and hyperactivity ($r = .31, p < .001$) but teacher rated social skills were not associated with either attention problems ($r = -.17, p = .05$) or hyperactivity ($r = -.01, p = .90$).

Latent Profile of Social Functioning

Latent profile analyses (LPA) were conducted in Mplus 7.0 (Muthén and Muthén 2012) to identify profiles of social functioning. Indicators used for profile membership were parent and teacher rated atypicality and social skills on the BASC-2, emotion recognition on the EK task, and hostile attribution bias based on the aggressive responses on the CST. Given considerable work demonstrating high rates of discordance between parent and teacher reports within samples of children with EBP (Mitsis, McKay, Schulz, Newcorn, & Halperin, 2000), parent and teacher reports of atypicality and social

skills were entered as separate indicators into the LPA. While some studies have recommended using combined parent/teacher reports (Power et al., 1998), psychometric studies demonstrate significant measurement invariance across parent teacher measurement models suggesting that reporters are contributing unique clinical information for children with EBP (Narad et al. 2015). Given that we were examining parent and teacher indices of social functioning within a measurement framework (i.e., LPA) we chose not to combine reports in order to prevent losing unique variance.

In fact, in our sample parent rated atypicality was not associated with teacher rated atypicality ($r = .09, p = .28$). However, social skills ratings were significantly associated between parents and teachers ($r = .31, p < .001$). Given that we did not want to lose variability from the atypicality scale we decided the most parsimonious approach would be to include both reporters for both measures. Indeed, other studies have also included multiple reporters/sources (e.g., parent, self, observational, physiological) as indicators within latent profile analyses (Zalewski et al. 2011).

We examined LPA solutions using a 1-, 2-, and 3-factor model. A boot-strapped likelihood ratio test revealed that the two-factor solution was significantly better than the 1-factor solution, $\chi^2(7) = 43.65, p < .001$. An absolute lower BIC and AIC value was produced for the 2-factor solution (BIC = 5233.75; AIC = 5177.99). The entropy value indicated acceptable classification quality (.74; Murphy, Shevlin, & Adamson, 2007). Although the 3-factor solution produced a significant likelihood ratio test, $\chi^2(7) = 32.12, p < .001$, when compared with the 2-factor model, the solution identified a class with only 9 individuals with only 78% classification probability for that class. Thus, a subsequent 4-factor solution was not tested and the more parsimonious 2-factor solution was selected.

The 2-factor model produced 2 classes indicating average and low social functioning. Children classified in the low social functioning group had higher levels of teacher rated atypicality, $F(1, 130) = 272.52, p < .001$, lower levels of teacher rated social skills, $F(1, 130) = 24.38, p < .001$, and poorer performance on the emotion recognition task, $F(1, 137) = 18.10, p < .001$. See Table 2 for all other differences between the average and low social functioning group on LPA indicator variables.

Baseline Differences in Functional Domains Based on Social Functioning Profile

Social functioning profile group membership was used to predict baseline differences in other functional domains including behavior, academics, EF, and IQ. As seen in Table 3, children in the low social functioning group had higher levels of baseline teacher rated hyperactivity, $F(1, 130) = 5.90, p < .05$, and attention problems on the BASC-2, $F(1, 130) = 32.21, p < .001$, as well as lower levels of baseline cognitive functioning as indexed by full scale IQ, $F(1, 136) = 4.58, p < .05$.

Table 2 Results of latent profile analysis

Indicators	Social functioning group <i>M</i> (<i>SD</i>)		<i>F</i>	<i>d</i>
	Average <i>n</i> = 97	Low <i>n</i> = 42		
BASC-2 Atypicality T-score (P)	58.44 (13.61)	60.02 (15.41)	.37	.11
BASC-2 Atypicality T-score (T)	51.27 (6.83)	74.14 (8.54)	272.52***	3.10
BASC-2 Social Skills T-score (P)	47.85 (9.10)	48.71 (10.25)	.25	.10
BASC-2 Social Skills T-score (T)	51.47 (10.56)	42.71 (6.58)	24.38***	-.92
Emotion Knowledge (O)	6.95 (2.05)	5.43 (1.63)	18.10***	-.79
Hostile Attribution Bias on CST (O)	1.55 (1.52)	1.67 (1.62)	.12	.08

*** $p < .001$, BASC-2= Behavior Assessment System for Children, 2nd Edition; CST= Challenging Situation Task; P =parent report; T= teacher report; O= observed measure

Children in the average and low social functioning groups did not differ on baseline parent rated behavior problems, baseline academic achievement or baseline EF.

Differences in Treatment Response Based on Social Functioning Profile

Regression analyses were conducted to determine the effects of social functioning profile membership in predicting differences in treatment response in the domains of behavior, academics, EF, and peer status.

Behavioral Treatment Outcomes For behavioral outcomes (Table 4), parent rated hyperactivity and attention problem t-scores were used on the BASC-2 as outcome measures, controlling for pre-treatment scores. Additionally, given the differences in IQ between social functioning groups, IQ was also controlled and tested as a potential moderator. In order to test the moderation, an interaction term between social functioning group and IQ was entered on a final step. There was no significant main effect of social functioning group on either hyperactivity or attention problems.

Results did reveal a significant interaction between social functioning group and IQ in predicting parent-rated attention problems at post-treatment, $\beta = .22$, $p < .05$ (see Fig. 1). Probing of the interaction revealed that IQ moderated the association between attention problems and social functioning, such that parents of children in the low social functioning group only reported higher levels of attention problems at the end of treatment if the child had average IQ, $\beta = .62$, $b = 6.09$, $t = 2.33$, $p < .05$. Social functioning had no impact on post-treatment levels of attention problems for children with low IQ, $\beta = -.13$, $b = -1.29$, $t = -.56$, $p = .58$.

Academic and EF Outcomes Post-treatment standard scores on the WJ-III were used as the outcome variable for academic achievement and scores on the HTKS task were used as the outcome variable for EF. Pre-treatment scores were entered as covariates. We did not control for IQ in these analyses due to the large influence of IQ on these measures for children with neurodevelopmental disorders (Dennis et al., 2009; Nigg et al., 2005). No group differences were observed in academic achievement (see Table 5). However, there was a significant effect of social functioning group on EF, such that children in the low social functioning group had lower scores on the HTKS task at the completion of treatment, $\beta = -.17$, $p < .05$.

Table 3 Baseline differences in functioning based on social functioning profile

	Social functioning group <i>M</i> (<i>SD</i>)		<i>F</i>	<i>d</i>
	Average <i>n</i> = 97	Low <i>n</i> = 42		
BASC-2 Hyperactivity T-score (P)	68.80 (11.89)	66.90 (12.65)	.72	-.15
BASC-2 Hyperactivity T-score (T)	64.32 (11.41)	69.81 (13.45)	5.90*	.45
BASC-2 Attention Problems T-score (P)	64.12 (8.53)	64.52 (7.11)	.07	.17
BASC-2 Attention Problems T-score (T)	57.73 (6.91)	65.00 (6.71)	32.22***	1.06
WJ Academic Achievement SS (O)	98.53 (14.47)	97.35 (15.13)	.14	-.10
HTKS EF Performance (O)	10.10 (11.23)	8.71 (10.69)	.46	.11
WPPSI Full Scale IQ (O)	91.26 (13.95)	85.61 (14.71)	4.58*	.40

*** $p < .001$, * $p < .05$, + $p < .10$, BASC-2= Behavior Assessment System for Children, 2nd Edition; WJ= Woodcock Johnson Test of Achievement, 3rd Edition; HTKS= Head-Toes-Knees-Shoulders Task; P= parent report; T= teacher report, O =observed measure; SS= standard score

Table 4 Model for predicting behavioral outcomes

	β	T-value	Model R^2	R^2 Change	F Change
BASC-2 Hyperactivity T-score (P)					
Step 1. Pre-treatment Hyperactivity (P)	.42***	5.30	.18	.18	13.86***
IQ (O)	.04	.51	—	—	—
Step 2. Social Functioning Group (L)	.13	1.58	.20	.02	2.51
Step 3. Social Functioning Group X IQ	.19+	1.92	.22	.02	3.69+
BASC-2 Attention Problems T-score (P)					
Step 1. Pre-treatment Attention Problems (P)	.38***	4.56	.15	.15	10.87***
IQ (O)	.04	.51	—	—	—
Step 2. Social Functioning Group (L)	.09	1.10	.15	.01	1.22
Step 3. Social Functioning Group X IQ	.22*	2.12	.18	.03	4.52*

*** $p < .01$, * $p < .05$, + $p < .10$. BASC-2, Behavior Assessment System for Children, 2nd Edition; P, parent report; O, observed measure, L, latent group membership, S, sociometric report

Discussion

The purpose of the current study was to create social functioning profiles for preschoolers with EBP and examine how profiles were predictive of response to a behavioral treatment program. While well-documented associations have been established between distinct aspects of social functioning and externalizing behavior problems (see Nixon, 2001 for a review), limited studies have examined such associations within a profile framework, especially in preschoolers. Spence (2003) theorizes that social functioning deficits are comprised of not only behavioral, but also emotional and cognitive factors. Thus, the current study took a more comprehensive approach to examining social functioning by incorporating measures within each domain.

Latent profile analyses resulted in two profiles (e.g., average and low) marked by differences in social skills, emotion knowledge, and rates of atypical behaviors. Interestingly, while differences emerged within behavioral and emotional indicators

of social functioning, no differences emerged for cognitive factors (i.e., hostile attribution bias). Results suggest that within samples of children with heightened levels of EBP, behavioral and emotional indicators more readily differentiate social abilities. While considerable work has examined social cognitive factors within young children (Denham, 2006), the lack of differences in cognitive factors between social functioning profiles may have been due to the limited variance of the CST in our sample. Of note, scores for aggressive responding on the CST only had a possible range of 0 through 6, limiting the variance that the CST could provide as an index in the LPA model. Given the small variance in our measure for the cognitive domain of social functioning, it is not surprising that differences across other domains (e.g., behavioral and emotional indices) more readily discriminated high and low groups of social functioning. Additionally, considerable work has documented that as children progress into the middle childhood years, more sophisticated social cognitions emerge (Crick &

Fig. 1 Effect of social functioning on parent reported attention problems at post-treatment. BASC-2 = Behavior Assessment System for Children, 2nd Edition, P = parent report

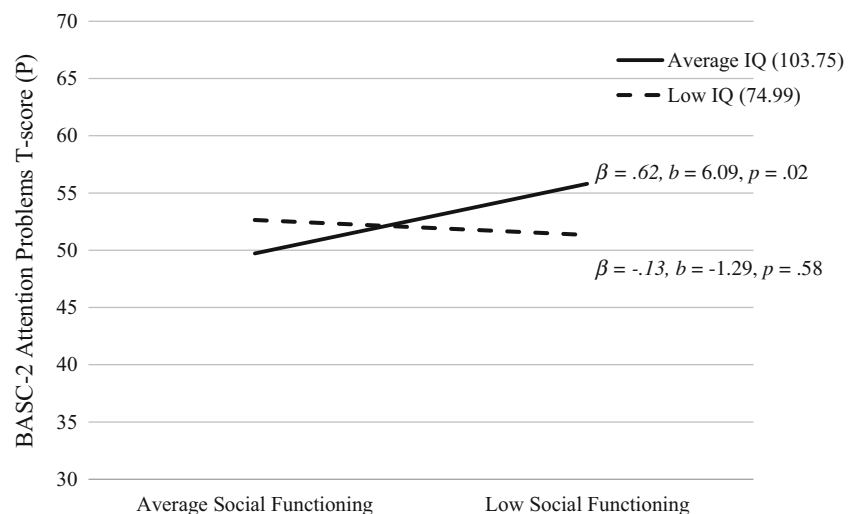


Table 5 Model for predicting academic and executive functioning outcomes

	β	T-value	Model R^2	R^2 Change	F Change
WJ Academic Achievement SS (O)					
Step 1.	—	—	.57	.57	119.61***
Pre-treatment WJ SS (O)	.75***	10.94	—	—	—
Step 2.	—	—	.57	.00	.01
Social Functioning Group (L)	.01	.09	—	—	—
HTKS EF Performance (O)					
Step 1.	—	—	.29	.29	55.64***
Pre-treatment HTKS Score (O)	.54***	7.46	—	—	—
Step 2.	—	—	.32	.03	5.39*
Social Functioning Group (L)	-.17*	-2.32	—	—	—

*** $p < .001$, * $p < .05$, WJ= Woodcock Johnson Test of Achievement, 3rd Edition; HTKS= Head-Toes-Knees-Shoulders Task; EF= Executive Functioning; SS= standard score; O= observed measure, L= latent group membership

Dodge, 1994). For instance, while our study captured more basic social problem solving strategies (i.e., asking children to pick a solution to a peer provocation scenario), studies with older children are able to more readily assess cognitive biases and attributions by asking about higher order social cognitions such as perceived intent. Nonetheless, social functioning profiles marked by differences across behavioral and emotional domains were predictive of treatment outcomes.

With regard to preliminary analyses, several implications may be gleaned from initial correlations between study variables. Patterns of correlations between parent and teacher rated atypicality and social skills suggest that while social skills ratings may be comparable across reporters, perhaps parents and teachers are conceptualizing atypicality differently. While items on the social skills scale often refer to the initiation of overt prosocial behaviors (e.g., shares, compliments others, offers help) items on the atypicality scale represent behaviors that deviate from social norms (e.g., seeming odd, seeming unaware of others, acting strangely) which may be more perceptible to teachers rating children in more social settings. Although some source effects may be evident by correspondence between respective parent/teacher ratings of atypicality and social skills with treatment outcomes (e.g., attention problems and hyperactivity), the parent/teacher ratings of atypicality and social skills were not consistently predictive of respective rater's treatment outcomes. For instance, teacher rated social skills were not predictive of teacher rated attention problems or hyperactivity. This suggests that atypicality and social skills ratings were not consistently predictive of treatment outcomes from the same reporter providing support for the more comprehensive latent profile group membership approach in predicting outcomes. Perhaps a combination of indicator variables in the latent profile of social functioning or even the combination of parent and teacher reports within the latent construct may be impacting the associations with hyperactivity and attention problems. Additionally, while baseline differences were largely present for teacher rated

variables, parent and objective outcome at post-treatment were also impacted by social functioning profiles suggesting a robust nature of the effects across reporters and measures.

Consistent with our hypothesis, findings suggested that initial social functioning may negatively impact treatment gains for preschoolers with EBP. Specifically, results suggest that social functioning profiles have implications for treatment effects within the domain of EF skills. Our results are consistent with previous work demonstrating strong links between EF skills and social competence measure such as socio-communicative skills (Clark et al., 2002). EF skills have also been previously linked with more direct measures of social functioning such as peer nominations (Diamantopoulou et al., 2007) further demonstrating the robust effect of EF on social functioning. Nonetheless, the effect of social functioning on EF skills is not surprising as skills necessary for EF may also underlie skills necessary for social competence (Riggs et al., 2006). For instance, EF skills such as cognitive flexibility, working memory (Riggs et al., 2006), and inhibitory control are necessary for social problem solving and interpretation of social cues (Nigg et al., 1999), which are key aspects of social competence (Crick & Dodge, 1994). Deficient EF skills are also associated with poorer theory of mind abilities (Carlson & Moses, 2001), which have been implicated as an important aspect of social competence (Walker, 2005). In fact some studies have suggested cognitive immaturity as a plausible theoretical explanation for cognitive social biases amongst children with ADHD (Owens et al., 2007). Our study goes a step further by highlighting the effect of social functioning on EF gains after the completion of a psychosocial intervention. Results highlight the effect that social functioning has on the improvement of EF skills. Initial social functioning profiles may also be used to identify children who exhibit poorer treatment response. Additionally, future studies should more thoroughly examine whether interventions aiming to improve social-emotional competence may indirectly improve EF skills and vice-versa.

Concurrent with our last study aim, IQ did moderate the association between social functioning and treatment outcomes, particularly for behavioral outcomes (i.e., hyperactivity and attention problems). However, the moderation occurred in the direction opposite to our hypothesis. Poor social functioning only predicted worse behavioral outcomes for children with IQ within the normative range, whereas social functioning did not play a role for children with borderline impaired levels of IQ. The moderating role of IQ highlights the importance of social functioning in samples with normative cognitive abilities while also underscoring the impact that cognitive delays have on behavioral functioning beyond social factors. Given the heightened levels of EPB in children with intellectual delays (Baker et al., 2002; Baker et al., 2003; Dekker et al., 2002), perhaps deficits in social functioning may offer no further incremental validity in predicting treatment outcomes. These results suggest that deficits in cognitive abilities present as a salient risk factor independent of other influences such as social functioning. Indeed, low IQ has been identified as predictor of worse treatment outcomes (Owens et al., 2003). Based on the current study, social functioning neither ameliorated nor exacerbated the effects of borderline impaired levels of IQ on treatment response. However, for children with IQ scores in the normative range, results do suggest that social factors may predict treatment outcomes within the behavioral domain, highlighting the saliency of social functioning in predicting outcomes.

There are limitations to the current study that should be noted. An important limitation to consider is also the fact latent profiles were only marked by differences primarily in teacher reported measures rather than parent measures. Given the heightened opportunities for peer interactions in classroom contexts (Downer et al., 2010), it is not surprising that teachers may provide unique perspectives about the social functioning of young children with EBP. However, given the variability in children's behaviors across school and home contexts, ratings from parents and teachers may tap into varying domains of social functioning. For instance, social behaviors reported by parents may provide better insight into how young children interact socially with siblings and family members where social expectations may be altered. Nonetheless, social functioning profiles did predict parent reported treatment outcomes, suggesting a degree of cross-informant utility. Additionally, treatment outcome analyses controlled for pre-treatment behavioral severity scores (e.g., hyperactivity, attention problems) which lessen the extent to which social functioning scores may have represented EBP severity. Nonetheless, examination of said constructs within a larger sample may aid in revealing differences across informant ratings of social functioning which may contribute to the emergence of further profiles. Additionally, given the timing of our intervention we were precluded from examining changes in teacher rated treatment outcomes.

An additional limitation to consider is the ethnic homogeneity of the sample used in the current study. The majority of families enrolled in the current study identified as Hispanic/Latino limiting the generalizability of our conclusions to more heterogeneous groups. However, studies have documented measurement equivalence in social competence with similar covariance patterns across Hispanic/Latino and Caucasian samples (Raver et al., 2007). Nonetheless, this limitation may serve also serve as a strength as Hispanic/Latino children represent the fastest growing and most understudied ethnic minority within mental health research (La Greca et al., 2009).

With regard to future directions, it would be of interest to replicate these findings within other populations with social functioning deficits. For instance, children with intellectual delays experience severe social impairments (Pearson et al., 2000), which may have differential impacts on treatment effects. Similarly, children with more severe social communication deficits such as ASD experience heightened levels of social dysfunction as early as the first year of life and remain persistent in development (Ozonoff et al., 2007). Future studies should examine these effects in samples with more severe cognitive delays and social communication difficulties.

Clinical implications of the current study should also be discussed. Results highlight the importance of identifying children with poor social functioning in an effort to target children who would likely have poorer response to treatment. Although behavioral treatments are effective in improving outcomes for children with EBP, a considerable portion of children experience poor treatment response (Webster-Stratton and Hammond 1997); thus it is important to identify factors such as social functioning to target this population of children. Results highlight not only the stability of social deficits but also demonstrate the impact that poor baseline social functioning has on treatment outcomes within the behavioral and EF domains. Thus, future studies should identify and examine treatment factors that may contribute to improving outcomes for children with initial poor social functioning.

In summary, results of the current study highlight the feasibility and utility of creating social functioning profiles comprised of indicators across domains (behavioral, emotional, and cognitive) for preschoolers with EBP. Importantly, results demonstrate the differential impact that social functioning has on treatment outcomes while considering the role of IQ. While the current work provides novel insight into the identification of poor treatment responders based on social functioning, more work is needed in understanding the mechanisms by which social functioning impacts these varying domains.

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Compliance with Ethical Standards

Conflicts of Interest Rosmary Ros, Paulo A. Graziano and Katie C. Hart declare that there is no conflict of interest.

Ethical Approval All procedures performed involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent Informed consent was obtained from all individual participants included in the study.

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