


The Relation of Poor Emotional Awareness and Externalizing Behavior Among Children With ADHD

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Abstract

Objective: Children with ADHD often demonstrate poor emotional self-awareness and higher levels of externalizing behavior problems relative to unaffected children. This study examined the relation of deficient emotional self-awareness to externalizing behavior problems in children with ADHD, and the role of emotional reactivity in this relationship. **Method:** Fifty-one 8- to 12-year-old children with ADHD and their parents completed measures of the children's emotional and behavioral functioning, as well as a diagnostic structured interview. **Results:** Logistic regression suggested that more impaired emotional self-awareness was strongly associated with the diagnosis of a comorbid externalizing disorder. Hierarchical regression analyses strongly supported the relation of poor emotional awareness to reactivity-driven externalizing behavior, but not to proactive externalizing behavior. These effects were evident across reporters. **Conclusion:** This study suggested that poor emotional self-awareness is significantly linked to externalizing problems in children with ADHD, and that dysregulated emotional reactivity plays an important role in this relationship. (*J. of Att. Dis.* 2013; XX(X) 1-XX)

Keywords

ADD/ADHD, emotional expression, externalizing, emotional regulation, externalizing comorbidity

Emotional awareness is the process by which one attends to, identifies, differentiates, and evaluates one's own emotions (Rieffe, Oosterveld, Miers, Meerum Terwogt, & Ly, 2008). Emotional awareness allows the individual to interpret and experience emotions accurately given contextual cues (Halberstadt, Denham, & Dusmore, 2001; Lemerise & Arsenio, 2000). Based on the demands of the situation, effective emotional awareness allows effective communication and/or regulation of emotion (Halberstadt et al., 2001).

Identifying one's own emotional state is a core element of emotion regulation, the process by which an individual identifies, modifies, and modulates emotions to meet internal and external needs (Zeman, Cassano, Perry-Parrish, & Stegall, 2006). With accurate emotional awareness, individuals are able to engage in effective emotion regulation and communicate these messages appropriately to other individuals (Halberstadt et al., 2001; Saarni, 1999). In contrast, insufficient awareness leads to inaccurate interpretation of internal and external emotional cues, poor social decision-making, and ineffective communication (Lemerise & Arsenio, 2000).

Frequent emotion dysregulation has been linked to numerous impairments in children, including externalizing behavior (Crundwell, 2005). Externalizing behavior includes oppositionality, defiant behavior, aggression, and

argumentativeness. However, externalizing behavior can result from multiple risk factors, and many have posited a distinction between reactive and proactive externalizing behavior (Orobio de Castro, Merk, Koops, Veerman, & Bosch, 2005). Children who frequently experience emotion dysregulation are unable to control their strong initial reactivity, and the behaviors they engage in as a result are often maladaptive and externalizing (Murphy & Eisenberg, 2002). As emotional awareness is an essential element of emotion regulation, it is likely that children who have poor emotional awareness are thus also at greater risk for reactive externalizing behavior.

Emotional Awareness

Emotional awareness is a core element of the emotion process. The emotion process consists of three domains: internal, behavioral, and external (Zeman et al., 2006). Internal processes include cognitive interpretation of emotional

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stimuli, subjective feelings, and labels of emotion; behavioral processes include facial expressions and actions; and external processes include awareness of the cultural and social significance of behavior as well as understanding the behavior of others (Zeman et al., 2006). Emotional awareness incorporates elements of all three domains. Awareness of one's own emotions requires organizing external (i.e., situational cues) and internal (i.e., physiological responses) incoming stimuli so that one is able to effectively interpret the emotion and the external context in which the emotion is experienced (Gross, 1998). This awareness influences the way in which an individual subsequently plans responses, executes the behaviors necessary to transmit the message, and utilizes contextual cues in selecting the appropriate mechanisms to transmit the message. The act of communicating the emotional message involves cognitive response planning, executing the behaviors necessary to transmit the message, and utilizing contextual cues in selecting the appropriate mechanisms to transmit the message. Given the multidimensional nature of emotional expression and the central role that emotional awareness plays in this process, the development of emotional awareness is a vital component of child development (Strayer & Roberts, 2004).

Development of emotional awareness begins at birth, and is a core process by which an infant communicates its needs to its caregivers (Keenan, 2000). The development of an emotional vocabulary coincides with the development of the child's overall language ability, emerging around 18 months and increasing in complexity as the child begins to incorporate contextual cues to discuss causality (Southam-Gerow & Kendall, 2002). From observing and mirroring their caregivers, children learn how emotions are labeled and displayed, as well as situations in which emotions are elicited and displayed (Gergely & Watson, 1996). Through this process children develop awareness of emotions, and extend this awareness to their own emotional states. In addition, they develop the ability to communicate these emotions to others and the knowledge of situationally appropriate mechanisms and styles of such communication.

Sources of Individual Differences in Emotional Expressiveness

A broad range of individual differences exist within the normative population with regard to emotional awareness. Children's emotional expressiveness and awareness increase in ability and complexity as they age due to developmental improvements in verbal ability, ability to formulate and verbalize more complex emotional states, and changes in expressive strategy (Bajgar, Ciarrochi, Lane, & Deane, 2005). With regard to complexity of emotional states, children become better able to differentiate emotional states from emotionally expressive behaviors, and describe emotional states as blends of emotion rather than global states

(e.g., "I feel bad") or singular emotions (Bajgar et al., 2005). Measures of emotional awareness in children have found that gender (females score higher on awareness than males; for example, Bajgar et al., 2005), higher levels of openness and agreeableness (Veirman, Brouwers, & Fontaine, 2011), and greater verbal ability (Bajgar et al., 2005) positively affect levels of emotional awareness within a normative sample. In addition, individuals differ in their capacity for attention. Variation in the neural networks involved in allocation of executive attention causes variation across individuals to attend to a number of stimuli, including internal emotional cues. Individuals with greater ability to attend to their own emotional cues demonstrate greater ability to regulate their emotions (Posner & Rothbart, 1998).

Effects of Deficient Emotional Awareness

While there exists a broad range of normal variation of emotional awareness in children, difficulties in these areas may result in significant impairment in functioning. Deficient self-awareness is a contributing component to the development of maladaptive regulation and expression of Negative Affect (NA; Halberstadt et al., 2001). Effective coping requires awareness and identification of mild to moderate NA, as it is at the mild to moderate stage when children are best able to generate and implement adaptive coping strategies (Rosen, Milich, & Harris, 2012). Children who are unable to identify and cope with mild NA often instead become overwhelmed by these emotions and choose ineffective regulatory strategies (Lemerise & Arsenio, 2000). Subsequent behaviors act to alleviate the distress caused by the emotion, such as aggression, yelling, crying, or "acting out" (Murphy & Eisenberg, 2002).

Deficient emotional self-awareness is linked to a variety of negative outcomes in children, including emotional reactivity and inconsistent emotion regulation strategies (Penza-Clyve & Zeman, 2002) and higher levels of anger (Denham et al., 2000). Furthermore, poor emotional understanding impacts a child's ability to take another's perspective in social interactions. This impairs the child's ability to engage in prosocial behavior, strains parent-child relationships, and leads to behavioral conflict between parents and children (Eggum et al., 2011). Frequent conflict can be indicative of externalizing problems.

Emotional Awareness and Externalizing Behavior

Deficient emotional awareness and emotion regulation have been linked to externalizing behavior in children. Children who have poorer emotional awareness are less likely to be able to recognize emotional distress, inhibit emotional reactivity, and use effective regulatory strategies. Children who

have difficulty regulating their negative emotionality lack the awareness to effectively appraise a stressful situation and select appropriate coping strategies. As a result, these children are more likely to demonstrate emotionally driven reactive behavior when distressed (Lengua & Long, 2002). The externalizing behavior exhibited by children with deficient emotion regulation tends to be reactive behavior in response to an emotionally provocative stimulus; this reactive aggression is distinct in origin and purpose from aggressive behavior that is planned, organized, and proactively executed for the purpose of attaining a goal (Crick & Dodge, 1996). Frequent incidents of ineffective regulation lead to frustration and negative emotions, and can result in behavior disorders such as oppositional defiant disorder (ODD). ODD is characterized by repeated engagement in negativistic behaviors, and contains symptoms encapsulating emotional reactivity (e.g., irritable, easily annoyed) and proactive behavior problems (e.g., spitefulness or vindictiveness, deliberately annoys people). A diagnosis of ODD can thus result from either a pattern of reactive and irritable behavior or a pattern of proactive and willfully defiant behavior, or a combination of both patterns (Aebi et al., 2010).

Deficits in working memory and inhibition have been linked to reactive aggression (Juujärvi, Kaartinen, Pulkkinen, Vanninen, & Laitinen, 2006). During emotionally arousing situations, children with difficulty shifting their attention have more difficulty processing environmental and internal emotional cues, leading them to respond with emotionally reactive behavior. Indeed, children who display aggression in reaction to an emotionally evocative stimulus show impairment relative to controls in their level of inattention (Vitaro, Brendgen, & Tremblay, 2002). When these children experience incidents of negative emotion, they are therefore unable to effectively plan and organize an effective response to the stimulus.

Emotional Awareness and ADHD

Emotional awareness is often poor in children with ADHD. Children with ADHD demonstrate deficiencies in recognizing emotional facial expressions (Kats-Gold, Besser, & Priel, 2007), emotional cues in an environmental context (Da Fonseca, Seguier, Santos, Poinso, & Deruelle, 2009), and overall affect (Rapport, Friedman, Tzelepis, & Van Voorhis, 2002). These deficiencies indicate overarching perceptual deficits in emotion recognition. Kats-Gold et al. (2007) postulated a model by which deficits in emotion recognition in others predict deficiencies in social skills and more behavior problems. Children with ADHD have deficits in working memory and information processing, which lead them to misinterpret their own emotions. Lacking the metacognitive ability to judge the adequacy of these interpretations, these children then react in a way that is

situationally inappropriate, leading to social difficulties. In addition, Casey (1996) found that this deficit in recognizing facial emotional expression extends to these children's ability to recognize their own facial expressions. Overall, the evidence is strong that general emotional awareness is impaired in children with ADHD.

Barkley (2010) and others have theorized that this poor emotional awareness stems from deficiencies in inhibitory processes, working memory, self-regulation, and synthesizing incoming input to formulate and evaluate multiple potential responses. Deficiencies in working memory and information processing inhibit these children's ability to organize and synthesize input from the environment as well as from their own emotional and physiological responses to the incoming stimuli. These deficiencies reduce children's awareness of their own emotional state. This lack of awareness, coupled with disinhibition, lead to ineffective response planning and maladaptive response behaviors.

Recent literature in ADHD has emphasized the presence and significance of emotional impairment in ADHD beyond just emotional awareness. Children with ADHD display more difficulties with emotion than unaffected children (Strine et al., 2006). Their emotional experience is more variable (e.g., Rosen & Factor, 2012b; Sobanski et al., 2010), intense (e.g., Maedgen & Carlson, 2000), and negative (Braaten & Rosen, 2000) than their unaffected peers, and they are quicker to display this negative emotion in frustrating situations (Melnick & Hinshaw, 2000). It is possible that deficient emotional awareness precipitates the emotional variability and intensity that is often evident in children with ADHD. This lack of emotional awareness may increase emotional reactivity and inhibit attempts to regulate aroused emotions, and lead children with ADHD to be less playful in emotionally arousing situations. These strong emotional reactions are maladaptive, and repeated maladaptive responses lead to functional impairment.

Emotion problems in ADHD have also been linked to externalizing behavior. Children with ADHD have stronger and more variable emotional responses (Sobanski et al., 2010), which impairs their ability to regulate these emotions and engage in prosocial goal-directed behavior. In addition, the impulsivity inherent in children with ADHD hinders their ability to inhibit negative behavior. These children experience more frustration and have difficulty suppressing negative frustrated behavior, thus leading to frequent engagement in the negative behaviors symptomatic of ODD (Barkley, 2010). This may explain the frequent comorbidity of ODD in children with ADHD; estimates place the rates between 65% and 84% (Barkley, 2010). In summation, it stands to reason that the deficient emotional awareness that is often present in children with ADHD would lead to more frequent and intense emotional reactivity and emotionally dysregulated behavior, which in turn would put children with ADHD at greater risk for ODD.

The Present Study

This study aims to determine the relations between deficits in emotional awareness, more frequent and intense emotional reactivity and emotionally dysregulated behavior, and the presence of comorbid behavior disorders in children with ADHD. The following hypotheses are postulated.

Hypothesis 1: Children with ADHD who have poorer emotional self-awareness will be more likely to concurrently have comorbid ODD.

Hypothesis 2: Children with ADHD who have poorer emotional self-awareness will concurrently have more reactive but not proactive externalizing behavior problems across parent and child report.

Method

Participants

A total of 51 children (35 boys, 16 girls) and their families participated in the present study. A sample of children aged 8-12 (M age = 9.41, SD = 1.314) was recruited through advertisements distributed through schools in a mid-sized Midwestern metropolitan area. The demographic breakdown of the children in the sample was 32 White/Caucasian, 11 African American, 2 Hispanic/Latino, and 6 biracial. All children met diagnostic criteria for ADHD on the Diagnostic Interview Schedule for Children (DISC; Shaffer, Fisher, Lucas, Dulcan, & Schwab-Stone, 2000). Thirty seven of the children met for ADHD-Combined Subtype, and 14 met for ADHD-Predominantly Inattentive Subtype. Twenty seven of the children were taking psychotropic medication for ADHD at the time the measures were completed. These children were recruited as part of a larger study examining emotional lability in children with and without ADHD (see Rosen & Factor, 2012a); for this analysis, only children who met diagnostic criteria for ADHD were included.

Procedures

Parents were administered the DISC to establish the presence of ADHD and ODD. Of the 51 children, 30 (58%) met criteria for ODD and 21 did not. In addition, 21 of the children (41%) met criteria for a comorbid internalizing disorder (Major Depressive Disorder, Dysthymic Disorder, Generalized Anxiety Disorder, Social Anxiety Disorder, and/or Separation Anxiety Disorder). Children completed measures of emotional awareness, while children and their parents completed measures of emotion regulation and externalizing behavior. Parents were compensated US\$15 for their participation, while children were given a US\$25 gift card as compensation. All study procedures were approved by the local Institutional Review Board.

Measures

The Positive and Negative Affect Scale—Parent Report (PANAS). The PANAS (Phillips, Lonigan, Driscoll, & Hooe, 2002) is a 20-item parent-report measure of the child's positive and NA. Parents rated the presence or absence of positive (e.g., alert, excited) and negative (i.e., afraid, irritable) mood states in their child on a five-point Likert-type scale. The measure yields a Total Affect (TA) scale and two subscales, Positive Affect (PA) and NA. For the purpose of the present study, only the TA scale was used. In this study, the PANAS-TA demonstrated excellent internal consistency (α = .87). The PANAS-TA scale was used in the present study to assess children's overall affect, as it is important to evaluate emotional awareness independent of the sheer amount of emotion the child typically experiences.

The Emotional Expressiveness Scale for Children (EESC). The EESC (Penza-Clyve & Zeman, 2002) is a 16-item self-report measure yielding scores on two factors: poor awareness and expressive reluctance. Children endorse statements of a 5-point Likert-type scale ranging from *not at all true* (1) to *extremely true* (5). The EESC is a well-validated measure within the age group in the present sample (Penza-Clyve & Zeman, 2002). For the present study, the EESC-Poor Awareness factor was used to assess children's overall level of emotional self-awareness. Higher scores on this factor indicated poorer emotional awareness. This factor yielded acceptable internal consistency (α = .73) in this study.

The Reactive-Proactive Aggression Questionnaire (RPAQ). The RPAQ (Raine et al., 2006) is a 23-item self-report of children's reactively and proactively aggressive behaviors. Children rate the frequency in which they engage in these behaviors on a scale from 0 (*Never*) to 2 (*Often*). This measure yields scores on two factors corresponding to the two types of aggression. In the present study, the reactive aggression (α = .86) and proactive aggression (α = .85) factors yielded excellent internal consistency.

The Emotion Regulation Checklist (ERC). The ERC (Shields & Cicchetti, 1997) is a 24-item parent-report measure that assesses negative emotion and emotion dysregulation in children. In the present study, the Emotion Regulation Index factor of the ERC was used to assess broad-based regulatory difficulties in children. Higher scores on this measure indicate poorer emotion regulation manifested through greater negative emotion and emotionally dysregulated behavior. This factor demonstrated excellent internal consistency in the current study (α = .86).

The Rule-Breaking Behavior subscale of the Child Behavior Checklist (CBCL; Achenbach, 2001) was used to assess parent's perceptions of children's willful, defiant behavior. This scale was chosen as the items on the scale (e.g., does not feel

guilty after misbehaving, vandalism) assess willful rather than emotionally reactive oppositional and defiant behavior. Scales of the CBCL provide T-scores that are normed by age and gender (Achenbach, 2001). This scale demonstrated excellent internal consistency in this study ($\alpha = .80$).

Results

Association of Emotional Awareness and Comorbid ODD

A hierarchical logistic regression analysis was conducted, regressing emotional self-awareness as measured by the EESC-Poor Awareness factor on the presence of comorbid ODD. Variables were entered hierarchically. The child's age, gender, ADHD subtype, and the presence or absence of psychotropic medication were all entered into the first step as covariates; all of these factors have been found to influence emotional expressiveness (Manos et al., 2011). The PANAS-TA score was entered into the second step to control for effects of the child's overall levels of emotional arousal; a child who experiences exceptionally strong emotion may have more difficulty recognizing milder levels of emotional arousal. The third and final step was to enter the score of the EESC-Poor Awareness factor.

Scores on the EESC-Poor Awareness were positively associated with the presence of a comorbid externalizing disorder on the DISC, $\text{Exp } \beta = 3.35$, $\text{Wald} = 5.56$, $p < .05$. A one-unit increase in EESC-Poor Awareness resulted in a 3.35-unit change in odds of meeting criteria for a comorbid externalizing disorder, suggesting that poorer emotional awareness was linked to greater likelihood of meeting criteria for an ODD diagnosis. In addition, the PANAS-TA ($\text{Exp } \beta = 3.30$, $\text{Wald} = 3.39$, $p < .07$) was marginally significantly associated with the presence of a comorbid externalizing disorder, such that higher scores were more strongly associated with a comorbid diagnosis. Contributions of each variable in the equation can be found in Table 1. Looking at the overall model, the model fit chi-squared value was significant only at the third step, $\chi^2(6) = 14.09$, $p < .05$, suggesting that it was only after the EESC-Poor Awareness was added that the model significantly improved. Nagelkerke's R^2 value improves from .172 to .325, a 15.3% increase on the variance explained by the model. The model correctly classified 66.7% of the subjects at Step 1, 66.7% at Step 2, and 74.5% at Step 3. The model fit analysis for this equation can be found in Table 2. Overall, results suggested that poorer emotional awareness was linked to greater rates of ODD diagnosis.

Association of Emotional Awareness and Aspects of Externalizing Problems

A series of hierarchical linear regressions were conducted, regressing the parent- and child-report indicators of reactive

Table 1. Summary of Logistic Regression Analysis for Comorbid Externalizing Disorder.

	B(SE)	Wald	Odds ratio(Exp β)
Constant	-6.645 (4.145)	2.571	.001
Gender	1.074 (.792)	1.837	2.927
Age	.060 (.280)	.046	1.062
Medication	.193 (.739)	.0068	1.213
Subtype	-.925 (.805)	1.320	.396
PANAS mean TA	1.193 (.648)	3.385 [†]	3.296
EESC-Aware	1.208 (.512)	5.557*	3.347

Note. PANAS = Positive and Negative Affect Scale; TA = Total Affect; EESC = Emotional Expressiveness Scale for Children.

[†] $p < .10$. * $p < .05$.

Table 2. Model Fit Analyses for EESC-Awareness and Externalizing Disorder.

	Model χ^2	χ^2 df	-2 log likelihood	Naegelkerke R^2	Percent predicted
Demographics	5.075	4	64.030	.128	66.7
PANAS-TA	6.983	5	62.121	.172	66.7
EESC-Aware	14.068*	6	55.036	.325	74.5

Note. EESC = Emotional Expressiveness Scale for Children; PANAS = Positive and Negative Affect Scale; TA = Total Affect.

* $p < .05$.

(ERC and RPAQ-Reactive, respectively) and proactive (CBCL-Rule Breaking and RPAQ-Proactive, respectively) externalizing problems on the EESC-Poor Awareness score. For each analysis variables were entered in the same steps and order as in the previously described logistic regression, with age, gender, subtype, and medication entered in the first step, PANAS-TA in the second step, and the EESC-Poor Awareness score in the third step.

Results supported the hypothesis that poor emotional awareness was related to the reactive behavioral difficulties of children with ADHD, as results suggested the model fit was substantially improved by inclusion of EESC-Poor Awareness in the estimation of RPAQ-Reactive, $\Delta R^2 = .075$, $p < .05$, Akaike information criterion (AIC) = -80.741, $\Delta \text{AIC} = -2.97$, and ERC-Emotion Regulation scores, $\Delta R^2 = .063$, $p < .05$, AIC = -95.329, $\Delta \text{AIC} = -9.89$. Results indicated that EESC-Poor Awareness scores were significantly associated with reactivity given the current set of variables, such that children with greater EESC-Poor Awareness scores also had higher RPAQ-Reactive, $\beta = .304$, $t = 2.12$, 95% confidence interval (CI) = [0.01, 0.32], $p < .05$, and ERC-Emotion Regulation scores, $\beta = .279$, $t = 2.181$, 95% CI = [0.01, 0.28], $p < .05$. Results indicated that the covariates entered into the first step resulted in a marginally significant improvement in the estimation of RPAQ-Reactive, $\Delta R^2 = .179$, $p < .06$, AIC = -79.12. At this step, the presence of psychotropic medication was significantly

Table 3. Hierarchical Regression Estimating Emotional Reactivity—Parent Report (ERC-ER).

Step/variable	R ²	ΔR ²	AIC	B	SE B	t	β
Step 1	.342	.34	-93.25				
Gender (male = 0, female = 1)				.07	.119	.613	.08
Age				.06	.042	1.49	.18
ADHD subtype (inattention = 0, Comb = 1)				.43	.130	3.30**	.43
Medication status (no med = 0, med = 1)				-.22	.12	-1.88 [†]	-.24
Step 2	.35	.01	-92.09				
PANAS-TA				.09	.10	.87	.11
Step 3	.42	.06*	-95.33				
EESC-Poor Awareness				.16	.07	2.18*	.28

Note. N = 51. AIC = Akaike information criterion; PANAS = Positive and Negative Affect Scale; TA = Total Affect; EESC = Emotional Expressiveness Scale for Children.

[†]p < .10. *p < .05. **p < .01.

Table 4. Hierarchical Regression Estimating Emotional Reactivity—Child Report (RPAQ-Reactive).

Step/variable	R ²	ΔR ²	AIC	B	SE B	t	β
Step 1	.18	.18 [†]	-79.12				
Gender (male = 0, female = 1)				.10	.149	.741	.10
Age				.05	.052	.933	.13
ADHD subtype (inattention = 0, comb = 1)				-.09	.15	-.587	.56
Medication status (no med = 0, med = 1)				-.36	.13	-2.75**	-.24
Step 2	.19	.01	-77.77				
PANAS-TA				.09	.12	.76	.11
Step 3	.26	.08*	-80.74				
EESC-Poor Awareness				.16	.07	2.12*	.30

Note. N = 51. AIC = Akaike information criterion; PANAS = Positive and Negative Affect Scale; TA = Total Affect; EESC = Emotional Expressiveness Scale for Children.

[†]p < .10. *p < .05. **p < .01.

related to RPAQ-Reactive scores, $\beta = -.394$, $t = -2.75$, 95% CI = [-0.63, -0.097], $p < .01$. Inclusion of PANAS mean TA in the second step did not significantly improved the estimation of RPAQ-Reactive given the current set of variables, $\Delta R^2 = .01$, $p < .50$, AIC = -77.77, $\Delta AIC = 1.34$. Furthermore, results indicated that the covariates entered into the first step substantially improved the estimation of ERC-Emotion Regulation, $\Delta R^2 = .342$, $p < .01$, AIC = -93.25. At this step, ADHD subtype was significantly related to RPAQ-Reactive scores, $\beta = .427$, $t = 3.30$, 95% CI = [0.17, 0.69], $p < .01$. The overall model demonstrated a modest but significant fit to RPAQ-Reactive, $R^2 = .264$, $F(6, 44) = 2.634$, $p < .05$ and ERC-Emotion Regulation difficulties, $R^2 = .416$, $F(6, 44) = 5.217$, $p < .001$. Results can be found in Tables 3 and 4. These results are particularly impactful given the inclusion of multiple covariates and the multitude of factors known to be associated with emotional reactivity.

Results indicated that neither the covariates ($\Delta R^2 = .072$, $p = .48$, AIC = -108.50) nor the PANAS mean TA score ($\Delta R^2 = .002$, $p = .76$, AIC = -106.6, $\Delta AIC = 1.90$) substantially improved the fit of the current model to the estimation

of RPAQ-Proactive Aggression, while the addition of EESC-Poor Awareness was marginally significant ($\Delta R^2 = .069$, $p < .07$, AIC = -108.534, $\Delta AIC = -1.93$, $\beta = .291$, $t = 1.878$, 95% CI = -0.08 to 0.23). Results also indicated that at no point did any step of the model or any individual variable significantly improve the fit of the model estimating CBCL-Rule Breaking. The overall model was not well fit to RPAQ-Proactive, $R^2 = .143$, $F(6, 44) = 1.22$, $p = .31$ or CBCL-Rule Breaking, $R^2 = .199$, $F(6, 44) = 1.822$, $p = .117$. Results can be found in Tables 5 and 6.

Overall, results suggested that deficient emotional self-awareness is positively associated with a diagnosis of a comorbid externalizing disorder and externalizing problems in children with ADHD. The externalizing problems are indicative of dysregulated emotional reactivity rather than planned, willful misbehavior.

Discussion

The current study examined the relationship between deficient emotional self-awareness and externalizing problems among children with ADHD. This study hypothesized that

Table 5. Hierarchical Regression Estimating Intentional Negative Behavior—Parent Report (CBCL-Rule Breaking).

Step/variable	R ²	ΔR ²	AIC	B	SE B	t	β
Step 1	.19	.19*	213.75				
Gender (male = 0, female = 1)				1.09	2.42	.45	-.13
Age				1.58	.85	1.85	.25
ADHD subtype (inattention = 0, comb = 1)				5.21	2.63	1.98 [†]	.28
Medication status (no med = 0, med = 1)				-2.10	2.34	-.90 [†]	-.13
Step 2	.20	.01	215.18				
PANAS-TA				1.50	2.12	.711	.10
Step 3	.20	.00	217.17				
EESC-Poor Awareness				.13	1.43	.094	.01

Note. N = 51. AIC = Akaike information criterion; PANAS = Positive and Negative Affect Scale; TA = Total Affect; EESC = Emotional Expressiveness Scale for Children.

[†]p < .10. *p < .05. **p < .01.

Table 6. Hierarchical Regression Estimating Intentional Negative Behavior—Child Report (RPAQ-Proactive).

Step/variable	R ²	ΔR ²	AIC	B	SE B	t	β
Step 1	.07	.07	-108.50				
Gender (male = 0, female = 1)				.05	.10	.50	.07
Age				-.02	.03	-.43	-.06
ADHD subtype (inattention = 0, comb = 1)				-.06	.11	-.56	-.09
Medication status (no med = 0, med = 1)				-.18	.10	-1.84 [†]	-.28
Step 2	.07	.00	-106.60				
PANAS-TA				-.03	.09	-.30	-.05
Step 3	.14	.07 [†]	-108.53				
EESC-Poor Awareness				.11	.06	1.88 [†]	.29

Note. N = 51. AIC = Akaike information criterion; PANAS = Positive and Negative Affect Scale; TA = Total Affect; EESC = Emotional Expressiveness Scale for Children.

[†]p < .10. *p < .05. **p < .01.

deficient emotional self-awareness would be significantly associated with the presence of a comorbid externalizing disorder, as well as higher levels of reactivity-driven externalizing behaviors. Furthermore, it was hypothesized that there would be no significant relation between deficient emotional self-awareness and proactive externalizing behavior. Results supported these hypotheses, demonstrating that children with ADHD and deficient emotional self-awareness were significantly more likely to meet criteria for a comorbid externalizing disorder and that this pattern of comorbidity was more likely due to increased reactive aggression rather than proactive aggression or willful rule-breaking behavior. These findings were consistent across parent- and self-report. These results underscore the vital role that emotional awareness plays in the regulatory process, especially among children with ADHD.

Emotional awareness is crucial to children's ability to regulate negative emotion. Children must be aware of their emotional state to be able to effectively regulate their emotional arousal. Successful recognition enables them to select appropriate regulatory strategies given adequate perception

of internal and external cues. Given the deficits inherent in ADHD, it is not surprising that these children have difficulties with this process. Underlying perceptual deficits in emotion recognition hinder their ability to achieve adequate awareness of their own emotional states. Following an inaccurate appraisal, these children then select inadequate regulatory strategies, impulsively engaging in negative behaviors out of frustration or confusion. These strategies attempt to alleviate the negative emotion rather than the stressor—for example, destructive behavior, oppositionality, anger, yelling, or “acting out” behaviors. Frequent engagement in these behaviors is typical in externalizing disorders, such as ODD; indeed, externalizing disorders are often strongly associated with dysregulation of NA (e.g., Halberstadt et al., 2001).

Alternatively, it is possible that children with ADHD react more strongly to emotionally evocative stimuli. Given these strong reactions and limited working memory, their perceptual systems are easily overwhelmed. When their emotions are too strong to identify beyond the positive or negative valence of the emotion, these children react more

strongly to alleviate their negative emotions. The resulting behaviors are intense and negative, leading the children to be classified as having externalizing problems.

Theoretical Implications

These findings have significant implications for research related to the psychosocial and behavioral challenges experienced by children with ADHD. The role of emotion within ADHD is still a relatively recent area of research. Much of the existing research on emotion recognition in children with ADHD focuses on the way in which these children perceive emotions in others and how these perceptual deficits can lead to functional impairment (e.g., Casey, 1996). However, the ability to accurately gauge one's own emotions is a vital component of the transmission of affective messages, and understanding the nature and ramifications of deficits in this area is an important link in understanding the role of emotions in ADHD. Furthermore, emotional expression is just one part of the emotion process. As has been frequently noted, the emotion process is multifaceted, multisystemic, and dynamic. Therefore, deficiencies in one aspect of this process can lead to deficiencies in others. By understanding this one component of the process, we can begin to analyze the other components and understand what components are affected in children with ADHD.

In addition, these findings support the conceptualization of ODD as a multifaceted disorder, including impulsive emotion-driven behaviors and more planned malevolent behaviors. Based on these results, emotional awareness appears to be a factor in formulating the distinction between these categories of symptoms. In earlier conceptualizations of ADHD, frequent engagement in emotion-driven externalizing behavior was a core symptom of the disorder (see Barkley, 2010, for a review), and some individuals have been calling for future iterations of the *Diagnostic and Statistical Manual* to reincorporate these symptoms (Barkley, 2010). Further research would be necessary to determine the legitimacy of this revision. Establishing a direct link between emotional awareness and these individual symptoms would be a crucial step of any such revision.

Clinical Implications

The findings of the current study have the potential to significantly impact assessment and treatment of behavior problems in children with ADHD. Understanding which aspects of emotional expression are associated with different types of comorbid disorders in children with ADHD could aid in the development of treatments for emotion recognition and frustration management for children with ADHD and a comorbid externalizing disorder. At present, many of the existing treatment modalities for children with ADHD do not sufficiently address emotional expression.

Behavior modification—a standard psychosocial treatment for ADHD—addresses the inattention and hyperactivity that constitute the core of ADHD but fails to address the emotional difficulties that are so frequently identified as impairing, especially in those with ADHD and a diagnosis of comorbid ODD. Therefore, treatments addressing emotional difficulties specifically within a population with ADHD and comorbid ODD would increase the effectiveness and comprehensiveness of psychosocial intervention for these children. Such treatments could emphasize building an emotional vocabulary, learning the physiological sensations and cognitions associated with each emotion, and problem solving based on correctly identifying the emotion and the stressor that brought about the emotion. A treatment addressing frustration management, emotion recognition, and problem solving in children with ADHD has shown promise in pilot studies in reducing internalizing and externalizing problems over the course of treatment (Rosen, Loren, & Epstein, 2010).

Limitations and Directions for Future Research

Several limitations exist with regard to this study. First, all data were collected concurrently, making it impossible to determine the directionality of the relations between emotional self-awareness, the child's total base-level affect, and the child's externalizing behaviors and diagnostic status. A longitudinal study would allow researchers to determine the directionality of these relationships. Second, although the analysis showed that the EESC factors significantly improved the model fit and were significantly associated with the comorbid disorders, Nagelkerke's R^2 value remained relatively low. This may be due to the wide range of factors associated with comorbidities, and emotional expressiveness is just one of many explanatory factors. Third, the sample size was relatively small, decreasing the power. Lower power reduces the ability to uncover small but robust effects, thus minimizing additional significant findings that may exist within the data. Fourth, although parent and child ratings of externalizing behavior were used, these measures were not entirely analogous, making comparisons of parent and child ratings somewhat more difficult.

A number of directions for future research exist based on the findings from this current study. First, conducting a longitudinal study with a larger sample utilizing multiple raters' assessments of the constructs assessed in this study would enable us to determine mechanisms of causality and achieve larger statistical power. In addition, a future study might expand on the role of frustration and impulsivity as mediators of the relation between deficient emotional self-awareness and ODD symptoms. Adding measures of coping skills, frustration, and specific emotion-driven behaviors would allow us to conduct such a mediation analysis.

Finally, given the role of working memory—a component of intelligence—in emotional awareness, future research might expand on the role of intelligence in the relation between ADHD, emotional awareness, and externalizing behavior.

Conclusion

The current study is an important step in understanding the relation between deficient emotional self-awareness and externalizing problems in children with ADHD. Awareness and understanding of one's own emotions are crucial components of effective social discourse and emotion regulation. Therefore, deficiencies in emotional awareness have significant and far-reaching negative consequences for children. Given the deficits children with ADHD experience in social and emotional functioning, deficits in emotional awareness make them especially vulnerable to these negative consequences. By understanding the links between deficient emotional self-awareness and externalizing problems in children with ADHD, we can begin to focus our interventions to address this crucial area of impairment in this population.

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