

Understanding or Feeling: Exploring Different Types of Empathy in Boys with Autism  
and Conduct Disorder

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by  
Shelley M. Barber

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## ABSTRACT

### Understanding or Feeling: Exploring Different Types of Empathy in Boys with Autism and Conduct Disorder

A thesis presented to the Psychology Department

Graduate School of Arts and Sciences  
Brandeis University  
Waltham, Massachusetts

By Shelley M. Barber

Problems with empathy have been suggested to be one source of social difficulties in children with autism spectrum disorders and children with conduct disorder. Empathy has been proposed to be made up of cognitive and emotional components. This proposal investigates cognitive and emotional empathy deficits and their differing manifestations in children with autism spectrum disorder and children with conduct disorder. Sixty boys with autism, 60 boys with conduct disorder and callous-unemotional traits, 60 boys with only conduct disorder, and 60 controls will be compared. Using a median split based on age, the participants will also be sorted by age, being placed into either a younger age group or an older group. Four tasks will be used to measure emotion recognition skills, perspective taking, emotional arousal, and emotional contagion. A 4 (group) X 2 (age) MANOVA will be used to analyze the results. Boys with callous-unemotional traits are expected to display emotion-specific cognitive empathy deficits, as well as deficits in self-reported and physiologically measured levels of emotional empathy. Boys with

autism are expected to display global cognitive empathy deficits. Boys with autism and boys with only conduct disorder are expected to show lower levels of self-reported emotional empathy but display typical physiological emotional empathy responses.

## Table of Contents

Acknowledgments.....	iii
Abstract.....	iv
Introduction.....	1
Method.....	14
Participants.....	14
Stimulus Material.....	14
Procedure.....	20
Audibility Check.....	9
Results.....	21
Discussion.....	25
References.....	29

## Understanding or Feeling: Exploring Different Types of Empathy in Boys with Autism and Conduct Disorder

While eating lunch at school, a boy on the autism spectrum notices a classmate getting bullied by an upperclassman. Once the bully moves on, the classmate bursts into tears. The boy on the autism spectrum doesn't understand why the classmate is crying and continues with his lunch. The bully, a boy on the psychopathy spectrum, has also noticed the crying classmate but feels nothing in response. Both the boy on the autism spectrum and the boy on the psychopathy spectrum have just displayed a significant lack of empathy for their classmate. The boy with autism has shown a cognitive impairment in perspective taking, not understanding why the classmate is crying, while the boy on the psychopathy spectrum has shown an impairment in emotional response, observing that his classmate is upset but is emotionally unaffected by it. While both responses are different, each can be considered a deficit in some aspect of empathy.

Autism spectrum disorder and psychopathy have been described as disorders of empathy. In psychology, the term empathy has had several conceptual definitions. Some refer to empathy as being solely an affective process, where one individual shares an emotional state in response to its being expressed by an interlocutor (Anastassiou-Hadjicharalambous & Warden, 2008). Others have defined empathy as reflecting a more cognitive process, one that involves being able to look at the self and others and perceive, interpret, and understand motivations and intentions that underlie behavior (Baron-Cohen et al., 2005), while others have proposed that the process of empathy is comprised of both components, emotional and cognitive (Blair, 2005b; Jolliffe & Farrington, 2006). These various operational definitions may well have relevance to the forms of empathy

dysfunction in autism and psychopathy. While both conditions can be considered disorders of social cognition, it is important to recognize that there are differences in the nature of the impairment associated with each disorder (Blair, 2008).

The terms empathy and sympathy are often used synonymously, but studies have shown that the two are possibly separate constructs (Eisenberg & Strayer, 1987; Feshbach, 1975). Jolliffe and Farrington (2006) held that for a reaction to be truly empathetic, the subject must be feeling the same emotion as the target (emotional congruence), but a sympathetic response will not necessarily produce the same emotion as the target is presenting (Jolliffe & Farrington, 2006). Imagine from our previous example, a typically developing child also witnessing the bullying of a classmate during lunch. This child also observes the classmate crying after the bully leaves and understands that the classmate is clearly sad and distressed. An empathetic response from the child would be to feel sad and distressed as well. This shared, emotional response may lead the child to display empathetic behavior, such as going over and comforting the classmate. A sympathetic response would be for the child to solely feel sorry for the classmate, and this response may not necessarily lead to the child behaving empathetically. Both are socially acceptable emotional responses to the event, but a response that yields emotional congruence may be much more likely to spur an individual to exhibit empathetic, prosocial behavior (Jolliffe & Farrington, 2006).

### **Cognitive Empathy**

Sympathy can also incorporate a form of cognitive empathy, given that it involves the ability to attribute mental states to self and others (Baron-Cohen et al., 2005). Cognitive empathy allows a person to recognize and understand the emotional



perspective of others. A person uses cognitive empathy when they can look at another person's behavior and attribute a correct emotional label to the other person. Cognitive empathy has also been considered synonymous with theory of mind (Blair, 2005b). Theory of mind was originally defined as the imputation of mental states to oneself and others (Premack and Woodruff, 1978; p. 515), which is very similar to the definition used by Baron-Cohen et al. (2005). Advanced theory of mind has been interpreted as the ability to "read" opaque behavior and determine the emotions, motivations, and intentions behind the behavior (Goldstein, Wu, & Winner, 2009). When considering the two components of empathy, cognitive empathy is thought of as a necessary step for the achievement of emotional empathy. Eisenberg (2000) defines empathy as an affective response that stems from the apprehension or comprehension of another's emotional state or condition. Blair (2005b) proposed that a person should be able to understand the emotional state of another before he or she can elicit a correct emotional response.

### **Emotional empathy**

Emotional empathy can be defined as an affective response more appropriate to someone else's situation than to one's own (Hoffman, 1975). It can be separated into at least two main forms. The first form is the response to the emotional displays of others, such as facial expressions, vocal tone, and body movements, while the second form is the response to other emotional stimuli, for example, a response to a phrase like "Judy's grandfather just passed away" (Blair, 2005b). Eliciting proper emotional responses helps to strengthen social bonds. It informs individuals about another's subjective and physiological experience and also serves as a means of sharing emotional reciprocity (Decety & Meyer, 2008). Emotional facial expressions often play an important role in

regulating interpersonal behavior (Marsh & Blair, 2008). Others' expressions could act as a means of reinforcement for this affective response, turning facial expressions into rewarding and punishing stimuli (Blair, 2008)

As has been previously mentioned, empathy has been defined and operationalized in various ways in studies throughout the years. Unfortunately, this does not mean that empathy, particularly emotional empathy, has always been operationalized accurately. Schwenck et al. (2012) measured emotional empathy by asking how much their participants were emotionally affected by video scenes featuring a protagonist experiencing certain emotions. Because the participants were only asked about their level of overall, non-specific affectivity, this was more a measure of emotional arousal, not emotional empathy. Schwenck et al. did not ask their participants what specific emotions they felt while watching the videos. It is essential that studies incorporate more accurate measures for emotional empathy, such as self-reported levels of emotion-matching along with emotional arousal or physiological measures of affectivity.

Several models of empathy have been proposed to help explain empathy development. Most of these models involve the role of the amygdala. It has been proposed that amygdala dysfunction would lead to impairment in interpreting others' behavior, which would cause individuals to have difficulty producing emotionally congruent responses via breakdown in emotional self-regulation (Bachevalier & Loveland, 2006). In our proposal, we will explore the relationship between clinical disorder and deficits in cognitive and emotional empathy based on a model of dysfunction in the orbitofrontal-amygdala circuit (Bachevalier & Loveland, 2006).

## **Amygdala Function**

The amygdala is a region of the brain that is comprised of thirteen nuclei and is located in the medial temporal lobes (Bachevalier & Loveland, 2006). It is a part of the limbic system and is considered to be the most important region of the brain associated with the processing of unfamiliar stimuli and emotional responses to such stimuli (Blair, 2005a). It has also been shown to be involved with self-regulation and goal-directed behaviors (Bachevalier & Loveland, 2006; Frick & White, 2008). Studies have shown that the amygdala is also involved in the detection and interpretation of visual cues from faces (Bachevalier & Loveland, 2006). Dysfunction in the amygdala has been connected to impaired self-regulation of social-emotional behaviors. Patients with amygdala damage have been shown to have severe deficits in emotional facial recognition and impairment in eliciting appropriate responses to stimuli (Bachevalier & Loveland, 2006; Muñoz, 2009). An individual with amygdala damage may laugh at someone crying in distress or may not recognize a threatening gesture. Dysfunction in the amygdala may also impair an individual's ability to make associations between stimuli (Bachevalier & Loveland, 2006; Blair, 2008). For example, a person with abnormal amygdala function, in order to achieve her goal of getting her desired dessert, may cut to the front of the cafeteria line, upsetting those behind her. Due to amygdala dysfunction, the person would have difficulty connecting the other individuals' distress and anger with her own behavior of cutting in line. This inability to create associations between stimuli could lead to impaired self-regulation of behavior and social difficulty.

## **Empathy and the Amygdala**

From a social neuroscience perspective, both autism and psychopathy display

abnormal amygdala function, and this appears to be associated with the empathy deficits found in both disorders (Bachevalier & Loveland, 2006; Blair, 2005a, 2008). If amygdala dysfunction was the sole source of social deficits in both disorders, it would be expected that both disorders would display similar deficits. While autism and psychopathy do display impairments in facial recognition and processing, studies have found that psychopathic individuals have pronounced impairment in recognizing facial expressions and body cues that display distress (e.g. fear and sadness) (Blair, Colledge, Murray, & Mitchell, 2001; Marsh & Blair, 2008). Individuals with autism, however, appear to display a global dysfunction in emotional facial expression recognition (Baron-Cohen & Wheelwright, 2004). These results suggest that amygdala dysfunction does not alone account for the empathy deficits and/or may take varied forms in autism and psychopathy.

Studies have indeed found that there are differences in amygdala arousal between autism and psychopathy. The amygdala undergoes hyperarousal when exposed to social stimuli in individuals with autism (Kleinhans et al., 2009). Normally, neurons habituate to stimuli relatively quickly after exposure, but when individuals with autism were exposed to neutral faces, they did not habituate as fast as typically functioning individuals did, showing a more gradual decrease in neural habituation instead (Kleinhans et al., 2009). This could mean that an individual would not be able to differentiate between socially relevant and irrelevant material. The individual would not know which stimuli to focus on, and as such, would be easily overstimulated by the visual cues. This neural deficit in habituation may explain why individuals with autism display tendencies to avoid eye contact or looking at faces in general (Bachevalier & Loveland, 2006).

Expressive faces may contain too much social stimulation for an individual with autism to process at once.

Individuals with psychopathy, however, have been found to display hypoarousal in the amygdala (Anastassiou-Hadjicharalambous & Warden, 2008; Blair, 2005a; Frick & White, 2008). This could mean that it takes more stimulation to get the amygdala to activate, or it may reflect a total lack of affective amygdala responsivity. This would explain why individuals with psychopathy display more diminished physiological responses to emotional cues than do typical individuals, with a normally functioning amygdala. Individuals with callous-unemotional traits have displayed lower heart rates in general while witnessing emotional displays, as well as smaller magnitude in heart rate change from baseline to witnessing the emotional display (Anastassiou-Hadjicharalambous & Warden, 2008). The amygdala is particularly involved with picking up cues involved with negative distress, such as fear and sadness (Bachevalier & Loveland, 2006; Blair, 2008). A meta-analysis using 20 studies has shown that individuals with psychopathy have no significant deficits when recognizing happy or angry expressions, but they do show significant deficits in fear and sadness recognition (Marsh & Blair, 2008).

Both autism and psychopathy display lifetime empathy deficits, although the trajectories of the deficits from childhood to adulthood appear to be different for each disorder (Bachevalier & Loveland, 2006). The amygdala has been found to grow at an abnormal rate during early childhood in individuals with autism, and amygdala size was predictive of symptom severity during early childhood in individuals with autism (Bachevalier & Loveland, 2006). During adolescence and adulthood, however, the

smaller the amygdala was, the greater the predicted severity of autism symptoms (Bachevalier & Loveland, 2006). These findings suggest that in individuals with autism, the amygdala exhibits abnormal growth in early childhood and then atrophies, compared to amygdala growth in typically developing individuals. Individuals that display psychopathic tendencies appear to display diminished amygdala growth throughout childhood and adolescence, with smaller amygdala volume being linked with more severe psychopathy (Yang, Raine, Narr, Colletti, & Toga, 2009).

### **Cognitive Empathy in Autism**

Individuals with autism have distinct impairments in theory of mind skills, as shown by poor performance on false-belief tasks (Bachevalier & Loveland, 2006; Baron-Cohen, Wheelwright, Hill, Raste, & Plumb, 2001; Blair, 2005b, 2008; Colle, Baron-Cohen, & Hill, 2007; Jones, Happé, Gilbert, Burnett, & Viding, 2010; Schwenck et al., 2012). Deficits in theory of mind skills appear to manifest themselves in early childhood, and this impairment appears to remain prevalent throughout adolescence and adulthood (Baron-Cohen et al., 2001). While it is possible that language helps bolster theory of mind development, language does not appear to be necessary for theory of mind skills. Compared to typically developing children, children with specific language impairment were shown to have intact theory of mind skills, as opposed to children with autism who performed significantly lower on the false belief task (Colle et al., 2007). On the “Reading the Mind in the Eyes” Test-Revised, a measure of advanced theory of mind skills that requires individuals to interpret a figure’s emotion from only his or her eyes, individuals with autism score lower than typical individuals, indicating impairment in advanced theory of mind skills (Baron-Cohen et al., 2001). Damage to the amygdala

during infancy or adulthood has been linked to impairment on theory of mind tasks (Bachevalier & Loveland, 2006). This impairment is similar to the theory of mind skill deficits displayed by individuals with autism, possibly suggesting a link between amygdala dysfunction and lack of theory of mind skills in autism.

Another possible link to amygdala dysfunction would be the impairment in emotional facial expression recognition found in individuals with autism. As mentioned previously, the amygdala is involved in facial processing, with amygdala dysfunction related to impaired recognition of emotional expressions. Individuals with autism display a global deficit in processing faces. They show impairment in face recognition, identifying emotional facial expressions, discriminating between faces, and facial memory (Bachevalier & Loveland, 2006; Rogers, Viding, Blair, Frith, & Happe, 2006), and even if individuals with autism do not score significantly differently from typical comparisons on accuracy, individuals with autism take significantly longer to recognize these emotions (Schwenck et al., 2012). Several studies have indicated that individuals with autism have a particularly difficult time recognizing expressions of sadness (Blair, 2005b; Schwenck et al., 2012).

### **Cognitive Empathy in Psychopathy**

It has been seen that individuals with psychopathic traits (e.g. callous-unemotional traits) have generally intact cognitive empathy skills (Blair, 2008). Children with conduct disorder who also have callous-emotional traits are much more likely to be diagnosed on the psychopathy spectrum as adults (Frick & White, 2008; Kimonis et al., 2008). However, there does not seem to be a link between psychopathic traits and theory of mind impairment (Blair, 2005b). Children and adolescents with callous-unemotional

traits do not display any deficits in theory of mind skills (Jones et al., 2010; Schwenck et al., 2012). When administered the “Reading the Mind in the Eyes” Test-Revised (Baron-Cohen et al., 2001), individuals with psychopathic tendencies do not display any deficits in advanced theory of mind skills (Richell et al., 2003). Children and adults with callous-unemotional traits appear to have the ability to take another person’s perspective.

Unlike autism which displays a general deficit in emotional expression recognition, individuals with callous-unemotional traits seem to display deficits in recognizing specific emotions. Marsh and Blair (2008) found individuals with psychopathic tendencies had significant impairments in recognizing facial distress cues (e.g sadness, fear, and surprise), with fear showing the greatest deficit of all in their meta-analysis. These specific impairments can also be seen in psychopathic children (Blair et al., 2001). Blair et al. (2001) found that children with psychopathic tendencies needed significantly more intense expressions of sadness in order to recognize the emotion, were significantly more likely to interpret fear as one of the other five basic emotions, or were unable to recognize fear at all. Children with psychopathic tendencies also appear to display an impairment in recognizing body language expressing fear (Muñoz, 2009). A dysfunction in the amygdala would impair the recognition of these specific emotions (Blair et al., 2001). Children with callous-unemotional traits display more impairment in emotional facial expression recognition than adolescents and adults with callous-unemotional traits (Bachevalier & Loveland, 2006; Frick & White, 2008). One explanation of this may be that as children with callous-unemotional traits age, other neural mechanisms activate in order to compensate for underactive amygdala functioning.



## **Emotional Empathy in Autism**

Individuals with autism have difficulty reading social cues and delivering emotionally appropriate responses (Bachevalier & Loveland, 2006), however it is unclear if these individuals have full impairment in emotional empathy (Blair, 2005b).

Compared to typically developing children and children with moderate learning disabilities, children with autism showed significantly greater reactivity to distress cues than to the neutral stimuli, showing that the children with autism did not process the distress cue as emotionally neutral (Blair, 1999), and when controlled for alexithymia, a subclinical inability to distinguish feelings from bodily sensations of emotional arousal, individuals with autism did not have significantly different empathic responses in the brain compared to controls (Bird et al., 2010). While self-reports of emotional arousal have shown that children with autism are more emotionally aroused than children with only conduct disorder or conduct disorder with callous-unemotional traits (Schwenck et al., 2012), few studies have actually looked at self-reported emotional congruence in individuals with autism. It may be that children with autism lack the cognitive empathy component to connect affective cues from others to their own emotional arousal, which could stem from amygdala dysfunction.

## **Emotional Empathy in Psychopathy**

Emotional empathy deficits are considered a key characteristic of psychopathy (Blair, 2005b; Decety & Meyer, 2008; Jones et al., 2010). Children with conduct disorder, along with high callous-unemotional traits, display significant deficits in physiologically-indexed (Blair, 2005b) and self-perceived emotional empathy (Anastassiou-Hadjicharalambous & Warden, 2008; Jones et al., 2010; Schwenck et al.,

2012). Along with having difficulties recognizing the expression of sadness in others, adults and children with psychopathic tendencies also show reduced physiological responses to others' sad expressions, such as displaying lower skin conductivity when observing sadness in others (Blair, 2005b). Along with having deficits in emotional arousal, these children have abnormal responses to danger and cues of punishment (Frick & White, 2008). However, children with conduct disorder, who lack callous-unemotional traits, appear to be just as vicariously physiologically aroused as typically developing children when observing an emotional stimuli, even if they lack the tendency to connect their own arousal with another person's mental state or are not consciously aware of their own arousal (Anastassiou-Hadjicharalambous & Warden, 2008). Since the amygdala is involved with processing distress cues, as well as punishment information, the lack of emotional empathy in children with callous-unemotional traits could reflect amygdala dysfunction, which would explain why it is difficult for these children to develop empathy, guilt, and conscience (Frick & White, 2008).

### **Purposes and Hypotheses**

The purpose of our proposal is to further explore the differences in cognitive and emotional empathy in children and adolescents with autism and children and adolescents with callous-unemotional traits. Few studies have compared these two clinical groups together on cognitive empathy tasks or directly compared emotional empathy in individuals with autism and individuals with callous-unemotional traits using a physiological measure. We are also interested in examining how cognitive and emotional empathy develops from childhood into adolescence in children with autism and children with callous-unemotional traits compared to each other and typically developing children.

From previous studies and literature reviews, we predict that the boys with autism will display general deficits in cognitive empathy. Boys with callous-unemotional traits will show significant deficits in distress cue recognition compared to the boys with only conduct disorder and the boys in the control group. Physiological deficits in emotional empathy will be specific to the group with callous-unemotional traits. We also predict that all three clinical groups will have significantly lower self-reported emotional empathy than the typically developing boys.

As for the developmental trajectories of cognitive and emotional empathy, we expect that the autism group, the conduct disorder group, and the typically developing group will all show marked increases in cognitive and emotional empathy with age. The older groups in these three conditions will score higher than the younger groups. We predict that individuals with callous-unemotional traits will show an increase in cognitive empathy over time, but that adolescent boys with callous-unemotional traits will not have significantly higher emotional empathy than younger boys with callous-unemotional traits.

## Methods

### Participants

The proposed study will include data collected from a moderate sized longitudinal study exploring cognitive and emotional empathy development in middle childhood and adolescence. Using an a priori power analysis, with  $\alpha = .05$  and power = .8, we determined that we needed to collect 240 participants, 60 boys with ASD, 60 boys with CD-CU+, 60 boys with CD-CU-, and 60 controls. We will be looking for children who will have been diagnosed based on DSM-IV TR criteria prior to the experiment by trained clinicians who are independent from the study. We are interested in recruiting boys between the ages of 8 to 16. Subjects with ASD and CD will be recruited from the Department of Psychiatry, Harvard University, and through local child and adolescent psychiatrists. Control participants will be recruited through ads in a local newspaper.

### Measures

*Inventory of Callous/Unemotional Traits (ICU; Frick, 2003).* The ICU is a 24-item scale that is used to measure callous-unemotional traits that are thought to be specific characteristics associated with psychopathy. The scale is comprised of three factors: callousness, uncaring, and unemotional. Items are rated on a four-point Likert-type scale. Previous studies have shown that the ICU has satisfactory internal consistency ( $\alpha = .87$ ; Jones et al., 2010;  $\alpha = .81$ ; Viding et al., 2009;  $\alpha = .77$ ; Essau et al., 2006) and has good construct validity (Essau, Sasagawa, & Frick, 2006; Kimonis et al., 2008). There are multiple versions of the ICU, and in this study, we will use the parent-

report version of the ICU.

*Child Symptom Inventory IV and Adolescent Symptom Inventory IV (ASI; Gadow & Sprafkin, 1997; CSI; Gadow & Sprafkin, 2002).* The ASI and the CSI were designed as measures to screen for behavioral, emotional, and cognitive symptoms of DSM-IV disorders. The CSI is designed for children from 5-12 years old, and the ASI is for adolescents 12-18 years of age. Our study will use the Conduct Disorder scale from the CSI and ASI as a means of measuring conduct problems. All Conduct Disorder behaviors will be parent-reported as occurring “never”, ‘sometimes’, ‘often’, or ‘very often’. Scores will be measured using the scoring system developed by the inventories’ creators. The items are the same for the CSI and ASI, but different age norms are used when converting the raw scores into the t-scores.

*Wechsler Abbreviated Scale of Intelligence (WASI; Wechsler, 1999).* The WASI is a brief assessment of general cognitive ability that was designed to be used for children and adults. In our study, we will use the short-form, which includes assessment of Vocabulary and Matrix Reasoning. These two scores will be combined to assess general intelligence.

*Child Behavior Checklist (CBCL; Achenbach, 1991).* The CBCL is a parent-report questionnaire that is used to measure various behavioral and emotional problems in children. It contains 113-items that are rated on a three-point-Likert-scale. It measures maladaptive internalizing (e.g. anxious) and externalizing (e.g. aggressive) behaviors. The CBCL has been used as a valid measure of psychiatric symptoms in studies of children around the world (Roessner, Becker, Rothenberger, Rohde, & Banaschewski, 2007).

*Autism Diagnostic Interview Revised (ADI-R; Lord, Rutter, & Le Couteur, 1994).*

The ADI-R is a standardized interview administered by an investigator to the parents of a child for the evaluation of possible autism spectrum disorders (Lord et al., 1994). The interview looks at behaviors in three areas: communication and language, patterns of behavior, and reciprocal social interactions. The interview contains 93 questions, which are then rated by the interviewer on a nine-point-Likert-type scale.

*Social Communication Questionnaire (SCQ; Rutter, Bailey, & Lord, 2003).* The SCQ is a 35-item, true-false questionnaire that is used to screen for to determine if a full diagnostic assessment is necessary for ASD. The SCQ is administered to parents and asks about the behavior of the child. It is considered a companion instrument to the ADI-R.

*Autism Diagnostic Observation Schedule (ADOS; Lord, Rutter, DiLavore, & Risi, 1999).* The ADOS is an observation instrument, based on the DSM-IV, used for diagnosing and assessing ASD (Lord et al., 1999). For children, the ADOS consists of a series of structured and semi-structured tasks that involve the child socially interacting with the interviewer. The interviewer identifies and observes the child's behavior and assigns them to categories determined by the ADOS. These categorized observations are then quantified for analysis.

### **Empathy Tasks**

*Animated-Shapes Task (Abell, Happé, & Frith, 2000; Castelli, Frith, Happé, & Frith, 2002).* The animated-shapes-task is designed to measure emotional perspective taking. In our study, we will be using this task as a measure of cognitive empathy. The task involves film clips of two animated triangles and has three different conditions:

random movement without interaction (RA; e.g. wandering), goal directed interaction (GD; e.g. dancing), and interaction that implies that one triangle is reading the mind of the other (ToM; e.g. flirting) (Abell et al., 2000). We will show our participants 14 film-clips on a computer, all featuring a large blue triangle and a small red triangle.

Participants will be asked to describe the scene presented to them. The first two of the film clips will serve as practice items so that the participants can understand the task at hand. The subsequent 12 film-clips (four in each condition) will be presented in random order. Participants' answers will be recorded by the investigator and assessed by at least two independent and blind raters. The blind raters will evaluate the responses according to the scoring system developed by Abell et al. (2000): 0-2 points will be assigned based on how accurate a participant's description of the scene was. Scores will be excluded if there is not a Cohen's kappa of at least .85 for inter-rater reliability.

*Emotional Expression Morphing Task.* This task will be used to measure emotion recognition in moving faces, a cognitive empathy skill. Participants will be shown 60-film clips that will show a neutral face morphing into one of five different emotional expressions (happiness, sadness, disgust, anger, and fear) over a course of 9s. We will use the Pictures of Facial Affect Series (Ekman & Friesen, 1976) for our stimuli because it has been used in similar studies (Blair et al., 2001). Five control items will be included, which will show one neutral, geometric figure, such as a circle or triangle, morphing into a neutral animal, such as a cat or elephant. The five control items will always be presented first and in random order, followed by the 60 expression clips, which will also be presented in random order. We will morph the images using the most current and economically available facial expression morphing computer program, and the stimuli

will be presented to the participants on a computer using the most readily available presentation.

First, participants will be instructed that they will observe one object morphing into another. They will be told that their goal is to correctly identify what the initial object is morphing into. Participants will be asked to press a key on the computer when they first think they can correctly identify the object without guessing. They will then name the object out loud. Participants will be informed that they will not be told if they gave a right or wrong answer. Once the participants complete the control items, they will be told that they will now be identifying emotional facial expressions. The children will be reminded that the procedures for these items will be the exact same as the practice items. Only the final responses and reaction times will be recorded.

*Video Sequences Task.* The video sequences task (VST) is based off of previous empathy response tasks and video sequences tasks (Ricard & Kamberk-Kilicci, 1995; Schwenck et al., 2012). This task is designed to measure both cognitive and emotional empathy. Participants will be presented with a video clip featuring one protagonist experiencing one of four emotions: fear, sadness, happiness, and anger. Each condition has four video clips, for a total of 16 video clips. Each video clip will last roughly 20 seconds, and they will be presented to the participants in random order to prevent order effects. Following each clip, participants will be asked to identify what emotion the protagonist had felt during the video clip. This will measure emotion recognition. The accuracy of participants' responses will be judged as either correct or incorrect. Participants will also be asked to explain why they thought the protagonist felt the way they did, which will be used as a measure of emotional perspective taking. This will be



scored on a 0-2 point scale, as used by previous studies (Schwenck et al., 2012). A response that does not explain the emotional state of the protagonist will be evaluated with 0. A response that explains the emotional state of the protagonist but only does this through knowledge of other situations (e.g. “I saw a kid crying when that that happened to him before) will receive a 1. A 2 will be given to responses that explain the emotional state of the protagonist referencing the protagonist and the protagonist’s situation. Following that, participants will be asked to indicate what emotion they felt while watching the video clip, which we will use as a self-report measure of emotional empathy. Finally, participants will be asked how affected they were by the films, which will be used as a self-report measure of emotional arousal. Following each clip, we will ask participants to rate how intense they felt each of the four target emotions while watching the video segment. Each of the ratings of intensity will be on a seven-point Likert-type scale, with 1 being not feeling the emotion at all and 7 being feeling the emotion very intensely.

*Physiological Measure of Arousal.* We will measure skin conductance activity during the VST as a physiological measure of emotional empathy. We based physiological measurements off of those of previous studies (Blair, 1999). Activity will be measured from the medial phalanges of the first two fingers of the participants’ non-dominant hand using 1 cm Beckman Ag-AgCl electrodes filled with Johnson and Johnson K-Y lubricating jelly. At the beginning of the VST, the electrodes will be connected to a constant voltage system which will feed the data to our computer. As with other studies (Blair, 1999), we will define the skin conductance rating (SCR) as the greatest amplitude change from the baseline occurring between 1 and 5s after the

beginning of the stimulus.

## **Procedure**

Participants who give their consent will be placed into groups based on additional assessments. Participants will be placed in the ASD group if they score above the cut-off criteria for autism spectrum disorder on at least two of the three measures: ADOS, ADI-R (scores above the cut-off on at least two subscales), or SCQ (total score of  $\geq 15$ ). The CD-CD+ group will consist of participants who score above the cut-off on the parent rating scale for CD, score 50 or above on the CSI or the ASI, and have scores of  $\geq 32$  (median of the CD-sample) on the ICU. The CD-CD- group will have participants who score 50 or above on the CSI or the ASI and have a score of  $\leq 32$  on the ICU.

Participants placed in the control group will have scores that fall below the cut-off values on the CBCL, the CSI or ASI, and the SCQ. We will conduct a median-split for age in order to analyze developmental differences in empathic skills.

All participants will be tested individually in a quiet room in a local university's psychology department. Parental informed consent will be received before the participants arrive on campus. Participants will be informed of the study's purposes and given the opportunity to give assent and ask any questions. They will be reminded that they can stop participating in the study at any moment. All of the tasks will be administered on a laptop computer, except for the WASI. The WASI will be administered first, but the remaining tasks will be given in random order. All of the subjects will receive a monetary compensation of \$10 per hour of their time.

## Results

All of our analyses will be computed using the latest version of the Statistical Package for the Social Sciences (SPSS). We will first screen our data to uncover any outliers, data that is missing, odd data points, or any distributions that might need to be transformed before we can run our analyses. We will be running task specific 4 (CD-CU+ vs. CD vs. ASD vs. CG) X 2 (young vs. older) factorial MANOVAs. This will let us see if there are differences in cognitive and emotional empathy between clinical groups, between age groups, and if there is an interaction between clinical group and age. We will set a critical alpha level of .05 for all of our statistical analyses. Effect sizes ( $\eta^2$ ) will be calculated, and all statistically significant group differences will be followed up by post-hoc Scheffé tests.

For the animated shapes task, we do not think we will not observe any significant main effects or interactions for the random interaction stimuli. We do expect to see a main effect for age for goal-directed stimuli. We anticipate that the older group will score higher than the younger group for the goal directed films. For the theory of mind films, we predict that we will observe a significant main effect for group and for age. We do not expect there to be a significant interaction. We predict that the older group will perform significantly better than the younger group and the autism group will score significantly lower than the other clinical groups.

For the morphing task, we will first compare the control item reaction times of the two factors in order to control for general differences. We do not expect to see any

significant differences between reaction times for the control items. Results for reaction time of all the emotions are expected to show a main effect for clinical group and age. Overall, we predict that the older group will have shorter reaction times than the younger group. For the emotions of happiness, anger, and disgust, we expect that the autism group will have significantly longer reaction times than all of the other clinical groups. For the emotions of fear and sadness, we expect that the callous-unemotional trait group and autism group will have significantly longer reaction times than the conduct disorder group and the control group. Post-hoc Scheffé will show whether the callous-unemotional trait group and the autism group were significantly different from one another. We do not expect to see any significant group X age interactions.

Regarding accuracy scores of emotional recognition on the morphing task, we expect that the emotions fear and sadness will display a significant main effect for age. We expect that older children will be significantly more accurate in identifying these emotions than the younger group. For the emotions happiness, anger, and disgust, we predict we will see a significant main effect of group, with the autism group being significantly less accurate in recognizing these emotions. Accuracy scores for fear and sadness are also expected to reveal a main effect with group, and we predict that the callous-unemotional trait group and the autism group will be significantly less accurate than the conduct disorder and comparison group. We also expect to observe a significant group X age interaction for the emotions fear and sadness. We expect that post-hoc tests would reveal that the older callous-unemotional trait group will not score significantly different from the older conduct disorder and control groups, but the younger callous-unemotional will score significantly lower on fear and sadness than all other groups.

For emotion recognition during the video sequencing task, we expect to see accuracy results similar to the morphing tasks emotion recognition results. Results will reveal a significant main effect of group for the emotions fear, sadness, anger, and happiness. We predict that post-hoc tests would reveal that the autism group performed significantly less accurately for anger and happiness than any other group. The autism group and the callous-unemotional trait group would perform significantly worse than the conduct disorder group and the control group in recognizing fear and sadness. Post-hoc comparisons would reveal if there is a difference in accuracy between the two groups. We predict that there would be a significant main effect of age for fear and sadness, with older children being more accurate than the younger children. We also expect to see a significant interaction of group X age for fear and sadness. Again, we expect that the younger callous-unemotional trait group will score significantly lower on fear and sadness than the conduct disorder group and the control group, but the older callous-unemotional trait group will not score significantly different from the older conduct disorder and control groups.

Results for self-reported emotional contagion during the video sequences task are expected to show significant main effects for group and age for the emotions fear, sadness, anger, and happiness. We predict that the older children will be more likely to experience emotional contagion than the younger group. We also expect to see the control group experiencing emotional contagion to a significantly higher degree than the callous-unemotional group, the conduct disorder group, and the autism group. We do not expect to see any significant group X age interactions.

For emotional arousal during the video sequences task, we predict that we will observe significant main effects of group and age for the emotions fear, sadness, anger, and happiness. We predict that the control group and the autism group will be significantly more aroused than the callous-unemotional trait group. We also believe we will observe that the younger participants will be significantly more emotionally aroused than the older group. There will most likely be no significant group X age interactions.

Regarding physiological responses during the video sequences task, we expect to find a significant group main effect for the emotions fear, sadness, anger, and happiness. We expect that *post-hoc* Scheffé tests will reveal that the callous-unemotional trait group will have significantly lower physiological responses than any other group. We do not expect the conduct disorder group, the autism group, and the control group to be significantly different from one another. We do not expect to see a main effect for age nor a significant group X age interaction.

## **Discussion**

The primary aim of our proposal is to compare cognitive and emotional empathy in children with autism, children with conduct disorder, children with conduct disorder and callous-unemotional traits, and typically developing children. We expect that our results will fall in line with prior research which has found that boys with autism spectrum disorders display cognitive empathy deficits. These boys will exhibit consistent theory of mind deficits from childhood through adolescence. They will have difficulty taking the perspective of others, as shown in their impairment on the theory of mind section of the animated shapes task and their inability to take the protagonist's perspective on the video sequences task. We also expect that boys with autism will also show impairment in emotion recognition. While we expect that they will be able to correctly identify emotions, we believe that it will take them significantly longer to do so. This would be detrimental in real world settings where facial expressions change rapidly, leaving individuals with autism unable to accurately read the social environment.

Unlike individuals with autism, we expect that individuals with psychopathic tendencies will display specific cognitive empathy deficits. They will not have any deficits in theory of mind skills, but we expect that children with callous-unemotional traits will have difficulty recognizing facial expressions of fear and sadness. However, adolescents with psychopathic traits are not expected to have these deficits. We predict that adolescents with psychopathic tendencies will not show significantly different levels of cognitive empathy from the control group or the conduct disorder group. Prior

research has found that adults and adolescents with callous-unemotional traits do not display emotion recognition deficits as great as children with callous-unemotional traits (Bachevalier & Loveland, 2006; Frick & White, 2008). By the time they participate in our study, it is possible that the adolescents with psychopathic tendencies will have developed other neural components to compensate for any amygdala dysfunction that was present.

Most studies that look at empathy only rely on self-report measures, particularly studies that examine emotional empathy. One of the biggest strengths of this study is that it directly compares emotional empathy in individuals with autism and individuals with psychopathic traits using physiological means, as well as using self-report measures. From only the self-reported results of emotional contagion for emotional empathy, we would assume that individuals with autism, individuals with conduct disorder, and individuals with psychopathic traits display an emotional empathy deficit. However, we expect that individuals with autism and individuals with conduct disorder will be just as physiologically responsive as the control group. By directly comparing self-reported emotional empathy to physiologically measured emotional empathy, we will be able to detect and measure any differences between the two. If there is a difference, as we expect, this opens up new avenues for future research to explore differences and similarities between individuals with autism and individuals with only conduct disorder. Even if both clinical groups display differences between self-reported emotional empathy and physiologically measured empathy, there may be differences in neural activation between the two groups that will need to be explored in future studies.

Two of the main limitations of this study involve participant collection and group



assignment. We are interested in very specific clinical groups, making it potentially difficult to collect the number of participants necessary for the desired level of statistical power. It must also be noted that the populations of autism spectrum disorders and conduct disorders are quite heterogeneous, with certain traits and behaviors potentially being present in both autism and conduct disorder. In our study, we have tried to account for this by assigning individuals to groups according to specific guidelines. However, it is possible that we will miss some shared tendencies or other potential mediating variables. Another weakness is the study is cross-sectional, thus we cannot make causal inferences. Longitudinal designs should be incorporated in future research in order gain some understanding of some of the causes of the cognitive and emotional empathy deficits in these clinical populations.

We believe that the results gathered from this proposal on these different clinical groups would add to the research literature and help guide future research. Future studies could incorporate functional magnetic resonance imaging (fMRI) in order to observe and compare amygdala activation between individuals with autism and individuals with psychopathic tendencies, which may be linked with the deficits in cognitive and emotional empathy observed in this proposal. A longitudinal study using fMRI to measure neural activation during tasks, such as the VST, would be a way to gain some causal understanding of mechanisms underlying the deficits in cognitive and emotional empathy among individuals with autism and individuals with callous-unemotional traits. Another research avenue would be to look at other physiological measures of emotional empathy, such as heart rate or autonomic facial muscle reactions to emotional stimuli, to further explore differences between these two groups. Physiological measures may prove

to be a more accurate and reliable measure of emotional empathy. Further understanding cognitive empathy and emotional empathy differences between autism and psychopathy may lead to the development of better empathy therapy, which will help these individuals better interact with the social world they live in.

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