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Jessica A. Sunshine	4/13/10

The association between anxiety and nonverbal decoding ability in children: Age and gender differences

by

Jessica A. Sunshine

Advisor:

Stephen Nowicki, Jr., Ph.D.

Department of Psychology

_____

Stephen Nowicki, Jr., Ph.D.
Adviser

_____

Patricia Brennan, Ph.D.
Committee Member

_____

Kay Stewart, B.S.
Committee Member

_____

4/13/10

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Jessica A. Sunshine

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Stephen Nowicki, Jr., Ph.D.

An abstract of
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Abstract

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The purpose of this study was to examine (1) if an association exists between the degree of anxiety in children referred for social problems and the ability to identify emotions in nonverbal communication channels and (2) to see if this association differs by age (5 to 8 years of age; and 9 to 12 years of age) or gender (male and female). Based on the theorizing of Sullivan (1956), Harris (1995), and Youniss (1980) who suggested that relationships were the basis for successful adjustment, it was predicted that there would be a positive correlation between nonverbal receptive skills and the degree of anxiety as observed and rated by parents. Scores from the Diagnostic Analysis of Nonverbal Accuracy Scale-2 (DANVA2) and the Child Behavior Checklist (CBCL) were obtained from the records of children (n = 331) seen at a social skills training center, Beyond Words. After conducting appropriate Spearman Correlations, it was found that gender acted as a moderating variable while age did not. The association between anxiety and nonverbal decoding ability varied depending on children's gender. The more anxious girls were, the significantly more mistakes they made identifying emotions in adult faces and voices than for boys. The findings were discussed within the framework of the different ways males and females learn to relate as children.

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The association between anxiety and nonverbal decoding ability in children: Age and gender differences

The purpose of the present study was to examine the association between the ability to read emotions in adult and child facial expressions, tone of voice, and adult postures and the level of anxiety in children identified as having social adjustment problems. Participant's age and gender were evaluated as possible moderating factors. In the sections to follow, I provide the pertinent information regarding anxiety and nonverbal communication necessary for stating relevant predictions.

Anxiety

According to Harry Stack Sullivan (1953), anxiety motivates behavior. It guides us in our pursuit of pleasure and our avoidance of pain. It is important to note that the level of anxiety will differ from person to person and from situation to situation. At a facilitative level, anxiety provokes people to live their lives to the best of their abilities. When the level of anxiety in a given situation exceeds that which is helpful or necessary to motivate behavior, debilitative effects are made salient. Higher, harmful levels of anxiety have the capability of interfering with processes that are necessary for the healthy development of children, adolescents, or adults.

Anxiety that is inappropriately high for a given situation can interfere with the processing of cognitive information (Mullins & Duke, 2004) and educational success (Stein, Torgrud, & Walker, 2000). As reflected by the inverted U-shaped curve of the Yerkes-Dodson Law, if there is too little or too much arousal, learning will be impaired (Yerkes & Dodson, 1908). Consistent with this view, when people experience higher levels of anxiety, they may not be able to function optimally and consequently, their performance will suffer.

Higher levels of anxiety in children have been linked to interpersonal problems (e.g. Puig-Antich, Lukens, Davies, Goetz, Brennan-Quarttock & Todak, 1985; Strauss, Lahey, Frick, Frame, & Hynd; 1988) and social failure (Li, 1985; as cites in Strauss, et al., 1988). Puig-Antich et al (1985) found that children diagnosed with some form of an anxiety disorder were less likely to have peer interaction outside of school, indicating a lack of friends. This is similar to what was found by Strauss et al (1988), in that participants who were clinically diagnosed with an anxiety disorder were liked less, neglected more, and received lower social-impact scores than their peers.

Evidence suggests that there is a strong relationship between the scales used to diagnose general anxiety disorder and social anxiety/phobia. For example, the *Social Phobia and Anxiety Inventory for Children* (SPAI-C; Beidel, Turner, & Morris; 1995), was found to be significantly correlated with the *Child Behavior Checklist* (CBCL; Achenbach, 1991) Internalizing Scale, $r = .45$, $p < .001$. The internalizing scale is used to assess general anxiety and depression in children. According to the manual (Achenbach & Rescorla, 2001), the construct validity for the CBCL was established by looking at all anxiety disorders. The Anxiety Problems subscale of the CBCL in particular has been found to be related to DSM-IV-TR anxiety disorders, suggesting that it is an appropriate measure of anxiety related problems. Likewise, the SPAI-C, which examines anxiety only in relation to social situations, was also found to have a negative relationship with the CBCL Social Competence scale, $r = -.33$, $p < .01$, suggesting that social activities decrease as social anxiety increases (Beidel et al, 1995). Both correlations found between the SPAI-C and the CBCL support the assumption that high levels of general as well as social anxiety are associated with personal and social difficulties.

The participants in the current study have all been referred for treatment because they have social adjustment problems. I am assuming that anxiety plays some part in their social difficulties and what follows provides the basis for my assumption.

Anxiety in Social Situations

Social anxiety, as the name suggests, refers to the fear of interpersonal interactions and performance-based conditions occurring in front of others. Anxiety in a social situation can be beneficial because it encourages individuals to make a positive first impression and to learn ways to interact in a positive manner. The fear in individuals who experience any level of social anxiety derives from the potential to be embarrassed by negative evaluations of others in a social situation (Mash & Wolfe, 2007). Physical symptoms of anxiety include, but are not limited to, sweating, blushing, palpitations, muscle tension, and tremors. Psychological symptoms of anxiety include excessive worry and nervousness (APA, 2000).

According to the cognitive-behavioral model of anxiety proposed by Rapee and Heimberg (1997), people who experience social anxiety do so because of their cognitive distortions and misperceived evaluation by their audience. An example of a cognitive distortion, or an irrational thought process, is "disqualifying the positive". Individuals with anxiety in social situations have been found to allocate most of their attention towards negative stimuli (Ohman, 1986; as cited in Rapee & Heimberg, 1997). Due to this tendency, they are assumed to pick up on even the slightest cues of perceived negative feedback from their audience, whether it is present or not. Thus, inaccurately interpreting the most basic indicators of others emotional states should create social difficulties that could increase feelings of anxiety about future interactions.

As previously discussed, the process of learning can be disrupted by higher levels of anxiety (e.g. Mullins & Duke, 2004; Stein et al, 2000; Yerkes & Dodson, 1908). Not only does high levels of anxiety disrupt the learning of verbal information but nonverbal as well (Nowicki, 2010). The ability of more intense anxiety to interfere with nonverbal communication is important because it has been shown that the ability to process nonverbal information is significantly related to successfully relating to others and forming friendships (Wenzel & Kashdan, 2008).

Anxiety and Relationships

First, children learn to related to adults. It is not until entering fulltime schooling that children begin to learn how to related to their peers (Nowicki, Duke, & Van Buren, 2008; Youniss, 1980). "Through peers and especially friends, children learn to become interpersonally sensitive, how to handle intimacy, and ways to achieve mutual understanding. These achievements are the key to interpersonal adjustment not just in childhood but throughout later life" (Youniss, 1980, p. 1). Childhood and preadolescence are critical periods for the development of same sex friendships that, in turn, will form the basis for later sexualized relationships that are formed in adolescence and adulthood. Anxiety may interfere with learning to relate during childhood and adolescence which may result in children achieving less, withdrawing from others more and feeling very unhappy (Gleason, Jensen-Campbell, & Ickes, 2009). These outcomes can further perpetuate the likelihood of developing adjustment problems due to the overwhelming evidence that anxiety and social anxiety are related to different types of social interaction difficulties (Gleason, Jensen-Campbell, & Ickes, 2009; Greco & Morris, 2005; Schneider, 2009).

Nonverbal Communication

One way that higher anxiety can negatively impact the development of relationships is by interfering with the learning and processing of nonverbal cues of emotion (Ekman & Friesen, 1969). By nonverbal behaviors we mean information that is conveyed through "the face, eyes, voice, body (arm/hand gestures and postures)…the use of space in human encounters…appearance, clothing and environmental stimuli" (Knapp, p. 15). Expressive and receptive abilities are important subtypes of verbal and nonverbal communication (Duke et al., 1996). Expressive nonverbal communication refers to the ability to send appropriate emotion cues while receptive nonverbal communication is the ability to accurately interpret other people's nonverbal cues of emotions.

Nonverbal communications is more intimately tied to relationship development because of the way it differs from verbal communication. For example, nonverbal communications are more continuous than verbal ones. People can stop talking but they cannot stop communicating feelings through nonverbal modalities such as faces and postures. It has been estimated that verbalizing through actual words accounts for only 7% of the emotions we are expressing (Merhabian, 1968; as cited in Duke et al., 1996). In part this might be due to a second way that nonverbal communications differs from verbal communication; because individuals are less aware of what they are communicating nonverbally than verbally, they may be more likely to communicate their true emotions (Ekman & Friesen, 1969). Ekman and Friesen (1969) referred to this as "nonverbal leakage", reflecting the fact that people are often unable to control the nonverbal cues that they express.

Information carried via nonverbal channels, when expressed and received accurately, allow for a more effective and meaningful interaction with others. However, when nonverbal

cues are inaccurately depicted or interpreted, social interaction difficulties can result. Children who have difficulties with accurately identifying nonverbal cues have been found to be less popular (Mash & Wolfe, 2007) and to have a negative impression on others (Marton, Abramoff, & Rosenzweig, 2005; as cited in Mash & Wolfe, 2007). When children misinterpret subtle cues within social interactions, they are more likely to respond in inappropriate ways that can alienate others.

A cycle can develop between nonverbal communication and anxiety. Nowicki and Duke (1992) suggest that anxiety generated within a social situation can interfere with the appropriate processing of nonverbal information and interfere with social interactions. When people fear that they will be judged for how they act or what they say, it can cause them to focus on internal cues, such as "a mental picture of themselves as seen by the social partner", instead of external cues that are imperative for the accurate assessment of a situation (Mullins & Duke, 2004). Over time, some people may even become conditioned to fear social interactions (Beesdo, Knappe, & Pine, 2009).

For the present investigation, I chose to examine the nonverbal modalities of facial expressions, paralaguage, and posture. They were chosen because they account for a major share of nonverbal emotional information passed between individuals in social situations (Mehrabian, 1968). Each will be described next.

Facial Expressions: Most of the research on nonverbal communication has focused on the face (e.g Ekman & Friesen, 1975). Darwin was the first to emphasize the importance of facial expressions in the communication of animals and humans (Darwin, 1965). The face is the part of the body that we are constantly looking at when engaging in conversation in order to assess and interpret the feelings and attitudes of others (Duke et al., 1996). Therefore, if an

individual experiences problems identifying facial expressions, significant difficulties making friends will ensue. Deficits in accurately reading facial expressing have been seen in children with social anxiety (Walker & Nowicki, 2008).

Paralanguage: Paralanguage, or the sounds that accompany spoken words, can say a lot about a person's feelings towards something. The "tone, loudness, intensity of voice, and sounds uttered between or instead of words such as humming and whistling" that communicate emotion (Duke et al., 1996) are all aspects of paralanguage. Researchers have found that it is often the case that the way somebody says something is more important than the words that they are saying (Pally, 2001). An association has been found between the ability to accurately interpret emotions in tone of voice and social competence (McClure, 2001; McClure & Nowicki, 2001). The job of the receiver is to try to determine what the speaker means in order to respond accordingly and it is the responsibility of the expresser to accurately relay the message they are trying to convey, leaving much room for error.

Posture: Posture is more of a long-distance form of nonverbal communication (Duke et al., 1996) that can relay information about one's personality (Ekman, 1965) and feelings about the person that he/she is interacting with (Kudoh & Matsumoto, 1985). It is the job of a person's entire body to accurately depict the way in which they are feeling. "Resting posture" is in effect at all times that active movement is not; therefore, we cannot avoid having posture because it is present in every situation. This lays the foundation for why interpersonal problems may prevail when inaccurately interpreting another person's posture. Ekman (1965) emphasized the importance of posture due to the ability to relay gross types of emotions, such as like and dislike. Additionally, it has been found that changes in posture reflect changes in emotion pertaining to interpersonal comfort or discomfort (Mehrabian & Friar, 1969).

Research Regarding the Social Adjustment and Nonverbal Decoding Ability

A number of studies have provided evidence for an association between social maladjustment and nonverbal decoding capabilities. For example, Edwards, Manstead, and Macdonald (1984) found a relationship between children's (age 8 to 11) sociometric status (SMS), or degree of likeability, and their ability to accurately recognize emotions in facial expressions. Children higher as opposed to lower in social anxiety were found to be less liked by their peers (Mash & Wolfe, 2007). This is consistent with what was found by McClure and Nowicki (2001). They used 8-10 year old children and found that those higher as compare to lower in anxiety were associated with more errors in identifying emotions in vocal cues.

The impact of anxiety and social anxiety can vary based on age and gender. For example, previous research has found that older individuals generally experience higher levels of anxiety than younger individuals (Mash & Wolfe, 2007). As well as age being associated with levels of anxiety, it has also been found that females generally show higher levels of anxiety than males (Hefter, 1996).

Age Differences

Anxiety may be differentially associated with the adjustment of younger and older children because of the basic types of interactions within which they are involved. Younger children tend to engage in strictly "top-down" relationships like those they have with their caregivers or teachers, while older children are involved in more "equal partner" relationships with their peers (Younnis, 1980). As the requirements and demands of relationships become more extensive with age, they can produce greater stress.

Researchers have suggested that anxiety in social situations increases for children in early to mid adolescence (Mash & Wolfe, 2007). Researchers have found that older children have

higher levels of anxiety than younger ones (e.g. Foot, Chapman, & Smith, 1995; Hefter, 1996; Mash & Wolfe, 2007; Schneider & Tessier, 2007). Mash and Wolfe (2007) attribute this finding to the fact that this is "the time when [preteens and] teens experience heightened self-consciousness, doubts, and worries about their appearance, social prowess, and what others think of them".

Youniss (1980) points out that children's relationships change dramatically when they begin full time schooling. In preschool and early grade school, children's social interactions are primarily with and directed by adult caregivers or teachers. Youniss (1980) suggests that this is the way that parents assist their children in adjusting to society; however, children of such a young age are unable to fully comprehend their parents' perspective. When entering full time schooling, children's relationships change from being mostly with adults to being mostly with peers. The peer relationships differ from those that children had with adults in that they involve negotiations with equals rather than submitting to dominant adults. This is the time when social skills become even more important to the process of making and maintaining friends.

One explanation for why there may be age differences in anxiety originated with Harry Stack Sullivan. His theory of human relationships suggests that human development is characterized by learning increasingly complex ways to interact with others and the failure to learn increasingly important relating skills is associated with social maladjustment (Hefter, 1995). There are various developmental stages that people progress through in which different goals are made salient and hopefully attained (Nowicki, Duke &Van Buren, 2008). The six stages take individuals from birth to early adulthood. The childhood, juvenile, and preadolescent stages are important for the present investigation.

Childhood: For those in the childhood era, ages two to five, the most significant relationship they have is with their primary caregiver. Although not the focus of this investigation, it is important to note the top-down relationship is the most common one and governs interactions during the childhood era. Youniss (1980) posits that it is the job of the parents to assist their children in adjusting into the order of society but that children of such a young age are not yet able to completely understand this perspective. The juvenile period begins with full time schooling when a child's relationships shift away from parents and unto peers.

Juvenile Period: The juvenile era occurs between age six to eight. During this stage, children begin school and are forced into an unfamiliar atmosphere surrounded mainly by strangers. Peers base relationships during this stage on similarities and acceptance. Although children are no longer with their caregiver for the majority of the day, adult relationships are still present in the form of teachers and aids who monitor and supervise children's behaviors. Children begin to make friends of their own during this age rather than being told whom they are going to spend time with (Nowicki et al., 2008). The Juvenile stage is characterized by interactions amoung equals and acts as a transition period to preadolesence.

Preadolescence: As children gain experience in interacting with peers, the interpersonal demands increase as they enter the preadolescent era which is generally put at ages nine to eleven. During this stage, peer relationships become even more important and parental interactions less so. The peer relationships that form during this time tend to be significantly more intimate than the previous ones. It is during this time that Sullivan suggests that a special best friend relationship develops. He called this best friend a "chum". The chum becomes important because it is through this relationship that individuals learn about trust and love. They trust the chum to give them feedback about their behavior. Because of this special chum

relationship and its interactions, children experience consensual validation in which they are able to assess how their ideas and behaviors fit with those of their peers. The chum relationship is characterized by self-disclosure and intimacy (Hefter, 1996).

More recently, Harris (1995) has offered a theory that is consistent with Sullivan's theory of human relationships. Called the group socialization theory, it assumes that peer interaction is of utmost importance for successful adjustment in society. She discredits the idea that parents are the main contributors to the level of adjustment and social development in a preadolescent child. If Harris and Sullivan are accurate, then children's ability to process social information, both verbally and nonverbally, becomes even more important and deficits in such skills may even produce negative outcomes such as anxiety.

If children fail to learn social skills necessary to mature interpersonally, it could increase anxiety which could increase and interfere with typical social interactions. In support of this idea, anxious children have been found to have a more difficult time decoding facial expressions in children than in adults (Walker & Nowicki, 2008). Based on the shift from parental relationships to peer friendships during the preadolescent phase, it can be assumed that the difficulty in interpreting facial expressions of people their own age would have major implications for social adjustment.

Gender Differences

Not only might the nonverbal accuracy and social anxiety association vary by age, but there is some reason to believe that it will be affected by gender as well. Boys and girls have been found to relate to one another and others in different ways and anxiety is no exception. Previous research suggests that girls have higher levels of anxiety than boys (e.g. Dunn & Bruner, 2004; Mash & Wolfe, 2007; Schneider & Tessier, 2007). Pertinent to the present study,

boys and girls have also been found to relate in different ways (Maccoby, 2002). Girls appear to be more worried about being socially competent and to "attach a greater importance to interpersonal relationships" than do boys (Essau, Conradt, & Petermann, 1999; as cited in Mash & Wolfe, 2007).

One of the ways that boys and girls differ in their interactions is apparent in the ways that girls and boys play. Empirical evidence guided by Sullivan and Harris' perspectives suggests that children tend to stay in same-sex groups when forming relationships (Dunn & Bruner, 2004). By the age of six, it has been found that 61% to 81% of children prefer same-sex friends (Foot, Chapman, & Smith, 1995). Dunn observes that boys prefer more rough-and-tumble type play than girls. In contrast to the aggressive play of boys, girls seem to favor different activities such as playing house or coloring. The difference between boys and girls in their regulation of emotions also plays into their need to interact in same-sex groups (Dunn & Bruner, 2004). It appears that girls tend to engage in more complex play, such as "pretend play" (e.g. house) which requires more emotional thought, while boys partake in more competitive play, such as wrestling (Maccoby, 2002).

The number of friends that girls and boys tend to play with also varies by gender. Research suggests that as children reach the juvenile stage, girls engage in more one-on-one interactions and prefer more intimate settings, conversations, and interactions while boys form larger groups of friends that do not invite intimate interactions (Foot, Chapman, & Smith, 1995). The fact that girls favor intimate interactions more than boys may affect the role that emotional recognition skills plays in that process. Boys engage in more group play with many boys and a competitive component, focusing on themes such as danger and conflict (Maccoby, 2002), Girls,

on the other hand, tend to have relatively fewer best friends and focus on themes of domestic life and caring.

The level of emotionality involved in the relationships of girls appears to be far greater than that of boys. A study by Bigelow and La Gaipa (1980), found that of nine dimensions of friendships they analyzed, the only sex difference was on the dimension of "intimacy potential". Intimate interactions consist of an abundance of modest positive nonverbal cues that are likely to induce anxiety in an individual experiencing difficulty with interpersonal situations. An association between friendship and positive nonverbal cues, such as smiling, touching, and laughing, was found in children (Foot, Chapman, & Smith, 1995). Smiling and slight touching, for example, are more often seen in girls than boys apparently because of the heightened level of intimacy in their relationships. Thus, if socially maladjusted female children are anxious and placed in an intimate setting, their anxiety may be exacerbated. Since one of the defining characteristics of a friendship is reciprocity (Mannarino, 1980), if a juvenile stage girl is too anxious to send appropriate signs of attractions and comfort like laughter and smiles, it will make forming friendships much more difficult.

Statement of the Problem

The ability to form strong and meaningful relationships is a key to a happy and satisfying life. Anxiety in general and anxiety in social situations in particular have been found in some instances to compromise the development of satisfactory peer relationships. One way that excessive anxiety can impact the development of relating to others negatively is by interfering with the processing of receptive nonverbal emotion information. Such information is assumed to be essential for interacting effectively because it provides indicators of the true emotional states of interactants (e.g. Nowicki et al, 2008; Youniss, 1980). Without accurate communication of

nonverbal indicators of emotion, it is assumed that interactions would be more difficult to do and more likely to fail. The purpose of the present study was not only to see if anxiety is associated with the ability to identify emotions nonverbally, but to see if it differs by the age and gender of the participants.

Figure 1:

GENDER

AGE	Male	Female
5-8		
9-12		

Based on the theoretical assumptions of Sullivan, Youniss, and Harris as well as the empirical findings they have generated, I make the following predictions:

(1) It is predicted that there will be a positive association between the level of anxiety in socially maladjusted children and the amount of mistakes they made in the identification of nonverbal cues of emotion. Specifically, the correlation between anxiety and nonverbal errors will be higher in children aged 9 to 12 as compared to children 5 to 8. This prediction is based on the supposition that peers have a greater impact on the development of social skills in the preadolescent era than they do in the juvenile era because relationships increase in complexity and intimacy as children become older (Schneider, 2009).

(2) It is predicted that the correlation between level of anxiety and number of receptive nonverbal errors on both facial expressions and paralanguage (tone of voice) will be higher in girls than in boys. This prediction is based on the idea that girls are more likely to interact

intimately in one-on-one interactions than boys (Bigelow & La Gaipa, 1980) where accurate processing of facial expressions and paralanguage cues are most important.

(3) It was predicted that the correlation between errors on posture and anxiety will be higher for boys than for girls. This prediction is based on boys' greater preference for group interaction and non-intimate relationships than girls (Foot, Chapman, & Smith, 1995). Because boys' interactions, such as in sports and games, occur over greater physical distance it is assumed that being able to identify emotion cues in posture will be more important for them than for girls.

(4) Finally, it was predicted that the correlation between anxiety and overall nonverbal errors will be significantly higher for girls 9 to 12 than for any of the other three groups. This prediction is based on the combination of evidence suggesting that girls' relationships are more intimate and more important to them than boys' relationships are to them and that as children get older, their relationships with their peers become more complex and difficult.

Method

Participants

Participants are all clients of Beyond Words, a social skills training center for children with social and developmental issues located in Atlanta, Georgia. All of these children were self-referred for social adjustment problems. 331 clients (252 males, 79 females) ages 5 to 12 were used in order to complete this investigation. The participants were split into two groups based on age; children ages 5 to 8 (n = 138) and children ages 9 to 12 (n = 193). Written parental consent was obtained prior to this study for the use of all participants' information to be used for research purposes.

Measures

Diagnostic Analysis of Nonverbal Accuracy Scale-2 (DANVA2; Nowicki, 2009; Nowicki & Duke, 1994). This instrument evaluates the accuracy of correctly identifying and representing nonverbal skills (i.e. facial expressions, paralanguage, and postures). This reliable and valid measure has been used in over 300 studies (Nowicki, 2010). There are a variety of subscales that are more specific in order to identify the precise deficits in nonverbal skills. These include Receptive Facial Expressions, Receptive Adult Paralanguage, Receptive Child Paralanguage, Receptive Adult Postures, Expressive Facial Expressions Subtest, and Expressive Paralanguage Subtest. Construct validity is discussed in detail in a manual for the DANVA2.

Receptive Facial Expressions. The Diagnostic Analysis of Nonverbal Accuracy- Adult Facial Expressions (DANVA2-AF) and The Diagnostic Analysis of Nonverbal Accuracy- Child Facial Expressions (DANVA2-CF) portray four emotions (happy, sad, scared, and angry) in 24 photographs of facial expressions. Each emotion is present in six of the pictures, three high-intensity and three low-intensity expressions. The participant is asked to rate each photograph based on which emotion they feel is representative of the person's face. The DANVA2-AF has good internal consistency for first graders (.71, n = 28), third graders (.68, n = 30), and fifth graders (.71, n = 38). The DANVA2-CF has good test-retest reliability for third graders (r = .74, n = 84). Lower scores on the DANVA2-CF are significantly correlated with lower social competence, providing evidence for criterion validity.

Receptive Adult Paralanguage. The Diagnostic Analysis of Nonverbal Accuracy-Adult Paralanguage (DANVA2-AP; Baum and Nowicki, 1997) asks participants to rate the same neutral sentence based on if they believe the tone is happy, sad, scared, or angry. There are 24 audiotapes in which an adult states: "I am going out of the room now, but I'll be back later". By

choosing a neutral sentence, children will not be inclined to choose an emotion based on what is being said but rather on how it is being said. Acceptable internal consistency exists for the DANVA2-AP subtest for elementary school children (α = .70, n = 84). Criteria validity exists for this measure as seen in elementary school boys. The more mistakes made on the DANVA2-AP was found to be related to lower social competence as scored on the CBCL (r = - .44, $p < .05$, n = 14).

Receptive Child Paralanguage. The Diagnostic Analysis of Nonverbal Accuracy-Child Paralanguage (DANVA2-CP, Rothman & Nowicki, 2004) consists of 24 audiotapes that have children stating the neutral sentence: "I am going out of the room now, but I'll be back later". Again, the participant is asked to rate the voice based on the emotions previously discussed. Internal consistency is good for the DANVA2-CP for eight year olds (n = 32, .74) and 10 year olds (n = 31, .76). Nowicki and Demertiz (1997) found good test-retest reliability for 10 year old children during a six week period (r(22) = .88).

Receptive Adult Postures. The Diagnostic Analysis of Nonverbal Accuracy-Adult Postures (DANVA2-POS; Pitterman & Nowicki, 2004) examines the accuracy of identifying emotions linked to posture. There are 16 photographs of an entire body in a pose with the face covered as to avoid any additional cues.

Child Behavior Checklist (CBCL; Achenbach, 1991). The CBCL was used in order examine the presence and degree of anxiety in each child. This measure, which is completed by the child's parents, addresses the psychological adjustment a child by examining 120 different behavioral problems. This standardized measure tests for both internalizing and externalizing difficulties through the various subscales. These subscales are Withdrawn, Somatic Complaints, Anxious/Depressed, Social Problems, Thought Problems, Attention Problems, Delinquent

Behavior, and Aggressive Behavior. This study will look specifically at the DSM-IV oriented category labeled anxiety problems. This scale consists of 6 items from the CBCL including dependent, fears, fears school, nervous, fearful, and worries. The range of scores for this scale is 1-12. When the DSM anxiety checklist scores were correlated with this subscale, an association of .43 was found. Independent from the DSM, the anxiety problems subscale has high test-retest reliability (r = .80). The CBCL as a whole has been reported to have good reliability and validity (Archenbach & Rescorla, 2001).

Procedure

The data that was used was taken from a data set that was already created at Beyond Words. The DANVA2 and the CBCL were given to each child as part of the initial evaluation used for all clients. The primary caregiver of each child filled out the CBCL. The staff at Beyond Words was trained to successfully administer and score the DANVA2. Written consent was given for research purposes.

The initial dataset consisted of 1,146 participants. After sorting the data by age and excluding participants who were not in the range of 5 to 12, 762 participants remained. If the gender of participants was not included in the data, those participants were also excluded. The final participants to be excluded were those whose data was not complete for all of the DANVA2 subscales and the CBCL Anxiety Problems subscale. A number of clients did not have a score for the Anxiety Problems subtest, as it is relatively new to the CBCL. The DSM oriented subscales were not added until 2001 (Achenbach & Rescorla, 2001) and some of the clients completed their initial assessment prior to this date. Data analysis was conducted after the dataset was recreated to fit the needs of this study.

Results

Spearman correlations were computed due to the skewed distribution of the majority of the variables that were included for analysis. After creating histograms, it was concluded that the data were not normally distributed and that nonparametric statistics were appropriate to use. Correlations were conducted between the number of problems endorsed on the anxiety problems subscale of the CBCL and the total number of mistakes made on the DANVA2 subscales of adult and child faces, adult and child voices, and adult posture. The data were then split by age group and gender to further assess whether the correlations differed by these moderators. If a significant correlation was found, only then were further correlations computed to see if the errors for specific emotions were significant. This was done in an attempt to reduce the possibility of making type I errors. Independent *t*-tests were conducted and no significant findings were produced when looking at the means and standard deviations to see if the errors for specific emotions were significantly different from one another. Fisher *Z*-scores were also computed to see if the correlations between groups were significantly different. The statistical level of significance was set at .05.

Table 1 presents the correlations computed between CBCL anxiety problems and adult and child faces and voices and adult postures.

Total DANVA2 scores

A non-significant negative correlation was found (r = -.031) between the anxiety problems subscale of the CBCL and the total number of mistakes made on the five DANVA2 subtests. Correlations were then computed for age and gender differences. No age or gender correlations were found to be significant for anxiety and total number of errors made on the DANVA2.

Receptive Adult Facial Expressions

No significant correlations were found between total mistakes made identifying adult faces and one's level of anxiety problems. As shown in Table 1, when broken down by age and gender, gender was found to be significant while age was not. There was a significant positive correlation for girls ($r = .28$, $p < 0.01$) between level of anxiety and the number of mistakes made when attempting to identify the emotional cues in adult faces. A *Z*-score ($z = 2.33$, $p < .05$) confirmed that the correlation coefficient were statistically significantly different between boys and girls.

Receptive Child Facial Expressions

As can be seen in Table 1, no significant correlations were found.

Receptive Adult Paralanguage

No significant correlations were found between total mistakes made identifying emotion in adult voices and level of anxiety problems. When broken down by age and gender, gender was found to be significant while age was not. For boys, there was a significant negative correlation ($r = -.13$, $p < 0.05$) between level of anxiety and the number of mistakes made when attempting to identify the emotion presented in adult voices. A *Z*-score ($z = 1.97$, $p < .05$) confirmed that the correlation coefficient were statistically significantly different between boys and girls.

Receptive Child Paralanguage

Although no significant results were found, the correlation between level of anxiety and total number of mistakes made when attempting to identify the emotion in child voices approached significance ($r = -.10$, $p = .056$).

Receptive Adult Posture

As can be seen in Table 1, no significant correlations were found.

Discussion

The purpose of this study was to examine the possible association between the level of anxiety and the total number of mistakes made when identifying emotions in faces, voices, and postures. Support was found for a difference in association by gender for faces and voices but not postures. Although the finding that two of the possible 25 correlations were significant approaches the level of chance, where the significant correlations were found suggests a meaningful pattern based on gender. Specifically, as predicted, high anxiety was associated with more errors for girls but surprisingly fewer errors for boys. In contrast, none of the associations between anxiety and nonverbal receptive ability were significant for age. The meaning of the significant gender and nonsignificant age associations are expanded on next.

Gender Differences

The most important finding of this study was the suggestion that gender may play a part in the associations between anxiety and nonverbal communication. Results suggest that higher anxiety is associated with deficient processing of nonverbal cues of emotion in adults for girls, but with significantly more efficient processing of these same cues for boys. The findings are consistent with the second prediction that socially maladjusted girls with anxiety would have significantly more impairment than boys when identifying emotions in faces and voices. At least for girls, high levels of anxiety, as suggested by Yerkes and Dodson (1908), are associated with impaired ability to properly decode and process information in this case, emotion in adult faces and voices.

The finding that high anxiety affected girls more than boys may be explained in part by the different way that girls and boys relate. For example, girls are involved in more intimate relationships than boys. If a typical girl wanted to make and maintain a friendship, a certain level of self-disclosure and closeness are required and perhaps even preferred (Bigelow & La Gaipa, 1980; Foot, Chapman, & Smith, 1995). Since cues of intimacy include smiling, tones of voice, and slight touching (Foot, Chapman, & Smith, 1995), misperception of them could produce interpersonal difficulties that could further perpetuate anxiety which will cause more interference with the processing of both social nonverbal and verbal information.

The association between level of anxiety and deficits in receptive nonverbal communication was in a direction that was opposite to the predicted association for boys. In contrast to their female peers, boys with higher, not lower, levels of anxiety were better at identifying the emotions in faces and voices. While this finding is not consistent with past results (e.g. Duke et al., 1996; Ekman & Friesen, 1969; Walker & Nowicki, 2008), it is important to note that previous results were obtained from typical boys unlike those used in the present study. The findings suggest that for boys who are having social adjustment difficulties higher levels of anxiety may be associated with more accurate nonverbal information. Anxiety appears to be more facilitative in producing greater vigilance and alertness for boys, at least as measured by identifying emotion in adult faces and voices, than it is for girls between the ages of 5 and 12.

One possible explanation for this unexpected relationship may be that boys do not allow their anxiety to govern their lives as much as girls do. A study by Zlomke and Hahn (2010) explains that "accepting that a negative event had occurred and attaching meaning to a negative event for personal growth" is beneficial to an individual. Learning from negative events seems like something that boys may be more willing to do than girls, given the propensity of girls to

ruminate more than boys do about negative events. For girls, negative events appear to be more likely to results in an "increased negative self-focus" than for boys (Zlomke & Hahn, 2010). This difference in the way boys and girls cope with negative events may explain the differential effects that are seen in the current study. Based on the present findings, it may be that higher anxiety actually helps boys to adapt to the social situations by increasing their ability to identify emotions in faces and voices. Girls, on the other hand, may be more likely to continue to dwell on the situation, conditioning them to fear future social interactions, interfering with identifying emotions in nonverbal cues and reducing their ability to learn from the previous anxiety-induced situation. If this finding can be substantiated by future research, it could have major implications for intervention purposes. For example, paradoxically, it appears that it may be beneficial not to relieve boys of their anxiety in order for them to successfully interact socially. Of course, much of this reasoning assumes a cause and effect process that has yet to be determined.

While there appeared to be systematic associations between anxiety and nonverbal accuracy in faces and voices that differed for boys and girls, they did not extend to the association between anxiety and posture. Relative to faces and voices, there is comparatively little past research on the association between errors in identifying emotion on postures and personal or social correlates of children. The work that has been completed has used primarily adult participants and found associations between accuracy on postures and personal feelings such as loneliness (Pitterman & Nowicki, 2004). It may be that reading postures is not as important to social interactions in children, especially as it related to anxiety, as it is with adults or that the absence of children's postures in the DANVA2 may have affected the findings in some unknown way. Future research could help evaluate the usefulness of posture to the social interactive behavior of children. It would be beneficial for future studies to examine posture

seen in both adults and children in everyday life, rather than in posed picture. It may be that pictures of people in different positions do not accurately depict the emotions that people portray in their posture in every day life.

Age Differences

It was predicted that as children got older, moving from Sullivan's (1953) juvenile stage (ages 5 to 8) to his preadolescent stage (ages 9 to 12), anxiety would show an increasing degree of association with the number of mistakes made identifying emotions. This prediction was based on the assumption that relationships become more complex with age and that anxiety would be more likely to interfere with the interpersonal negotiations that take place in the more egalitarian oriented peer relationships that were developing. The prediction was not supported by the findings. No significant age differences were found in this study. In fact, the correlation approached zero in most cases.

There are a number of possible reasons for the lack of support for this hypothesis. First, the theoretical assumptions of increasing complexity of relationship process may not have applied to the population used in the present study. Perhaps it is what takes place in a typical population of children, but not one like the one used in the present study in which social progress has stalled. Previous findings have shown that as typical children age, not only does the impact of anxiety on their personal and social behavior increase but even the absolute level of their anxiety as well. Because of the lack of comparative data for typical versus atypical children, it is not known whether age acts as a moderator between anxiety and receptive nonverbal cues in that population. With a typical population of children we could compare the trajectories in the formation of friendships and anxiety with the atypical population to evaluate their similarities and differences. It may be that this atypical population do not progresses as rapidly in

relationship formation so if they were compared to the typical population, larger differences would be seen between groups experiencing low versus high levels of anxiety.

Because the children in this study shared problems in social interactions, it may be that they also share a lack of developing age appropriate relationships. If true, it may be that age does not differentiate the anxiety/receptive nonverbal skill association. The original prediction was made based on the fact that relationships become more complex and intimate, which present increasing challenges for children who are anxious in social situations. Based on this potentially slowed trajectory seen in the current population, it may be concluded that atypical children tend to remain stagnant in their relationship skills over time.

Some support for this reasoning comes from the finding that the significant correlation between anxiety and nonverbal cues were only present in the identification of adult faces and voices but not in child faces and voices. It may be that the most important relationships for the children in this study were those with adults and not with children. This is not what has been found for typical children. If the relationships with adults meant more to these children then anxiety may be important in determining whether these cues were read correctly or not. With fewer valued interactions with own age peers, anxiety may not make a difference in the identification of cues. In identifying emotion in adult faces and voices, anxiety is associated with heightened accuracy in boys as opposed to girls.

Limitations and Future Research

The findings in the current study may have been affected by a number of factors. First, the study would have benefited from the presence of a population of typical children. With a comparison group of typical children it would have been possible to compare typical with atypical children in the anxiety/nonverbal association. The inclusion of a typical population

would also have increased the range of the variables under study and raised the potential for correlations to reach levels of significance.

Second, there were a fewer number of girls (n = 79) than boys (n = 252) in the data set used in the present study. The smaller number of girls may have contributed to the lack of significant findings because it reduced the statistical power for the associations for girls. While having more girls in the study would have been helpful, it also may be that the proportion of girls to boys in the present sample reflects the incidence of social maladjustment in the overall population. That is, boys in general have a greater number of social adjustment issues than girls in general who are more successful at creating and maintaining friends (Bigelow & La Gaipa, 1980; as cited in Foot, Chapman, & Smith, 1995).

Future studies also may want to control for the severity of children's social adjustment because there is some suggestion that girls who have such problems may be more severely affected than boys. If they are more disturbed than boys, it may be one of the reasons anxiety affected their ability to identify emotions in faces and voices. Either controlling for severity of adjustment or balancing the number of boys and girls might increase chances of the study's predictions being supported.

Finally, it would have been beneficial if the Beyond Words dataset included diagnoses for children with social maladjustment. By obtaining the accurate diagnoses of each participant, I would have been able to better identify children and place them into subtypes that would allow more accurate testing for the predicted high versus low levels of social maladjustment. For example, children with an Autism spectrum diagnosis might be less likely to show the anxiety/receptive nonverbal cues association than those with Social Anxiety diagnosis.

The measures that were used in this investigation may also contribute to the results of this study. The CBCL is a measure that uses the observation of parents. This presents several possible shortcomings. First, because anxiety is an internalizing disorder, many of the children's symptoms may not be observable by the primary caregiver. In future studies, I would suggest using the CBCL in conjunction with a self-reported scale that measures intra-psychological aspects of anxiety symptoms in order to gain more valid knowledge about the extent of the anxiety within each participant. Second, parents do not see their children in a social situations. It would be potentially helpful to use the observations of teachers who may be more likely to see children in a variety of social interactions.

As well as potential difficulties posed by the use of the parent oriented CBCL, there are other concerns about how anxiety was measured in this study. For example, there was no measure in the dataset specific to social anxiety. The findings may have been more significant had this measure been present since social anxiety has previously been linked to deficits in nonverbal communication; however, based on the significant findings dealing with general anxiety, I would suggest that future studies look at both general anxiety and social anxiety instead of just one or the other.

Despite the limitations in the CBCL anxiety problems subscale, this measure was derived from the DSM; therefore, it has been developed consistent with the principles of construct validity. This subscale is rooted in good measurement, background and concept. Additionally, it is an observational measure rather than a self reported measure so participants are unable to trivialize the issues during the report. It can be argued that parents know their child the best when they are such a young age so the measure is most accurate when filled out by them.

Finally, it is important to address the potential limitations of the measure of receptive nonverbal the DANVA2. First is the fact that there are relatively few stimuli for each emotion. It is difficult to determine if these children would perform better or worse with more pictures per emotions. Second, the DANVA2 lacks ecological validity in that the stimuli are posed and static. Due to the fact that emotions are not being portrayed in real life situations, it is hard to predict if the child would identify the same emotion during the DANVA2 as they would in an actual social interaction. Despite these limitations, the DANVA2 has been used in over 300 studies, many of which were examining the effects of social anxiety on the identification of emotion. It can be argued that although these pictures are posed, they are only flashed on the screen for approximately 2 seconds. Nonverbal cues are continuously changing; therefore, the DANVA2 is somewhat representative of what may occur when an anxious child is presented with nonverbal cues in a real life context.

With these limitations in mind, it is important that future studies attempt to replicate the current findings. Any future study that is attempting to look at the association between anxiety and receptive nonverbal processing skills should include a group of typical children in order to examine how they differ from atypical children and a more specific measure for social anxiety completed by more than one rater. With the replication of the current findings, the implementation of novel intervention techniques could be explored.

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Table 1

Spearman Correlations between the Diagnostic Analysis of Nonverbal Accuracy 2 (DANVA2) Receptive Subscales and Child Behavioral Checklist (CBCL) Anxiety Problems Subscale by Age Group (5-8, 9-12) and Gender (female [n = 79], males [n = 252])

	DANVA2 Subscales					
CBCL Anxiety Problems Score by Age and Gender	AF	CF	AV	CV	AP	TOT
TOTAL	.061	.026	-.064	-.064	-.045	-.031
5-8	.074	.086	-.057	-.016	-.104	.000
9-12	.085	.028	-.002	-.066	.004	-.015
Male	-.019	-.014	-.129*	-.101	-.078	.075
Female	.279**	.146	.128	.049	.060	.148

*p < .05, **p < .01

Note. "AF" represents the DANVA2 item "Receptive Adult Facial Expression", "CF" represents the item "Receptive Child Facial Expression", "AV" represents the item "Receptive Adult Paralanguage (Voice)", "CV" represents the item "Receptive Child Paralanguage (Voice)", "AP" represents the item "Receptive Adult Posture", and "TOT" represents the total number of mistakes made on the DANVA2 for adult and child facial expressions, adult and child voices, and adult posture.

Table 2

Means (standard deviations) for errors on the Diagnostic Analysis of Nonverbal Accuracy Scale-2 (DANVA2) and all receptive expression subtests for boys and girls ages 5 to 8 (younger) and 9 to 12 (older) with low levels of anxiety (CBCL anxiety problems score < 60) and high levels of anxiety (CBCL anxiety problems score > 60)

	Younger		Older	
	Girls	Boys	Girls	Boys
Receptive Adult Faces				
Low Anxiety	7.00 (4.41)	7.28 (3.18)	5.05 (3.29)	5.68 (2.50)
High Anxiety	8.15 (3.41)	7.50 (3.27)	6.64 (2.61)	5.94 (2.74)
Receptive Child Faces				
Low Anxiety	5.31 (4.41)	5.48 (2.64)	3.86 (2.83)	3.31 (2.26)
High Anxiety	6.75 (4.63)	5.33 (3.50)	4.05 (2.79)	3.92 (2.98)
Receptive Adult Voices				
Low Anxiety	10.63 (3.28)	11.42 (2.79)	8.24 (2.61)	8.03 (2.51)
High Anxiety	12.15 (3.91)	10.65 (3.49)	9.05 (2.65)	8.49 (2.45)
Receptive Child Voices				
Low Anxiety	9.13 (3.52)	9.86 (3.82)	6.19 (3.09)	7.37 (3.31)
High Anxiety	9.90 (4.72)	9.00 (3.54)	7.64 (3.98)	6.87 (3.01)
Receptive Adult Posture				
Low Anxiety	5.50 (2.86)	7.06 (2.69)	4.67 (2.37)	4.60 (2.37)
High Anxiety	6.30 (2.75)	5.92 (2.57)	4.95 (3.15)	4.95 (2.70)

Table 2 (continued)

	Younger		Older	
	Girls	Boys	Girls	Boys
Total DANVA2 Errors				
Low Anxiety	37.56 (15.79)	41.10 (10.53)	28.00 (10.55)	28.98 (7.79)
High Anxiety	43.25 (16.59)	38.40 (12.72)	32.32 (12.27)	30.18 (10.05)