

Facial Expression Recognition and Interpretation in Shy Children

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Dedicated to my uncle, Dr. Morris Kokin, who will forever be missed

Abstract

Two studies were conducted in which we examined the relation between shyness and facial expression processing in children. In Study 1, facial expression recognition was examined by asking 97 children ages 12 to 14 years to identify six different expressions displayed at 50% and 100% intensity, as well as a neutral expression. In Study 2, the focus shifted from the recognition of emotions to the interpretation of emotions. In this study, 123 children aged 12 to 14 years were asked a series of questions regarding how they would perceive different facial expressions. Findings from Study 1 showed that, in the case of shy boys, higher levels of shyness were related to lower recognition accuracy for sad faces displayed at 50% intensity. However, in most cases, shyness was not related to facial expression recognition. The results from Study 2 suggested broader implications for shy children. The findings of Study 2 demonstrated that shyness is predictive of biased facial expression interpretation and that rejection sensitivity mediates this relation. Overall the results of these two studies add to the research on facial expression processing in shy children and suggest that cognitive biases in the way facial expressions are interpreted may be related to shy children's discomfort in social situations.

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Declaration of Academic Achievement and Contribution of Authors

Jessica Kokin is the primary author of the manuscript “Facial expression recognition in shy children.” Jessica conceptualized the manuscript from the theoretical and methodological formulations from the research proposal, conducted the literature review, collected and analyzed the data, and prepared the manuscript for submission. The second author, Alastair Younger, is the thesis supervisor who played an active role in each phase of the research formulation and manuscript preparation. The third author, Pierre Gosselin, is a thesis committee member who offered input and expertise during the formulation and manuscript preparation. His expertise in the field of emotional recognition, and his proposal to use Wagner’s (1995) unbiased hit rate to measure facial expression recognition accuracy was greatly appreciated. Previous versions of this manuscript were presented as posters at the Canadian Psychological Association’s (CPA) 70th Annual Convention in Montreal, Quebec, June 11-13, 2009 and at the Society for Research in Child Development Biennial Meeting in Montreal, Quebec, March 31-April 2, 2011.

Jessica Kokin is the primary author of the manuscript “Biased facial expression interpretation in shy children.” Jessica conceptualized the manuscript from the theoretical and methodological formulations from the research proposal, conducted the literature review, collected and analyzed the data, and prepared the manuscript for submission. The second author, Alastair Younger, is the thesis supervisor who played an active role in each phase of the research formulation and manuscript preparation. The third author, Pierre Gosselin, is a thesis committee member who offered important input and expertise during both the formulation and preparation of the manuscript. He specifically proposed the use of Wagner’s (1995) unbiased hit rate to measure facial expression recognition. The fourth author, Tracy Vaillancourt, is a thesis committee member who provided important input on the manuscript. Dr. Vaillancourt proposed

and offered expertise on an original mediation model incorporating rejection sensitivity to explore the link between shyness and facial expression interpretation. The manuscript has been submitted to the journal *Infant and Child Development* and is currently in revision.

Table of Contents

Abstract.....	i
Acknowledgments	ii
Declaration of Academic Achievement and Contribution of Authors.....	iv
Table of Contents	vi
 General Introduction	 1
Definition of Shyness.....	2
Contributions to Childhood Shyness	2
Behavioural inhibition.	2
Mother-child attachment.	4
Parenting styles.	4
Diathesis-stress model of shyness.....	6
Problems Associated with Shyness.....	6
Shyness and friendships, peer rejection, exclusion, and victimization.....	7
Shyness, depression, and other internalizing problems.	9
Shyness and anxiety.....	11
Shyness and social anxiety disorder.	12
Shyness and social competence.	13
Shyness and the Interpretation of Social Cues.....	14
Facial expressions of emotion.....	15
The Present Research.....	16
 Study 1: Facial Expression Recognition in Shy Children	
Abstract.....	19
Introduction.....	20
<i>Figure 1: Sample facial expressions at 50% and 100% intensity.....</i>	<i>28</i>
Method	29
Participants.....	29
Materials	29
Demographic information.	29
Shyness.	29
Facial expressions of emotion.....	30
Procedure	31
Facial expression task.	31
Self-report questionnaires.	33
Statistical Analysis.....	33
Results	34
Preliminary Analyses	34
Main Analyses	35
Facial expressions presented at 50% intensity.....	35
Facial expressions presented at 100% intensity.....	35
Individual facial expressions at 50% intensity.....	35
Table 1: Accuracy (Unbiased Hit Rate) for Recognition of Facial Expressions Presented at 50% Intensity for Total Sample	36

<i>Sadness (50%)</i>	36
Table 2: Sequential Regression Analysis Predicting Accuracy Scores for Sad Faces Presented at 50% Intensity for Total Sample.....	36
Table 3: Relative Frequencies of Error-Types in Recognizing Facial Expressions of 50% Sadness based on extreme groups (shy boys and non-shy boys).....	38
<i>Happiness, surprise, fear, disgust, and anger (50%)</i>	38
Individual facial expressions at 100% intensity.....	38
Table 4: Accuracy (Unbiased Hit Rate) for Recognition of Facial Expressions Presented at 100% Intensity for Total Sample	39
<i>Sadness (100%)</i>	39
Table 5: Relative Frequencies of Error-Types in Recognizing Facial Expressions of 100% Sadness based on extreme groups (shy boys and non-shy boys)	40
<i>Disgust (100%)</i>	40
Table 6: Sequential Regression Analysis Predicting Accuracy scores for Sadness and Disgust at 100% Intensity for Shyness, Sex, and Shyness x Sex	41
<i>Happiness, surprise, fear, and anger (100%)</i>	41
Neutral Expressions.....	41
Discussion	41
 Study 2: Biased Facial Expression Interpretation in Shy Children	
Abstract	49
Introduction	50
<i>Figure 1:</i> Sample facial expressions	56
Method	57
Participants.....	57
Materials	58
Demographic information.....	58
Shyness.....	58
Rejection sensitivity.....	58
Facial expression stimuli.....	59
Procedure	60
Part 1: Facial expression task.....	60
Part 2: Self-report questionnaires.....	61
Statistical Analysis.....	61
Results	62
Preliminary Analyses.....	62
Facial Expression Recognition	63
Table 1: Recognition Accuracy (Unbiased hit rate) for Each Emotional Expression for Total Sample	63
Relation between Shyness and Rejection Sensitivity	63
Relation between Shyness and Facial Expression Interpretation Outcomes	64
Table 2: Mean Scores, Standard Deviations, and Ranges for Facial Expression Interpretation Variables and their Correlations with Shyness and Sex.....	65
Probability estimates.....	65
Consequences for the Self.....	66
Ratings of Liking.....	66

Table 3: Summary of Sequential Regression Analysis Predicting Facial Expression	
Interpretation Variables for Shyness, Sex and Shyness x Sex.....	68
Rejection Sensitivity as Mediator between Shyness and Facial Expression Interpretation	
Biases	69
Table 4: Rejection Sensitivity as a Mediator of Shyness and Children's Facial Expression	
Interpretation.....	70
Discussion	70
General Discussion.....	78
Summary of Primary Results, Strengths, and Global Implications	78
Limitations and Future Directions	83
Conclusions.....	88
References.....	89
Appendix A	115
Appendix B	118
Appendix C	120
Appendix D.....	122
Appendix E	124
Appendix F.....	126
Appendix G.....	133
Appendix H.....	136
Appendix I	138

General Introduction

In the past, researchers studying social maladjustment in children have focused less on children who are shy and socially withdrawn compared with those who are aggressive (Rubin & Coplan, 2004). This unbalanced research focus can be partly attributed to the fact that socially withdrawn children, in contrast to aggressive children, have not been considered at-risk for later psychological difficulties (Burgess & Younger, 2006). Furthermore, shy children's behaviour is less noticeable than the behaviour of aggressive children because they do not violate the rights of others. This is especially true in a classroom setting where aggressive children often disrupt the class, while shy children are more likely to sit quietly. It has become increasingly clear, however, that childhood shyness, inhibition, and withdrawal (defined below) are related to an array of negative outcomes (Rubin et al., 2009). Shyness in children has also been associated with an avoidant coping style (Eisenberg, Shepard, Fabes, Murphy, & Guthrie, 1998), peer-rejection and exclusion (Gazelle & Ladd, 2003), negative affect, loneliness, and social anxiety (Findlay, Coplan, & Bowker, 2009). Furthermore, shy children tend to experience negative cognitions about themselves, suggesting that they may be at risk for the development of internalizing disorders in adolescence and adulthood (Burgess & Younger, 2006). In the U.S. National Comorbidity Survey (2005) it was found that 26% of women and 19% of men identified themselves as "very shy" growing up and, of these shy individuals, 53% of women and 40% of men met criteria for a lifetime diagnosis of one or more anxiety or mood disorders (Cox, MacPherson, & Enns, 2005). Given this information, it is important to examine children's shyness further, with the ultimate goal of helping prevent shy children from developing future problems. The findings of the current research will add to our understanding of the social

difficulties faced by shy children, and will have implications for interventions to improve their social relations.

Definition of Shyness

In broad terms, shyness can be described as tension and discomfort in the presence of others (Cheek & Buss, 1981). This discomfort can arise from a fear of strangers or novel situations (Cheek & Buss, 1981; Crozier & Burnham, 1990), sometimes referred to as “behavioural inhibition” (Kagan, Reznick & Snidman, 1988), as well as from self-consciousness and fear of social evaluation (Cheek, 1990; Leary, 1986; Zimbardo, 1982). Shyness is associated with behavioural indices such as gaze aversion, inhibition (Cheek & Buss, 1981), withdrawal, and avoidance (Henderson & Zimbardo, 2001) when exposed to a novel or social situation. Taken together, shyness can be defined as “discomfort and the motivations to escape situations that contribute to it” (Henderson & Zimbardo, 2001, p. 6). Shyness has been found to be moderately stable from early childhood to adolescence, but can also be shaped by environmental factors such as parenting (e.g., Coplan, Arbeau, & Armer, 2008) and peer relations (Gazelle & Ladd, 2003).

Contributions to Childhood Shyness

Behavioural inhibition. Many researchers and theorists believe that the social withdrawal and inhibition displayed by shy children is linked to differences in the excitability of the amygdala – the fear center of the brain (Kagan & Snidman, 1991; LeDoux, 1996; Nader & Ledoux, 1999). Jerome Kagan’s research (Kagan, Reznick, & Snidman, 1987, 1998; Kagan & Snidman, 1991; McManis, Kagan, Snidman, & Woodward, 2002), linked shyness with early infant reactivity in the face of novel stimuli. Kagan labeled this kind of reactivity as “behavioural inhibition” (Kagan & Snidman, 1991). Kagan found in his research that high levels of infant

reactivity predicted shyness and behavioural inhibition in the preschool and early school years. A recent longitudinal study replicated these findings showing that low levels of infant reactivity predicted low levels of shyness and higher sociability as rated by children and observers (Hardway, Kagan, Snidman & Pincus, 2013). Kagan and his colleagues found that children who were inhibited had a physiological profile that distinguished them from uninhibited children, which suggested a genetic component (Kagan & Snidman, 1991). In support of this hypothesis, one study found that monozygotic twins showed stronger intraclass correlations of inhibited behaviour compared to dizygotic twins and non-twin siblings when placed in an unfamiliar laboratory playroom (Dilalla, Kagan & Reznick, 1994). Inhibited children have been found to have higher baseline levels of the stress hormone cortisol (Kagan, Reznick, & Snidman, 1987), increased cortisol levels when interacting with unfamiliar peers (Gunnar, Tout, de Haan, Pierce & Stansbury, 1997), and an elevated heart rate when exposed to novel situations (Kagan et al., 1987, 1988). More recent studies have also found evidence of the biological underpinnings of behavioural inhibition by demonstrating associations between behavioural inhibition and right EEG asymmetry and low cardiac vagal tone (Fox, Henderson, Marshall, Nichols & Ghera, 2005). Behavioural inhibition can be viewed as a type of temperament that is moderately stable over time. The stability of behavioural inhibition throughout childhood has been documented by earlier studies conducted by Kagan and his colleagues (e.g., Kagan, Reznick, Snidman, Gibbons & Johnson, 1988) as well as by more recent studies (see Fox et al., 2005 for a full review). In sum, the origins of shyness in some children has been linked to behavioural inhibition, defined as an inhibited temperament that is moderately stable from infancy throughout childhood, and is thought to have a biological component.

Mother-child attachment. It has been suggested that parenting an infant that is reactive and inhibited can be demanding. Specifically, it may be challenging for parents to provide the care and responsiveness a behaviourally inhibited child needs in a way that provides the child with a sense of security and safety (Kiang, Moreno & Robinson, 2004). According to attachment theory (Bowlby, 1969, Cassidy, 2008; Marvin & Britner, 2008), children are more likely to explore the world with confidence when they have a secure attachment bond with their caregivers. Different attachment styles develop based on the degree to which children experience their primary caregiver as sensitive and responsive (Ainsworth, 1973; Ainsworth, Blehar, Waters & Wall, 1978; Belsky & Fearon, 2008; Cassidy, 2008). With the knowledge that their parents are a “secure base” on which they can rely, children feel confident to explore their environment, allowing them to develop social skills and self-efficacy. Conversely, when children are insecurely attached to parents, because of lack of responsiveness or abusive behaviour, children do not feel safe or confident enough to explore their social world (Bowlby, 1969, 1988). Links between insecure attachment in infancy and toddlerhood and social withdrawal (Erickson, Sroufe & Egeland, 1985; Gerhold, Laucht, Texdorf, Schmidt & Esser, 2002; Renken, Egeland, Marvinney, Mangelsdorf & Sroufe, 1989), shyness (Booth-LaForce & Oxford, 2008; Borelli, David, Crowley & Mayes, 2010; Chen, 2012), and lower social competence (Cohn, 1990; Jacobson & Wille, 1986; Shamir-Essakow, Ungerer & Rapee, 2005; van Brakel, Muris, Bogels, & Thomassen, 2006) in early to middle childhood have been well documented.

Parenting styles. As mentioned, parents can react in a number of different ways to their children’s shy behaviour. Studies have shown that mothers of anxious-withdrawn children tend to respond to their child’s withdrawn behaviour with high control strategies such as giving directives, compared to mothers of non-anxious children (Erickson et al., 1985; Rubin & Mills,

1990). It has also been shown that shyness in preschoolers predicted social withdrawal during school years only if mothers displayed controlling behaviour and low positive affect (Hane, Cheah, Rubin, & Fox, 2008). A recent longitudinal study found that high levels of infant reactivity was related to a more controlling parenting style during verbal conflict with their children at age 9-12 years, suggesting a bidirectional relation between child temperament and parenting style over time (Hardway et al., 2013). It has been suggested that this kind of controlling behaviour undermines the child's autonomy, takes away the child's opportunity to learn how to navigate normal social challenges, and sends a message that the child is not capable of coping with such challenges on his or her own (Rubin et al., 2010).

A number of studies have found links between parental control and social reticence (Rubin, Cheah, & Fox, 2001), defined behaviourally as watching others from afar, or hovering near others but not engaging with them (Coplan, Rubin, Calkins, & Stewart, 1994). Parental control has also been linked with social withdrawal (Kiel & Buss, 2014; Rubin, Hastings, Stewart, Henderson, & Chen, 1997) and internalizing problems (Bayer, Sanson, & Hemphill, 2006; Zarra-Nezhad, 2014) in children. Results of longitudinal studies suggest that parenting style may impact the relation between behavioural inhibition and early childhood outcomes over time. Rubin, Burgess and Hastings (2002) found that levels of behavioural inhibition in toddlerhood predicted social reticence in pre-school only for toddlers whose parents exhibited overly controlling and solicitous behaviour. Similarly, Coplan, Arbeau, and Armer (2008) found that the relation between children's level of shyness at the start of kindergarten and social maladjustment measured at the end of the school year was stronger for children whose mothers had higher levels of neuroticism, threat sensitivity, and an overprotective parenting style,

compared to children whose mothers were higher in agreeableness and had an authoritative parenting style.

Although research shows a clear relation between attachment style and levels of parental control and the development of shyness, the direction of this relation remains unclear. As will be discussed next, a number of researchers have proposed a transactional model of shyness (e.g., Rubin et al., 2009), in which biological factors and environmental factors interact with one another to contribute to the development of shyness in children.

Diathesis-stress model of shyness. In view of the evidence supporting both biological and environmental pathways to shyness, a number of researchers have proposed a diathesis-stress model of shyness. Schmidt, Polak and Spooner (2005) point out that not all infants with behavioural inhibition or with an insecure attachment style go on to develop shyness, suggesting that both genetic and environmental factors contribute to its development in children. These researchers propose that a biological predisposition toward shyness and environmental stressors such as familial (e.g., parenting style) and extra-familial relationships (e.g., peer rejection) interact with one another in the development of shyness. Similarly, in a recent review, Rubin and colleagues (2009) describe a “transactional model” of shyness, in which factors such as childhood behavioural inhibition impacts parenting style and attachment style, which in turn impacts the child’s level of shyness and withdrawal. In support of a diathesis-stress model of shyness, a recent study found that behavioural inhibition was related to shyness and lower levels of social competence for children who had low levels of maternal support but not for children with high maternal support (Chen et al., 2014).

Problems Associated with Shyness

Shyness is associated with problems in a variety of life domains in both children and adults.

One area in which problems associated with shyness may manifest themselves is in the classroom at school. Shy children are often too anxious to join class discussions, ask questions, or approach peers or teachers for help, which may have consequences for school performance (Burgess & Younger, 2006; Evans, 2010). Shyness in childhood is also associated with school avoidance (Rubin, Coplan, & Bowker, 2009). Moreover, shy children's lack of interaction with peers may result in less well-developed social skills, leading to diminished enjoyment of school activities compared to their more outgoing peers (Ladd, Birch, & Buhs, 1999). In addition, underdeveloped social skills reinforce social anxiety and can foster negative self-appraisals (Nelson, Rubin & Fox, 2005).

Shyness and friendships, peer rejection, exclusion, and victimization. Although shy children are less likely to have a large group of friends than non-shy children (Pedersen, Vitaro, Barker, & Borge, 2007), they are just as likely to have at least one good friend as non-shy children (Ladd & Burgess, 1999; Rubin, Wojslawowicz, Rose-Krasnor, Booth-LaForce, & Burgess, 2006; Schneider, 1999). However, the quality of shy children's friendships appears to be lower than that of the friendships of non-shy children (Rubin et al., 2006; Schneider, 1999). Furthermore, from as early as kindergarten, shyness in children is associated with peer rejection and peer exclusion (Gazelle & Ladd, 2003). Peer rejection is defined as an attitude of dislike, whereas peer exclusion refers to children's actions or behaviour of passively ignoring or actively refusing peer group entry of the shy child (Rubin, Bowker & Gazelle, 2010). Younger and his colleagues (Younger & Boyko, 1987; Younger & Piccinin, 1989; Younger, Schwartzman, & Ledingham, 1985, 1986) have proposed that peer rejection of shy children increases in mid to late childhood and early adolescence, when shyness and social withdrawal are more salient and seen as more negative by peers of that age (see also Boivin, Hymel & Bukowski, 1995; Rubin,

2006). However, it has been found that rejection and mistreatment of shy, withdrawn children takes place as early as preschool and kindergarten (Gazelle & Ladd, 2003; Gazelle & Spangler, 2007; Sette, Baumgartner & Schneider, 2014). In fact, research indicates that although socially anxious children keep to themselves and do not bother anyone, their peers dislike their display of shy behaviour and are likely to target them for victimization (Erath, Flanagan, & Bierman, 2007; Hanish & Guerra, 2004; Kochenderfer-Ladd, 2003). Studies have shown that shy, withdrawn children who are excluded or victimized tend to display more stable and increased levels of anxious withdrawal and report higher levels of depression over time (Gazelle & Ladd, 2003, Oh et al., 2008). It has been suggested that experiencing victimization on a regular basis may lead to increased fear of classmates and further social withdrawal (Hoglund & Leadbetter, 2007), resulting in a feedback loop in which children are targeted based on their withdrawn behaviour, which then exacerbates their anxiety and reticence in the peer group (Rubin et al., 2010). There is some evidence that shy boys are viewed more negatively by peers than are shy girls (Coplan, Prakash, O'Neil, & Armer, 2004; Gazelle & Ladd, 2003; Spangler & Gazelle, 2009). Some authors have suggested that this may be the result of shyness being less socially acceptable for boys than it is for girls because of gender norms related to male assertion and dominance (Rubin & Coplan, 2004).

The literature on shy adults indicates similar social difficulties as shy children. For example, shy adults have fewer friendships and romantic relationships than do those who are not shy (Meleshko & Alden, 1993; Paulhus & Morgan, 1997). Shy adults also report less satisfaction with their friendships and less support from their friends (Joiner, 1997; Jones & Carpenter, 1986). Adult men with a history of shyness have been shown to both marry and have children later in life (Caspi, Elder & Bem, 1988; Kerr, Lamber & Bem, 1996) and to enter stable careers

later than non-shy adults (Caspi et al., 1988).

Shyness, depression, and other internalizing problems. In addition to its contribution to social problems, shyness has also been linked to mental health problems such as depression and other internalizing disorders. Eisenberg, Shepard, Fabes, Murphy, and Guthrie (1998) conducted a longitudinal study examining the relation between shyness and dispositional regulation, emotionality, and coping when children were 6-8, 8-10 and 10-12 years old. These researchers found that shyness as rated by teachers was related to internalizing negative emotions, maladaptive coping, and low levels of positive emotion, both over time and across raters. Similar results were obtained when shyness and internalizing negative emotion were rated by parents. A recent longitudinal study, investigating the stability, age-related changes, and socio-emotional outcomes of shyness from infancy to early adolescence found that shyness in childhood predicted parent-ratings of depressive symptoms (Karevold, Ystrom, Coplan, Sanson, & Mathiesen, 2012). A study examining shyness in children in grades 4 and 5 (mean age 10 years) found that self-reported shyness, as measured by the Children's Shyness Questionnaire (CSQ; Crozier, 1995), was negatively related to self-concept and positively related to negative affect, loneliness, and social anxiety (Findlay, Coplan, & Bowker, 2009). Another recent longitudinal study examining the relation between shyness and internalizing problems in a sample of Chinese children found that shyness at age 9 predicted loneliness and teacher-rated internalizing problems one year later (Chen et al., 2013). Another study similarly found that self-reported shyness was positively related to children's reports of depressive symptoms, social anxiety, negative affect, and loneliness and negatively related to social self-perceptions (Kingsbury, Coplan, & Rose-Krasnor, 2013).

Interestingly, a small number of studies have found that the relation between shyness and

internalizing problems is mediated in part by internalizing coping in the face of a stressor (Findlay et al., 2009; Kingsbury et al., 2013) involving strategies such as worrying, self-pitying, and self-blaming (Causey & Dubow, 1992). Internalizing coping, which has been found in many studies to be significantly related to shyness (e.g., Eisenberg et al., 1998; Findlay et al., 2009; Weeks, Coplan, & Kingsbury, 2009), results in the development of negative internal states. As such, it appears that the manner in which shy children cope with social stressors may be related to the discomfort they feel in social situations.

Social withdrawal, a construct similar to shyness has also been found to be associated with internalizing problems in children and adolescents (Rubin, Burgess, & Coplan, 2002). Burgess, Rubin, Cheah, and Nelson (2005) define social withdrawal as “the consistent (across situations and over time) display of solitary behaviour when encountering both familiar and/or unfamiliar peers” (p. 101). Although there may be reasons other than anxiety that socially withdrawn children avoid social contact, “shyness is one form of social withdrawal that is motivated by social evaluative concerns, primarily in novel settings” (Asendorpf, 1993, p.14). Rubin (1993) reported results demonstrating that social withdrawal from early to late childhood was associated with felt insecurity, negative self-perceptions, dependency, and social deference. Furthermore, Rubin reported that in combination with negative self-appraisal, social withdrawal significantly predicted internalizing problems in early adolescence. In another study conducted by Burgess and Younger (2006), the relation between social withdrawal and internalizing problems was examined in middle childhood/adolescence. These researchers found that socially withdrawn children, compared to aggressive children and normative controls, experienced higher levels of depressive symptoms, anxiety symptoms, and somatic complaints. Similarly, Gazelle, Olson, and Allan (2010) found that children who were

identified as anxious solitary as rated by peers either in grade 3 or grade 4, predicted a higher likelihood of receiving a composite diagnosis of dysthymia and depression in grade 4 compared to controls. These diagnoses were made based on The Anxiety Disorders Interview Schedule-Child and Parent Versions (ADIS-C/P; Silverman & Albano 1996), a semi-structured interview based on Diagnostic and Statistical Manual of Mental Disorders (DSM-IV; American Psychiatric Association, 1994) criteria.

As mentioned, social withdrawal is associated with peer exclusion from as early as kindergarten. Specifically, it has been found that the combination of social withdrawal plus peer rejection predicts an increased exclusion trajectory over time and higher levels of depression symptoms than social withdrawal without peer rejection (Gazelle & Ladd, 2003). Based on the findings of the previously described studies, it seems that shyness, and behavioural indices such as social withdrawal and solitude, are related to emotional disorders such as depression.

Shyness and anxiety. Shyness has also been shown to be associated with the development of anxiety. It appears that a consistent display of shyness and inhibition throughout childhood is associated with the development of anxiety problems. For example, Hirshfield and colleagues (1992) found that children who showed signs of behavioural inhibition consistently from 21 months through 7.5 years had higher rates of anxiety disorders than did children whose display of inhibited behaviour was not as stable. Likewise, Prior, Smart, Sanson, and Oberklaid (2000) found that consistent shyness throughout childhood predicted anxiety problems at 13 and 14 years of age. Another longitudinal study found that higher levels of shyness at age 4.5 years predicted lower levels of social skills and higher levels of anxiety symptoms in adolescence (Karevold et al., 2012). In terms of shyness and its relation to anxiety in early education contexts,

Graham and Coplan (2012) found that parent ratings of shyness were related to teacher-rated anxiety and social withdrawal in younger children ages 4 to 6 years. Fordham and Stevenson-Hinde (1999) found similar results with older children. Specifically, these investigators found that a higher level of observer-rated shyness was related to higher trait anxiety and lower global self-worth for older children (mean age of 10) than younger children (mean age of 9). The authors believe this effect may be due to older children's greater self-awareness and, as Younger, Gentile, and Burgess (1993) suggested, that shyness and social withdrawal become more negative in older children's perceptions. Gazelle, Workman, and Allan (2010) examined the relation between anxious solitude and internalizing problems in elementary school students. These researchers found that of children identified by peers in the third or fourth grade as anxious solitary, 30% met diagnostic criteria for social anxiety disorder, as compared to just 12% of controls, according to parent reports on the Anxiety Disorders Interview Schedule- Parent Version (ADIS-P) clinical interview (Silverman & Albano, 1996). Similarly, the U.S. National Comorbidity Survey found that retrospective reports of childhood shyness were significantly associated with a lifetime history of social phobia, even when individuals with current social phobia (diagnosed in the past year) were excluded from analysis (Cox et al., 2005).

Shyness and social anxiety disorder. Shyness and social anxiety disorder have been said to overlap on behavioural, cognitive, and physiological characteristics. Social anxiety disorder (previously referred to as social phobia) is defined in the Diagnostic and Statistical Manual of Mental Disorders 5th edition (DSM-5; American Psychiatric Association, 2013) as marked and persistent fear of social or performance situations. These feared situations are avoided or otherwise endured with great distress to the point that everyday functioning is negatively affected. It has been proposed that shyness and social phobia differ quantitatively

rather than qualitatively, with social anxiety disorder distinguished by greater impairment and avoidance than that found with shyness (Juster & Heimberg, 1998; Rapee, 1995; Turner, 1990). Schmidt and Buss (2010) express a similar view, suggesting that social anxiety disorder is a more intense version of shyness, severe enough to cause people to seek professional help.

Shyness and social competence. Shy children have been found to have poorer problem-solving skills compared to non-shy children and to be more reliant on adults when presented with hypothetical social problems (Rubin, Daniels-Beirness, & Bream, 1984). Shy children also make fewer peer overtures compared to their less shy peers (Nelson et al., 2005; Stewart & Rubin, 1995). Moreover, these overtures tend to be unassertive, often resulting in shy children's efforts being declined by peers.

Beginning with Piaget in 1932, perspective taking or the ability to understand the thoughts and feelings of others has been seen as a crucial factor in predicting social competence and social skills. Given the importance of peer interaction in the development of perspective-taking skills, it has been suggested that social withdrawal may lead to under-developed social skills (Rubin et al., 2010). Indeed, one of the hallmarks of shy children is their lack of social participation and communication (Coplan & Armer, 2007). Research has shown that shyness is related to difficulty with perspective taking (Lemare & Rubin 1987). One study found that socially anxious children with high levels of shy negative affect had difficulty understanding how emotions, beliefs, and intentions are linked in social situations. In addition, teachers rated socially anxious children as having poorer social skills that involve insight into others' inner states compared to children who were not anxious (Banerjee & Henderson, 2001).

Shyness and the Interpretation of Social Cues

A vital component of successful communication with others is nonverbal processing, specifically the accurate interpretation of emotional cues (Ekman, 1972). Lemerise and Arsenio (2000) integrated emotional experiences into Crick and Dodge's (1994) social information processing model. They posited that a child's mood, emotions, or arousal may impact which social cues the child notices and remembers, and, as a result, the child's interpretations of social cues may be mood-congruent. Lemerise and Arsenio (2000) argued that the intensity with which children experience emotions and their ability to regulate emotions influences the way social cues are interpreted. Rubin and colleagues (2010) suggested that the tendency to make mood-congruent interpretations of social events is particularly relevant to withdrawn children who tend to react with fear and anxiety to negative social situations. Moreover, Lemerise and Arsenio (2000) posited that children who are overwhelmed by their own emotions or the emotions of others may choose hostile or avoidant goals in order to lower their level of arousal. In line with this theory of social emotional processing, researchers have found that, when presented with hypothetical negative social events, shy children are more likely to cope with the situation by using avoidance than are non-shy children (Burgess, et al., 2006; Wichmann, Coplan, & Daniels, 2004). Lemerise and Arsenio's (2000) model is in line with cognitive theories of social anxiety, which suggest that shy individuals may misinterpret social cues because of their own inner experience of anxiety (Clark & Wells, 1995; Rapee & Heimberg, 1997). Specifically, concerns about social evaluation can lead to negative self-perceptions and physiological anxiety that shifts the individual's attention inward and away from their external environment. Appraisals of the social environment are then based on these negative internal states, rather than on the objective circumstances. According to the vigilance-avoidance hypothesis (e.g., Mogg, Bradley, De Bono,

& Painter, 1997), focusing inward is a form of avoidance of the threat stimulus, and consequently, the individual does not have the opportunity to habituate or reappraise the stimulus as non-threatening. As a result, the stimulus continues to provoke anxiety for the individual. Rapee and Heimberg (1997) propose that because social information in an interaction is often ambiguous, it is susceptible to misinterpretations-especially by those who are hypervigilant about signs of social threat. Given that shy children may have trouble interpreting social cues, and that facial expressions are the primary means of conveying non-verbal information (Patterson, 1999), it is possible that shy children have difficulty recognizing and interpreting the facial expression of others.

Facial expressions of emotion. Emotions can be expressed both verbally, and non-verbally. There are a number of channels such as the voice, the face, and bodily gestures through which non-verbal information is transmitted to observers. A facial expression of emotion (FEE) is defined as an emotion that is signalled through the face (Ekman, 1993). FEEs provide information to observers about a person's emotional experience. For example, the emotion sadness is signalled to observers by raising the inner corners of the eyebrows, raising the cheeks slightly, and pulling the corners of the lips downward (Ekman, 1993). During a social interaction, individuals appraise one another's emotions, and then adjust their behaviour accordingly (Gosselin, Kirouac, & Dore, 1995). Consequently, if an emotion is not recognized correctly, the appropriate behaviour that is expected to follow that expression is not displayed, thus disrupting the natural flow of the social interaction (Mullins & Duke, 2004). It has therefore been suggested that the correct identification of emotions in the nonverbal behaviour of others is a necessary ability for effective social interaction in all stages of development (Goodfellow & Nowicki Jr., 2009; Nowicki Jr. & Duke, 1994). As it applies to children, problems identifying

different FEEs have been shown to interfere with peer relations and school adjustment (Goodfellow & Nowicki Jr., 2009). This relates directly to shy children who are known to struggle with both peer relations and adjustment at school (Gazelle & Ladd, 2003). It is important, therefore to examine whether shy children's social difficulties may be related to the way they interpret the facial expression of others.

The Present Research

It has been suggested that shy children's lack of social participation may limit their opportunities to develop social skills such as perspective taking (Rubin et al., 2010). Moreover, cognitive theories of social anxiety suggest that people with concerns about social evaluation which includes shy individuals, may have difficulty interpreting social cues such as facial expressions (Rapee & Heimberg, 1997). Consequently, examining whether shyness is related to problems recognizing and interpreting facial expressions can further our understanding of shy children.

Researchers have investigated the relation between social anxiety and facial expression recognition, but results have been mixed. Some of these studies have found that socially anxiety is related to problems recognizing facial expressions, while others have not. These equivocal findings may be related to the methodological shortcomings of past research, which the present research aimed to improve upon. Moreover, the large majority of these past studies have been conducted with adults, and have used clinical samples of individuals with a diagnosis of social phobia. The few studies that have been conducted with children have similarly used clinical samples. As such, there remains a gap in the research in terms of understanding how shy children interpret the facial expressions of others. Although not a diagnosable mental illness, shyness is

associated with a host of negative outcomes in children, and it is important to understand how the interpretation of facial expressions may contribute to shy children's struggles.

Our aim was to fill this gap. Because we studied a non-clinical sample of children, the findings of the present two studies may be applied to shy children in a classroom setting. The objective of Study 1 was to determine whether shyness was related to children's ability to recognize accurately different facial expressions. Because the results of Study 1 only partially supported the hypothesis that shyness would be related to facial expression recognition, Study 2 was designed to investigate the relation between shyness and facial expressions from a different angle. Specifically, Study 2 was designed to determine whether shyness was related to biases in the way facial expressions are interpreted. Overall, our aim in conducting these two studies was to clarify how shyness is related to the way facial expressions are recognized and interpreted by children.

Study 1:

Facial Expression Recognition in Shy Children

Abstract

It has been suggested that social anxiety and shyness may be related to problems processing non-verbal cues, including a difficulty reading emotional facial expressions. However, results from past studies with children have yielded mixed results. In the present study, 97 12- to 14-year-old preadolescent children were asked to identify six emotions and a neutral expression depicted in slides from the Japanese and Caucasian Facial Expressions of Emotion (JACFEE). Stimuli were presented on a laptop computer screen, and children were asked to identify each facial expression by pressing the appropriate button on an external keyboard. Facial expressions were presented at two different intensities (50% and 100%). In addition, the children rated their level of shyness using the Revised Cheek and Buss Shyness Scale (RCBS). Results showed that accuracy of facial expression recognition was related to self-reported level of shyness but for sad faces only. Specifically, shyness in boys was related to lower accuracy when recognizing sad faces at both 50% and 100% intensity. For girls, higher levels of shyness were related to higher levels of accuracy when recognizing sad faces presented at 50% intensity but shyness was not related to girls' ability to recognize sad faces at 100% intensity. These findings suggest that with the exception of shy boys' difficulty recognizing sad faces, shyness is not related to a difficulty with facial expression recognition.

Facial Expression Recognition in Shy Children

Emotions can be expressed both verbally and non-verbally. Facial expressions of emotion (FEE) provide information to observers about a person's emotional experience. During a social interaction, individuals appraise one another's emotions and then adjust their behaviour accordingly (Gosselin, Kirouac, & Dore, 1995). Consequently, if an emotion is not recognized correctly, the appropriate behaviour that is expected to follow that expression is not displayed, this disrupting the natural flow of the social interaction (Mullins & Duke, 2004). It has therefore been suggested that the correct identification of emotions in the nonverbal behaviour of others is a necessary ability for effective social interaction in all stages of development (Goodfellow & Nowicki Jr., 2009; Nowicki & Duke, 1994). As it applies to children, problems identifying different FEEs have been shown to interfere with peer relations and school adjustment (Goodfellow & Nowicki Jr., 2009). This relates directly to shy children, who are known to struggle with both peer relations and adjustment at school (Gazelle & Ladd, 2003).

Shyness and social anxiety have been shown to overlap on behavioural, cognitive, and physiological characteristics (Henderson & Zimbardo, 2010) and have been said to exist on a continuum, varying in degree of concern about social evaluation (Rapee & Heimberg, 1997). According to cognitive theories of social anxiety, fear of negative evaluation leads many shy individuals to shift their attention inward during social interactions and to use internal information, such as physiological symptoms of anxiety and negative self-perceptions, to interpret what others are thinking about them (Melchior & Cheek, 1990; Rapee & Heimberg, 1997). When attention is shifted inward, the individual's processing of the external environment is reduced, and biased accounts of social interactions may, therefore, be encoded into memory (e.g., "I was blushing when the teacher called on me; she must think I am stupid"). In addition, when they do focus

externally, individuals who are socially anxious or very shy tend to scan the environment in search of information concerning what others may be thinking about them (Clark & Wells, 1995; Rapee & Heimberg, 1998), leading them to more easily detect cues of disapproval compared to non-anxious individuals (Veljaca & Rapee, 1998). Because social information available in an interaction is often ambiguous, it can be susceptible to misinterpretation, especially for those who are vigilant toward threat cues (Rapee & Heimberg, 1997). For example, social cues such as facial expressions are often ambiguous (Izard, 1990) and become increasingly difficult to recognize as the level of intensity of the expression displayed decreases (Hess, Blairy, & Kleck, 1997). This is problematic, as errors in the interpretation of emotional cues may result in negative interpersonal experiences (Forgas & Bower, 1987). It is therefore important to examine shy children's ability to recognize facial expressions in order to understand the association between shyness and social discomfort, particularly when facial expressions are ambiguous.

In this study the relation between shyness and facial expression recognition was examined in a sample of preadolescent children aged 12- to 14-years. This age group was of particular interest in view of findings that the emotional salience of peer approval tends to increase during late childhood (London, Downey, & Bonica, 2007; Steinberg & Morris, 2001). Given that fear of negative evaluation may lead to the misinterpretation of social cues (Rapee & Heimberg, 1997), it seemed appropriate to examine the relation between shyness and facial expression recognition in older children to whom peer evaluation is especially relevant.

In adult studies comparing FEE recognition accuracy in socially anxious individuals compared to non-anxious controls, a variety of results have been reported. Some studies have found a specific judgment bias in which socially anxious participants misinterpreted neutral FEEs as threatening (Mohlman, Carmin, & Price, 2006; Winton, Clark, & Edelman, 1995; Yoon &

Zimbarg, 2006). Other researchers have found that socially anxious individuals can recognize threatening emotions such as anger and disgust better than can control participants, when the threatening emotions are presented at a lower intensity, indicating that the anxious participants are vigilant to signs of threat (Joorman & Gotlib, 2006). In contrast, one study found that participants higher in social anxiety were more accurate at recognizing happy, sad and fearful faces but there was no difference for angry faces (Hunter, Buckner, & Schmidt, 2009). A more recent study examined the relation between shyness and facial expression recognition (Gao, Chiesa, Maurer, & Schmidt, 2014) and found that shyness was positively related to mislabelling fearful faces as sad. Finally, some researchers have found no differences in the ability to recognize FEEs between socially anxious individuals and non- anxious controls (Bell et al., 2011; Phillipot & Douillez, 2004; Schofield, Coles, & Gibb, 2007).

There have only been four studies to date that have examined FEE recognition accuracy in socially anxious children, and, as with studies with adults, results have been mixed. Simonian, Beidel, Turner, Berkes, and Long (2001) looked at FEE recognition accuracy in a sample of children and adolescents between 9 and 15 years of age, who met Diagnostic and Statistical Manual of Mental Disorders (DSM-IV; American Psychiatric Association, 1994) criteria for social phobia and a matched group of normal controls. The participants were shown slides with pictures of adults making different facial expressions. They were asked to indicate which expression was presented by choosing one of the six labels provided on an answer sheet. Accuracy in responses for happy, sad, mad, surprised, scared, and disgusted was measured by the mean percentage of misclassifications. Results showed that children with social phobia made more errors in identifying the correct facial expression than did controls. Specifically, these children made significantly more errors on expressions of happiness, sadness, and disgust.

A related study was conducted with second- and third-grade elementary school children, mean age 7.5 years (Battaglia et al., 2004). Children's level of shyness and social anxiety was rated by their teacher and then correlated with facial expression recognition ability. In contrast to the study by Simonian and colleagues, however, pictures of children's faces were used rather than adult faces. Participants were asked to identify the facial expression presented by checking the appropriate box among the seven choices appearing on the screen. Accuracy in responses for joy, anger, disgust, sadness, fear, surprise, and a neutral expression was examined by the mean percentage of misclassifications. Results showed higher levels of social anxiety were related to errors such as mislabelling neutral faces as sad, and angry faces as disgust. The tendency to confuse anger with disgust is one of the most common misjudgments made by adults and has also been found in adolescents, (Baird et al., 1999). The tendency to confuse anger and disgust is even more frequent in children (Gosselin & Simard, 1999). Battaglia and colleagues (2004) suggest that although confusing anger and disgust is a normal human phenomenon, their findings indicate that this confusion may occur more frequently in children with higher indices of shyness or social anxiety.

In addition to examining whether socially phobic children have a general deficit in decoding FEEs, Melfsen and Florin (2002) also investigated whether these children display a bias to categorize positive or neutral faces as negative. Children, aged 8 to 12 years were shown pictures on a computer screen of both adults and children making faces that depicted joy, anger, sadness, and disgust. After viewing each face, participants were asked to indicate whether they thought it was positive, negative, or neutral by pressing one of three buttons on a keyboard. Contrary to findings from the aforementioned studies, these results indicated no group differences in ability to allocate facial expressions into their respective valence categories. Interestingly,

however, the authors did find that socially anxious children were more likely to report seeing an emotion (both positive and negative) when a neutral face was actually presented.

Another study examined the relation between social anxiety, symptoms of depression, nonspecific symptoms of anxiety, and the recognition of facial expressions and vocal tones in 8 to 10 year old children (McClure & Nowicki, 2001). Results revealed that level of social anxiety, measured using the Social Anxiety Scale for Children-Revised (LaGreca & Stone, 1993) was not related to facial expression recognition.

There are a number of methodological shortcomings in the aforementioned child and adult studies that may account for the discrepant findings. The most significant methodological flaw was the use of hit rate (number of correct responses) as an index of accuracy, or the failure to take the utilization of response categories into account. The hit rate is valid for measuring overall accuracy, considering all emotions combined. However, hit rate is not valid when measuring the accuracy of specific emotions, because it does not take account for false alarms or bias in the use of response categories. In view of this, in the present study the *unbiased* hit rate (Wagner, 1993) was used to measure accuracy. The *unbiased* hit rate proposed by Wagner (1993) is described as the “joint probability that a stimulus category is correctly identified given that it is presented at all and that a response is correctly used given that it is used at all” (p. 3). In other words, in order to measure recognition accuracy for a given emotion, the number of misses (i.e., mislabelling anger as disgust) as well as the number of false alarms (i.e., incorrectly labeling another emotion as disgust) made by a participant should be taken into account. Failure to use the unbiased hit rate can result in calculations of accuracy rates that are less precise.

Other methodological limitations of the previously discussed studies include the failure to examine FEE recognition with the full array of emotions, the use of stimuli that lack ecological

validity, and the use of a facial expression task that has not been evaluated for its psychometric properties. For example, the study by Schofield and colleagues (2007) that did not find a difference in FEE recognition ability between socially anxious individuals and controls did not examine this phenomenon with the full array of emotions. Although these researchers included disgust and joy in their study, they did not include fear, sadness, anger, and surprise, which limit the findings of the study. Similarly, McLure and Nowicki (2002) used happy, sad, angry and fearful faces but did not use faces displaying surprise or disgust. Mohlman and colleagues (2006) used happy, sad, angry and neutral faces but did not use faces displaying fear, disgust, or surprise. Failure to include disgust is particularly limiting since it has been said to be the emotion that best represents rejection (Amir et al., 2005), an issue that is particularly relevant to those with high levels of shyness or social anxiety. In addition, one study used a set of pictorial stimuli that consisted of line-drawings depicting human faces rather than photographs of live models, which may limit the ecological validity of the stimuli (Mohlman et al., 2006). Furthermore, this study measured facial expression recognition using a speeded card-sorting paradigm in which participants were asked to match facial expressions of different intensities to the full intensity card of the same emotion category. As acknowledged by the authors, this method did not have well-documented psychometric properties, and is therefore a limitation of their study.

In regard to the child studies reviewed above, aside from failing to use the unbiased hit rate to measure accuracy, there is an additional methodological detail that may explain the mixed results obtained between different studies. Although the studies by Battaglia and colleagues (2004) and Simonian and colleagues (2001) did not obtain identical results, their findings were similar in that both found that socially anxious children were less accurate at recognizing FEEs than were non-anxious children. Conversely, Melfsen and Florin (2002) found no differences between

socially anxious and non-anxious children in ability to recognize FEEs. This lack of difference between anxious and non-anxious children may result from the way these researchers employed their facial expression task. Melfsen and Florin asked participants to indicate whether they thought the face they saw was positive, negative, or neutral. This is different from the other two child studies that provided participants with multiple-choice options consisting of specific emotions. Because the choices in the Melfsen and Florin study were very general, the study was likely unable to tap into participants' ability to discriminate between different emotions. It is possible that a recognition deficit does exist, but at a specific level: for example, for one or a number of emotions. The current study followed the method used by Battaglia and colleagues and by Simonian and colleagues, in that participants were presented with multiple-choice options consisting of specific emotions so that FEE recognition could be examined at very specific levels. Finally, another important shortcoming of previous child studies examining facial expression recognition in shy and socially anxious children is that these studies used only full intensity facial expression stimuli rather than stimuli at different intensities. This is problematic as people often display facial expressions that are more subtle than a prototypical expression displayed at 100% intensity (Joorman & Gotlib, 2006). As such, it is possible that the child studies reviewed may not provide a complete understanding of how shy, socially anxious children process facial expressions. A small number of the adult studies described above did use facial expression stimuli of different intensities; however, as previously mentioned, results of these studies have been inconsistent, possibly because of the methodological limitations discussed above.

In sum, there have been a number of methodological shortcomings that may limit the validity of the findings of previous research. In the present study we sought to reduce the influence of such methodological shortcomings by examining FEE recognition using a set of

stimuli that is ecologically valid and has sound psychometric properties. In addition, the present study included all six of the basic emotions (happiness, sadness, anger, disgust, fear, surprise) presented at two different intensities and also included a neutral expression. Moreover, the unbiased hit rate (Wagner, 1995) was used to measure recognition accuracy.

In the current study we sought to determine whether self-reported shyness is related to children's facial expression recognition. As mentioned, cognitive models of social anxiety suggest that shy children may have difficulty accurately interpreting non-verbal social cues such as facial expressions of emotion. Furthermore, past research has found a link between social anxiety and facial expression recognition in children, suggesting that this same relation may exist with shyness, which has been described as similar, but less intense than social anxiety (Schmidt & Buss, 2010). In the present study, we examined the relation between shyness and facial expression recognition differently than have past studies with child participants. We used pictures of facial expressions at two different intensities to observe specifically whether shyness predicted problems identifying particular facial expressions when the nature of the emotional expression is ambiguous (i.e., presented at a lower intensity). We also included a neutral face in order to replicate past findings with adults indicating that social anxiety is related to seeing threat in neutral facial expressions (Mohlman et al., 2006; Winton et al., 1995; Yoon & Zimbarg, 2006). Finally, based on past studies that found sex differences in facial expression processing (Lee et al., 2013; Mclure, 2000), sex was included in our analyses as a potential moderator of facial expression recognition and interpretation. Past studies have pointed to a slight advantage in facial expression recognition for girls (Mclure et al., 2000); however, boys have been found to be more accurate than girls at recognizing certain emotions such as anger (Gagnon, Gosselin, & Masserani, in press). Therefore, although we expected to see sex differences in FEE processing, we did not have specific

hypotheses regarding the direction in which sex would moderate the relation between shyness and FEE processing.

Six emotional stimuli were presented (happiness, sadness, anger, disgust, fear and surprise) in two different intensities, 50% and 100%, such that the facial expression was more pronounced and noticeable in the 100% intensity stimuli than the 50% intensity stimuli. The use of stimuli at the lower intensity served to increase the ambiguity of the emotional expression. In addition, given that most facial expressions encountered are of low intensity (Izard, 1991), the 50% intensity condition allowed for an ecologically valid examination of FEE recognition accuracy. An example appears in Figure 1, which displays a happy expression and an angry expression at both 50% and 100% intensity. In addition to these six expressions of emotion, we also included a neutral expression among the stimuli.

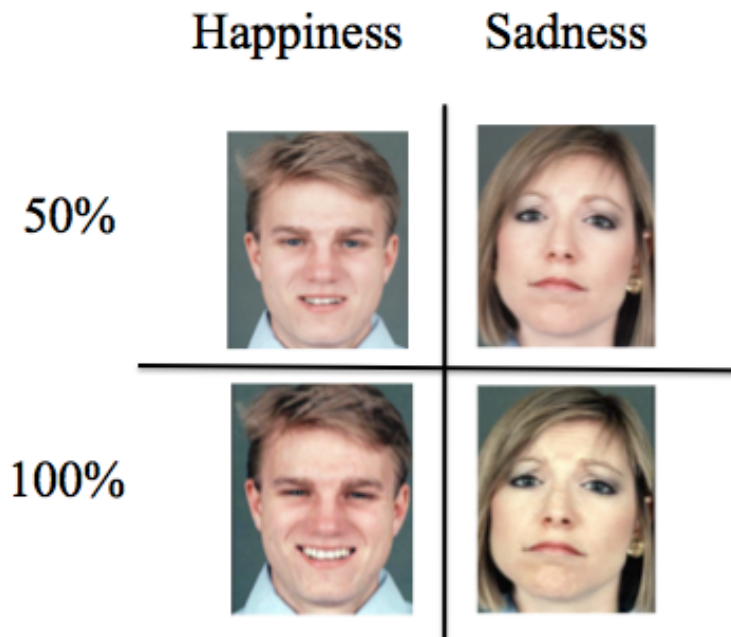


Figure 1. Sample facial expressions at 50% and 100% intensity. Adapted from the Japanese and Caucasian Facial Expressions of Emotion (JACFEE; Matsumoto & Ekman, 1989).

Based on cognitive theories of social anxiety, and past research with both adults and children, it was hypothesized that shyness would be related to a difficulty recognizing facial

expressions of emotion. Specifically, it was expected that the most pronounced effect would be seen in the lower intensity condition (i.e., faces presented at 50% intensity).

Method

Participants

Participants were 52 boys and 57 girls, ages 12-14 years, recruited from two Grade 7 and 8 classes from Anglophone schools in the Ottawa-Carleton District School Board. Informed consent of parents was obtained in the spring of the school year, with a consent rate of approximately 50 percent in both schools. In addition to parental consent (See Appendix A for information letter and parental consent form), participation also required student consent (See Appendix B). There were no additional inclusion or exclusion criteria.

Materials

Demographic information. General demographic information, including age, sex, and grade was collected on the day of the study. Information on ethnicity was not gathered at the request of the Ottawa-Carleton District School Board.

Shyness. The 14-item version of the Revised Cheek & Buss Shyness Scale (RCBS, Cheek & Briggs, 1990) was used to assess level of shyness. The original scale (Cheek & Buss, 1981) consisted of 9 items and multiple revisions have been produced, with 11, 13, 14 and 20 items respectively. The measure used in the present study consists of 14 items assessing difficulties overcoming shyness, worry about doing and saying the right thing, social tension and discomfort, and inhibited behaviour. Sample items include “I feel tense when I’m with people I don’t know well” and “I do not find it hard to talk to strangers” (see Appendix D). Participants were asked to rate on a 5-point scale to what extent each item was characteristic of their feelings and behaviour (1= very uncharacteristic, 2= uncharacteristic, 3= neutral, 4= characteristic, 5= very characteristic

or true, strongly agree). Shyness scores were obtained by adding the ratings for all items in the measure and can range from 14 to 70. As recommended by the school board, these anchors were changed to (strongly agree, agree, neutral, disagree and strongly disagree) in order to make them clearer to grade 7 and 8 students. This measure has been used with children and adolescents between the ages of 11 and 19 (Prakash & Coplan, 2003), which overlaps with the age range of the participants in our study. Initial administration of the measure in the current study revealed that some children had difficulty with the word “competence” in item #9, “I have no doubts about my social competence”, and with the word “inhibited” in item #11 “I feel inhibited in social situations”. Accordingly, we explained these words to each participant while presenting the instructions for the RCBS. Specifically, we told participants that “inhibited” means “shy” and that “social competence” means “social ability”. Following this, we presented the two practice questions included in the measure, to ensure that each participant understood the RCBS instructions. Internal consistency coefficients have been reported in studies with adults to range from $\alpha = .79$ to $\alpha = .86$ for the 14-item version of the RCBS, and .89 with children and adolescents aged 11 to 19 (Prakash & Coplan, 2003). These numbers are similar to those reported on all versions of the scale (Crozier, 2005). In the present study, Cronbach’s α for the RCBS was .83.

Facial expressions of emotion. The Japanese and Caucasian Facial Expressions of Emotion (JACFEE; Matsumoto & Ekman, 1989) served as the facial expression stimuli presented to the children. The JACFEE is a set of 56 photos of facial expressions of anger, contempt, disgust, fear, happiness, sadness and surprise. There were four photos for each emotion, displayed by an equal number of male and female faces. All stimuli were coded and verified by using the Facial Action Coding System (FACS; Ekman & Friesen, 1978) in order to ensure the validity of

the expressions to portray the intended emotion. The JACFEE was developed to test cross-cultural differences in facial expression recognition between people of American and Japanese descent (Matsumoto & Ekman, 1989). In the current study, because cross-cultural differences in recognition were not the variable of concern, only photos of Caucasian faces were used. Specifically, images of two Caucasian male posers and two Caucasian female posers for 6 emotions (happiness, sadness, anger, disgust, fear, surprise) were shown to participants at 50% intensity and 100% intensity. Adult photos were used instead of child photos, because to date there does not exist a standardized set of stimuli depicting children's faces at different intensities. The JACFEE has been found to be both a reliable and a valid tool for use in research on the decoding of facial expressions. When presented with a particular facial expression, individuals have been found able to accurately label the emotion, with judges reported agreement values of 70%, 75% and 80% (Matsumoto & Ekman, 1989). These reliability findings have been replicated in a study with participants from six different countries, confirming the cross-cultural validity of the JACFEE (Biehl, Matsumoto, Ekman, Hearn, Heider, Kudoh, et al., 1997).

Procedure

The children participated individually in the study during class time, as agreed to by their teachers. They were escorted individually from the classroom by the principal researcher or her assistant to another quiet room (e.g., the school library) in which the study took place. Participation in the study consisted of two main tasks: (1) A task of identifying facial expressions visually presented on a laptop screen, and (2) completion of the RCBS and filling in a sheet on demographic information.

Facial expression task. The visual stimuli presented to the participants were derived from the JACFEE (Matsumoto & Ekman, 1989) and were composed of 6 different emotions (happiness,

sadness, anger, disgust, fear, surprise) and a neutral expression from the Caucasian models. Using the Morpheus 7.0 program, emotions were altered to represent two different intensities (50% and 100%). Intensity refers to the amount of movement away from a neutral or relaxed facial expression, which involves changes in the pattern of muscle movements involved in different types of expressions (Hess, Bleary, & Kleck, 1997). That is, the Morpheus program merges a high intensity face with a neutral face until a new face is produced that has more emotional information than a neutral face but has still retained half of the emotional information from the original face. The visual stimuli were presented on the screens of two laptop computers, using the SuperLab pro: Experimental Lab Software program, version 2.0.4 created by Cedrus.

Each trial consisted of presenting one facial expression, following which participants were asked to identify the expression by pressing on the appropriate key on an external keyboard. Keys were labelled happiness, sadness, anger, disgust, fear, surprise, and neutral. There were 67 trials in total: two practice trials and 65 experimental trials. The two practice trials consisted of one happy face at 100% intensity and one sad face at 50% intensity. These two emotions were chosen in order to balance practice effects of positive and negative emotions. Order of presentation of the experimental facial stimuli was random for each participant. The experimenter watched as each participant completed the practice trials to ensure that the procedure was understood and then moved to the other side of the room until the participant signalled that he or she had finished the task.

Each stimulus was presented on the screen for 15 seconds. To the right of the face, a list of multiple-choice options appeared that included neutral, happy, sad, surprised, disgusted, angry, and afraid. The multiple-choice options accompanying the facial expressions appeared throughout the slideshow in two different orders: (1) neutral, happiness, fear, anger, surprise, sadness, and

disgust and (2) disgust, sadness, surprise, anger, fear, happiness, neutral. Using these two orders served to balance potential order-effects across emotions. During the 15-second period that each FEE was presented, participants were asked to report which emotion they saw by pressing on the appropriate button on the external keyboard. If participants did not respond during the allotted time, the next FEE appeared, and the previous item was coded as missing.

Self-report questionnaires. Participants were then asked to complete the RCBS as well as a sheet asking for demographic information. For the RCBS the researcher went over two practice examples with each participant. Participants were then asked to complete the measure on their own. Once they had completed the questionnaires, children were thanked for their participation, given a debriefing form explaining the purpose of the study (see Appendix C), and taken back to class.

Statistical Analysis

Sequential regression analyses were used to examine the relation between shyness, sex, and the interaction between shyness and sex in the prediction of facial expression recognition variables. Shyness was entered first, followed by sex and the interaction between shyness and sex. As suggested by Tabachnik and Fidell (2007), we chose the order of entry of the independent variables based on theoretical considerations. Specifically, cognitive theories of social anxiety suggest that shyness is linked to biased interpretations of social cues. Although research has found sex differences in the way facial expressions are interpreted (McLure, 2000), we felt that shyness was more important than sex of participant in assessing biased facial expression and it was therefore accorded a higher level of entry.

Results

The mean age of the children in the study was 12.63 years ($SD = .66$). The mean overall score on the RCBS was 34.71 ($SD = 8.09$).

Preliminary Analyses

Independent samples t-tests were conducted to determine whether differences existed in the dependent variables based on grade or school. Given the large number of comparisons, a Bonferonni corrected alpha level was used. No differences were found with respect to grade or school. Less than 1% of data were missing from the facial expression recognition task. This was dealt with by deleting the item that had the missing score and using the proportion of correct responses to calculate accuracy rather than total score. For example, for a participant who rated 4 out of 5 angry faces, rather than calculating his or her total score out of 5, we calculated the score out of 4. This method was chosen because the reason certain scores were missing was unable to be determined with certainty. For instance, missing scores may be attributed to the 15-second time limit being surpassed on a particular item or to a participant's simply not knowing the answer. Furthermore, during one day of testing, because of equipment malfunction, 9 participants were presented with 64 faces rather than 65 faces (a male happy face at 100% intensity was missing). For the above reasons, it was decided that using percentage of correct responses to calculate accuracy for this task was the best method. It was found that less than 1% of the data were missing from the self-report measures. As the percentage of missing scores within this section was extremely small and the scores were presumably missing at random, it was decided that missing scores in this section would be imputed using the Expectation Maximization (EM) algorithm within the missing values analysis (MVA) used in SPSS 17.0 to maintain a full data set. Variables were screened for univariate outliers, which were dealt with by reducing or increasing values.

Normality was assessed and appropriate transformations were applied to skewed variables.

Multivariate outliers were detected by calculating Mahalanobis distance for each regression analysis and were removed (Tabachnick & Fidell, 2007).

Main Analyses

The *unbiased* hit rate (Wagner, 1993) was calculated for each of the seven emotional expressions in order to measure recognition accuracy. Means and standard deviations of accuracy scores for the total sample are displayed in Table 1 for emotions presented at 50% intensity and are presented in Table 4 for emotions presented at 100% intensity.

Facial expressions presented at 50% intensity. Sequential linear regression analyses were conducted to examine the relation between shyness, sex, and the interaction between sex and shyness and children's ability to recognize facial expressions displayed at 50% intensity (all expressions combined). None of the predictors were found to contribute significantly to FEE recognition at 50% intensity.

Facial expressions presented at 100% intensity. Sequential linear regression analyses were conducted to examine the relation between shyness, sex, and the interaction between sex and shyness and children's ability to recognize facial expressions displayed at 100% intensity (all expressions combined). None of the predictors were found to contribute significantly to FEE recognition at 100% intensity.

Individual facial expressions at 50% intensity. Sequential linear regression analyses were conducted to examine the relation between shyness, sex, and the interaction between sex and shyness and children's ability to recognize facial expressions displaying happiness, sadness, anger, disgust, fear, and surprise presented at 50% intensity. A separate regression analysis was conducted for each facial expression.

Table 1

Accuracy (unbiased hit rate) for Recognition of Facial Expressions Presented at 50% Intensity for Total Sample

	Anger	Disgust	Fear	Happiness	Sadness	Surprise
Mean	.45	.46	.38	.73	.40	.65
SD	.23	.28	.27	.18	.26	.18

Sadness (50%). Results from regression analyses revealed that sex ($R^2 = .085$, $F_{\text{inc}}(1, 103) = 6.94$, $p = .01$) reliably improved R^2 . Specifically, girls (mean = .46, SD = .25) were more accurate than boys (mean = .34, SD = .26). The interaction between sex and shyness reliably improved R^2 ($R^2 = .172$, $F_{\text{inc}}(1, 103) = 10.92$, $p = .001$). Results are presented in Table 2. The interaction between shyness and sex was further examined by testing the simple slopes. Results indicated that for boys ($b = -.013$, $p = .001$), the slope was significantly different than zero. For girls ($b = .006$, $p = .155$), the slope was not different than zero. Specifically, for boys, shyness was associated with lower accuracy and for girls level of shyness was not related to accuracy with sad faces presented at 50% intensity.

Table 2

Sequential Regression Analysis Predicting Accuracy scores for Sad Faces at 50% Intensity for Shyness, Sex and Shyness x Sex

Variable	Step	Predictor	B	SE B	β	R2 change
Accuracy: Sadness 50% intensity	1	Shyness	.006	.004	.19	.024
	2	Sex	.557	.212	1.09	.085**
	3	Sex x Shyness	-.020	.006	-1.43	.172**

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

Because it was found that shyness in boys was related to lower accuracy in recognizing sad faces presented at 50% intensity, we wanted to determine the nature of shy boys' errors when recognizing these expressions (whether they tend to overuse or underuse sadness). Because simple slopes analysis indicated shyness was not related to accuracy for girls when recognizing 50% intensity sad faces, we did not conduct follow-up tests for girls regarding the nature of their errors with 50% intensity sad faces. For boys only, Pearson correlations were conducted between level of shyness and proportion of "false alarms" (i.e., a tendency to mistakenly label other expressions as sadness), made with sad faces presented at 50% intensity and between level of shyness and proportion of "misses" (a tendency to label sad faces incorrectly, when they are presented) made with sad faces presented at 50% intensity. This yielded a significant correlation between level of shyness for boys and proportion of sadness "misses", $r = .44$, $p = .001$ ($n = 109$). The relation between level of shyness in boys and proportion of sadness "false alarms" was not significant. This result indicates that shyer boys' low accuracy when recognizing sad faces at 50% intensity results from "misses".

In order to determine to which emotion categories 50% intensity sad expressions were misclassified by shy boys more often than non-shy boys, we compared a subgroup of very shy boys to non-shy boys on the mean score for each possible type of error: anger-sadness (i.e., mislabelling sadness as anger), happiness-sadness, disgust-sadness, fear-sadness, surprise-sadness, and neutral-sadness. Boys were included in the shy group if their score on the RCBS fell one standard deviation above the mean ($n = 10$) and in the non-shy group if their score on the RCBS fell one standard deviation below the mean ($n = 6$). See Table 3 for the relative frequency of error types made with 50% sad faces for shy boys and non-shy boys. Mann-Whitney U tests were used to compare the two groups because the distribution of scores for each individual error-type did not

meet the assumptions for a parametric test such as ANOVA. In total, six Mann-Whitney U tests were conducted; one for each possible error-type. Results revealed that shy boys most frequently confused sadness with neutral, fear, and happiness and that non-shy boys most frequently confused sadness with neutral and fear. However, the Mann-Whitney test revealed that there is no particular type of error that occurred significantly more frequently for shy boys than non-shy boys.

Table 3

Relative Frequencies of Error-Types in Recognizing Facial Expressions of 50% Sadness based on extreme groups (shy boys and non-shy boys)

	Non-Shy Boys (n=6)		Shy Boys (n=10)	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Mistaking Sadness (50%) for Other Emotions				
Happiness	0.00	0.00	12.67	23.19
Surprise	0.00	0.00	0.00	0.00
Fear	22.22	40.37	12.00	16.87
Disgust	0.00	0.00	5.00	15.81
Anger	0.00	0.00	0.00	0.00
Neutral	77.78	40.36	70.33	26.96

Happiness, surprise, fear, disgust, and anger (50%). No significant predictors were found for these emotions at 50% intensity.

Individual facial expressions at 100% intensity. Sequential linear regression analyses were conducted to examine the relation between shyness, sex, and the interaction between sex and shyness and children's ability to recognize facial expressions displaying happiness, sadness, anger, disgust, fear, surprise, at 100% intensity. A separate regression analysis was conducted for each facial expression. Means and standard deviations for each facial expression presented at 100% intensity are displayed in Table 4.

Table 4

Accuracy for Facial Expressions Presented at 100% Intensity (unbiased hit rate) for Total Sample

	Anger	Disgust	Fear	Happiness	Sadness	Surprise
Mean	.66	.59	.52	.94	.84	.71
SD	.11	.31	.30	.11	.18	.18

Sadness (100%). Results from regression analyses revealed that shyness ($R^2 = .035$, $F_{\text{inc}}(1, 103) = 3.77$, $p = .055$ and the interaction between sex and shyness ($R^2 = .033$, $F_{\text{inc}}(1, 103) = 3.73$, $p = .056$) approached significance but did not reliably improve R^2 . Results are presented in Table 6. Given that the interaction approached significance it was decided to follow-up with simple slopes analysis. This more liberal approach was taken given that a significant interaction was found with sad faces at 50% intensity, with the slopes being significantly different from zero with boys only. Therefore, we thought it would be interesting to determine whether a similar result would be found with sad faces at 100% intensity. Results indicated that for boys the slope was different from zero ($b = -.005$, $p = .009$), whereas for girls the slope was not different from zero ($b = .00$, $p = .851$). Specifically, it was found that for boys, higher levels of shyness were related to lower levels of accuracy, but for girls, level of shyness was not related to level of accuracy.

In order to determine to which emotion categories 100% intensity sad expressions were misclassified by shy boys more often than non-shy boys, we compared a subgroup of very shy boys to non-shy boys on the mean score for each possible type of error. Because simple slopes analysis indicated shyness was not related to accuracy for girls when recognizing 100% intensity sad faces, we did not conduct follow-up tests for girls regarding the nature of their errors with 100% intensity sad faces. For boys only, Pearson correlations were conducted between level of shyness and proportion of “false alarms” made with full intensity sad faces, and between shyness

and proportion of “misses” made with full intensity sad faces. This yielded a significant correlation between level of shyness for boys and proportion of sadness “misses”, $r = .22, p < .05$ ($n = 109$). The relation between level of shyness in boys and proportion of sadness “false alarms” was not significant. Using the identical procedure as was described with sad faces presented at 50% intensity, in order to determine to which emotion category 100% intensity sad expressions were misclassified by shy boys more often than non-shy boys, we compared a group of shy ($n = 10$) and non-shy ($n = 6$) boys using Mann-Whitney U tests comparing the mean score for each of the six possible error-types. See Table 5 for the relative frequency of each error-type for sad faces at 100% intensity for shy boys and non-shy boys. Results revealed that for non-shy boys, fear was the only expression that was confused with sadness. Shy boys confused sadness most frequently with neutral, fear and disgust. However, the Mann-Whitney test revealed that there is no particular type of error that occurred significantly more frequently for shy boys than non-shy boys.

Table 5

Relative Frequencies of Error-Types in Recognizing Facial Expressions of 100% Sadness based on extreme groups (shy boys and non-shy boys)

	Non-Shy Boys (n=6)		Shy Boys (n=10)	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Mistaking sadness (100%) for Other Emotions				
Happiness	0.00	0.00	0.00	0.00
Surprise	0.00	0.00	6.25	17.67
Fear	100.00	0.00	18.75	37.20
Disgust	0.00	0.00	12.50	35.36
Anger	0.00	0.00	0.00	0.00
Neutral	0.00	0.00	62.50	44.32

Disgust (100%). Results from regression analyses revealed that sex ($R^2 = .071$, $F_{inc}(1, 103) = 7.60$, $p = .007$) was the only predictor found to reliably improve R^2 . Specifically, girls (mean

=.66, SD = .27) were more accurate than boys (mean = .50, SD = .33) at recognizing disgust faces at 100% intensity. Results are presented in Table 6.

Table 6

Sequential Regression Analysis Predicting Accuracy scores for Sadness and Disgust at 100% Intensity for Shyness, Sex, and Shyness x Sex

Variable	Step	Predictor	B	SE B	β	R2 change
Sadness	1	Shyness	.00	.002	.026	.035
	2	Sex	.16	.108	.640	.031
	3	Sex x Shyness	-.006	.003	-8.75	.033
Disgust	1	Shyness	.001	.005	.036	.003
	2	Sex	-.272	.264	-.452	.071**
	3	Sex x Shyness	.003	.007	.198	.002

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

Happiness, surprise, fear, and anger (100%). No significant predictors were found for these emotions at 100% intensity.

Neutral Expressions. In order to determine whether shyness was related to a tendency to see emotions in a neutral face, a sequential linear regression analysis was conducted to examine the relation between shyness, sex, and the interaction between sex and shyness and the number of times children saw an emotion in a neutral face. No significant predictors were found. It appears that shyness is not related to a tendency to see emotions in a neutral face.

Discussion

In the present study we aimed to determine whether shyness is related to children's ability to process non-verbal social cues accurately. Specifically, we were interested in whether shyness was linked to difficulties recognizing facial expressions of emotion, particularly when cues are

ambiguous (i.e., presented at 50% intensity). Our findings partially support this hypothesis. Interestingly, of all of the emotions presented to participants, sadness was the only emotion for which recognition accuracy was significantly related to levels of shyness. Past studies examining emotional expression recognition in socially anxious children have also identified sadness as an emotion that is difficult to identify. For example, Simonian and colleagues (2001) found that socially anxious children made significantly more errors when labelling sadness than did non-anxious controls. In addition, Battaglia (2004) and colleagues found that shy children were more likely to label neutral faces as sad than were non-shy children. In the present study, we found that, on average, girls were more accurate at recognizing lower intensity sad faces than were boys regardless of level of shyness. When taking into account level of shyness, it was found that for boys only, higher levels of shyness predicted lower recognition accuracy in both 100% and 50% intensity sad faces. In agreement with our hypothesis, the relation between shyness and boys' recognition of sad faces was more pronounced when sad faces were presented at 50% intensity compared to full intensity. This finding suggests that level of ambiguity of sad facial expressions is linked with the accuracy with which they are recognized by shy boys. Shyness was not related to recognition accuracy in low intensity sad faces for girls.

Our findings that shy boys have trouble recognizing sad faces may be attributable, at least in part, to gender differences in socialization practices, in which boys are encouraged to value assertiveness and achievement, whereas girls are taught to value closeness and emotional communication (Berndt, 1982; Feiring & Lewis, 1991). In fact, a number of studies by Fivush and colleagues (Adams, Kuebli, Boyle, & Fivush, 1995; Fivush, 1991; Kuebli & Fivush, 1992) have found that both mothers and fathers tend to have more frequent and lengthier conversations about sadness with their preschool-aged daughters than they do with their sons of the same age. A more

recent study found that mothers and fathers discussed the emotional aspects of sad events and the causes of sadness more with girls than boys (Fivush, Brotman, Buckner, & Goodman, 2000). It may well be the case, therefore, that socialization practices with boys downplay the importance of paying attention to and understanding sadness and may also send a message that sadness is not a socially acceptable emotion for boys. If boys have less experience talking about sadness and feel the need to regulate or suppress displays of sadness in order to conform to social norms, this may decrease their sensitivity to recognizing sad faces. The finding that boys who are shy are even less accurate than boys who are not shy may be due to increased self-consciousness in shy boys. Shy boys may be more self-conscious about abiding by social norms compared to their less shy counterparts. This is particularly possible with older boys who are in a developmental stage in which peer approval is especially relevant (London, Downey, & Bonica, 2007; Steinberg & Morris, 2001) and in which shyness is perceived as increasingly negative by the peer group (Younger & Boyko, 1987; Younger & Piccinin, 1989; Younger et al., 1985, 1986). It is interesting that shyness was linked to recognition of sad facial expressions for boys but not for girls. This difference should be explored further in future studies. The fact that shyness was not related to accuracy for girls when recognizing sad faces may also be linked with socialization practices. As discussed above, socialization practices that encourage girls to value intimacy and closeness with others may lead girls to become more sensitive to emotional expressions and possibly more skilled at identifying certain emotions (Berndt, 1982; Feiring & Lewis, 1991), regardless of their level of shyness.

Problems correctly identifying sad faces may have negative implications during shy boys' interactions with others, in which a sad expression in another individual may be inaccurately interpreted by the shy boy as a different emotion. Inaccurate interpretations of facial expressions could disrupt the flow of a conversation, which could lead to awkwardness for both parties and

future avoidance of the person who made the social error (Mullins & Duke, 2004). Furthermore, sadness is an emotion that evokes empathy and comfort from others when it is correctly identified (Paivio & Greenberg, 2005). If a shy child were to misidentify a sad face, the child might not realize that comforting or consoling the other is the appropriate action. As a consequence, the shy child might be judged as insensitive or unkind. In fact, research shows that shy children are actively disliked by their peers, are often rejected (Gazelle et al., 2005) and based on their withdrawn behaviour may be judged by their peers as appearing aloof and unfriendly (Wells, 2000). Such negative peer judgments may result, at least in part, from this tendency of shy children to misidentify and not respond appropriately to sad expressions displayed by their peers.

Finally, neutral expressions were included in the present study to determine whether shyness is related to mistakenly perceiving negative emotions or threat in a neutral face. In contrast to findings from past studies with adults (Mohlman et al., 2006; Winton et al., 1995; Yoon & Zimbarg, 2006), no significant relation was found between degree of shyness and perception of threat in a neutral face. This finding suggests that the phenomenon of perceiving threat information in a neutral face, which has been found to occur in socially anxious adults, may not manifest itself in children ages 12 to 14 years. Whether seeing threat in a neutral face is related to shyness in younger or older children could be explored in future studies. Another possibility may be that the adult studies utilized samples of individuals with social phobia, whereas we used a non-clinical sample of shy children. Because social phobia has been described as a more severe version of shyness (Schmidt & Buss, 2010), it is possible that certain cognitive distortions such as viewing threat in a neutral face is more pronounced in clinical samples. Similarly, it would be interesting for researchers to examine whether shy children see threat in neutral faces using a clinical sample of shy or socially anxious children.

In sum, the finding that shyness was related to a difficulty recognizing sad faces in boys is important; however, this result only partially confirms our hypothesis that shyness would predict difficulty recognizing facial expressions. As mentioned, the findings of past research examining the relation between social anxiety and facial expression recognition have been mixed. Although some studies have yielded results indicating a skills deficit in socially anxious individuals in terms of their ability to accurately label facial expressions, others have found no relation between social anxiety and facial expression recognition. The results from the present study suggest that shyness and facial expression recognition ability are linked in terms of a difficulty recognizing sad faces; however, a general deficit in facial expression recognition was not indicated. These results confirm what has been found in a small number of previous studies (e.g., Melfsen & Florin, 2002; Philippot & Douilliez, 2005; Schofield et al., 2007) indicating that shy children can, similarly to non-shy children, accurately evaluate the emotional content of most facial expressions. As proposed by Philippot and Douilliez (2005), perhaps the salience of facial expressions for socially anxious individuals lies not in the individual's ability to label facial expressions accurately but rather in the personal relevance the anxious individual attributes to such expressions. In other words, although shy children may be able to identify accurately the emotion displayed in a person's face, they may interpret such expressions in a negatively biased fashion. A study with adults found that although socially anxious individuals could identify the content of emotional expressions, they were more likely than non-anxious controls to perceive any level of negative emotion as having a more negative emotional cost than non-anxious individuals (Shofield et al., 2005). The authors defined emotional cost as "the perceived impact of the social event on the individual" (p. 2951). Furthermore, a study by Campbell and colleagues (2009) found that when presented with prototypically happy faces, socially anxious adults rated them as less approachable

than did controls. We believe that researchers should investigate whether shyness in children is related to biased interpretations of both negative and positive facial expressions, similar to what has been found in socially anxious adults. Accordingly, Study 2 was designed to determine whether shyness is related to the way in which children interpret different facial expressions.

Although the current study contributes in an important way to the shyness literature, there are some limitations and recommendations that should be considered. First, our sample is relatively small in size, which may have limited power in detecting small to medium size effects. Second, the facial expression stimuli set used in our study consisted of adult models rather than child models. As children spend most of their time at school interacting with children, it may be more relevant to examine facial expression recognition accuracy using the faces of same-aged children. Researchers should examine facial expression recognition in shy children using a set of stimuli that consists of children's faces. Third, at the request of the participating schools, information on ethnicity was not collected. Some research has found children perform better on facial expression recognition tasks when presented with expressions modeled by people in their own cultural group (McLure, 2000). Because examining a possible interaction between ethnicity of the child and ethnicity of the facial expression stimulus was not possible in the present study, we used facial expressions modeled by only European-American models. Future studies, might benefit from including facial expression stimuli consisting of models from different ethnicities, if such stimuli are available, in order to determine whether children are indeed better at recognizing facial expressions of other children from their own ethnic group. Fourth, although the RCBS shyness measure has been used in past studies with similarly aged children, some of the children in our study had difficulty understanding certain terms in the measure. Future studies might benefit from using a shyness scale that was specifically created for children. In addition, although we were

interested in the relation between shyness and facial expression recognition in a non-clinical sample, it is possible that we would have found additional significant effects had we used a sample of children diagnosed with social phobia. Nevertheless, our use of a non-clinical sample allows us to broaden the relevance of our findings to the classroom. In Study 2, we aimed to address some of the above issues. Specifically, in Study 2, we used a set of stimuli consisting of child models in order to better assess children's reactions to the facial expressions of similarly aged peers. In addition, we used a measure of shyness that was specifically designed for children.

In sum, the results of this study revealed that although shyness was related to problems recognizing sad facial expressions for boys, in general, shyness did not seem to be related to ability to recognize facial expressions accurately. Findings from past studies have been inconsistent concerning whether or not shy children have problems recognizing facial expressions, possibly because of methodological shortcomings. Our study overcame some of these limitations through conducting a comprehensive examination of facial expression recognition using the unbiased hit rate and found that shy children can, indeed, recognize most facial expressions. We conclude that in the future, researchers should investigate the possibility that shyness is related to the *way* facial expressions are interpreted, rather than on the *ability* to recognize emotions.

Study 2:

Biased Facial Expression Interpretation in Shy Children

Abstract

The relation between shyness and the interpretations of the facial expressions of others was examined in a sample of 123 children from Grades 7 and 8. Participants viewed faces displaying happiness, fear, anger, disgust, sadness, surprise, as well as a neutral expression, presented on a computer screen. The children identified each expression by pressing a button on an external keyboard. For each expression, children also rated (a) the degree to which they felt the child displaying the expression would like them, (b) the probability that someone at school would look at them with that expression, and (c) their own emotional reaction to interacting with a child displaying the expression. Participants also completed the Children's Shyness Questionnaire and the Children's Rejection Sensitivity Questionnaire. We hypothesized that shyness in children would be related to negatively biased interpretations of facial expressions. Although the accuracy with which the children could identify the facial expressions was not related to their degree of shyness, negative biases were found in their interpretations of the meanings of the expressions. Furthermore, rejection sensitivity significantly mediated many of these biased interpretations. These findings may have implications for interventions for children experiencing social anxiety, especially social-skills training approaches.

Biased Facial Expression Interpretation in Shy Children

As detailed in Study 1, cognitive models of social anxiety posit that shyness and social anxiety are similar constructs that exist on a continuum of degree of concern about social evaluation (Rapee & Heimberg, 1997). Specifically, shy individuals' hypervigilance concerning what others may be thinking about them may be linked with distorted appraisals of social events, which are based more on internal feelings of anxiety than on objective external events. The facial expressions people display are among the primary sources of information used by others to infer their inner states, including their emotions and attitudes (Patterson, 1999). Given that shyness and social anxiety appear related to biased social information processing (Clark & Wells, 1995; Rapee & Heimberg, 1997), it may be that shy individuals display a negative bias in their interpretations of the facial expressions of others. Specifically, shy children may be more likely to "perceive" disapproval or dislike (e.g., "this person does not like me") in the facial expressions of their peers than are children who are not shy. Indeed, studies with adults have found that social anxiety influences the perception of disapproval in a crowd of faces (Gilboa-Schechtman, Presburger, Marom & Hermesh, 2005; Douillez, Yzerbyt, Gilboa-Schechtman, & Philippot, 2012). Such biased perceptions may be problematic, as errors in the interpretation of emotional cues can result in negative interpersonal experiences (Forgas & Bower, 1987) and increased anxiety levels (Clark & Wells, 1995). It is important to examine, therefore, whether shy children have a heightened tendency to see dislike in the faces of others, as this may be associated with their feelings of discomfort in social situations.

It has been established that social anxiety is related to certain biases in perceptions of social situations (Barlow, Allen, & Choate, 2004; Henderson & Zimbardo, 2010). Specifically, individuals with social phobia, compared to non-anxious controls, show judgmental biases

whereby they tend to overestimate the probability of a negative social event happening (probability overestimation) and overestimate the negative consequences or cost of that negative event if it were to happen (a bias sometimes referred to as *catastrophizing*; Barlow et al., 2004; Barlow & Craske, 2000; Craske, Barlow, & O'Leary, 1992). In other words, socially anxious individuals tend to believe that negative social events are highly likely to occur, and in the event that they do occur, that the consequences would be catastrophic (Barlow et al., 2004). Such judgmental biases have been reported in a number of studies of adults with social anxiety (Foa, Franklin, Perry & Herbert, 1996; McManus, Clark, & Hackman, 2000; Uren, Szabo, & Lovibond, 2004; Vassilopoulos, 2006). A smaller number of studies have identified similar judgmental biases in socially anxious children, as well (Bögels, Snieder, & Kindt, 2003; Miers, Blöte, Bögels, & Westenberg, 2008; Vassilopoulos & Banerjee, 2012). Interestingly, judgmental biases have also been found to extend to positive social scenarios: socially anxious individuals appear to underestimate the likelihood of having a positive social encounter (Gilboa-Schechtman, Franklin, & Foa, 2000; Lucock & Salkovskis, 1988). Given that shyness and social anxiety exist on a continuum and frequently co-occur (Henderson & Zimbardo, 2010; Rapee & Heimberg, 1997; Turk, Lerner, Heimberg, & Rapee, 2001), it would follow that these biases observed in socially anxious individuals may also be present in children who are shy.

In this study, we were interested in whether shy children overestimate both the probability of and the negative consequences of being looked at with a negative facial expression. In addition, we were interested in whether shyness was related to the tendency to underestimate the probability of and positive consequences of being looked at with a happy facial expression. Previous studies examining probability overestimation and catastrophizing biases have made use of written descriptions of hypothetical social situations (e.g., “you will be

ignored by someone you know”). However, facial expressions of emotion may provide a more ecologically valid form of social cue than do written descriptions (Campbell et al., 2009). Thus, we examined whether socially anxious children exhibit biases when interpreting facial expressions of emotion.

To date, studies examining how shy and/or socially anxious individuals respond to non-verbal cues such as facial expressions have focused largely on the recognition and accurate labelling of facial expressions. Results of these studies have been mixed. Some studies have found a difference between groups (Battaglia et al., 2004, 2010; Simonian, Beidel, Turner, Berkes, & Long, 2001, Strand, Cerna, & Downs, 2008), while others have not (Melfsen & Florin, 2002; Philippot & Douilliez, 2005; Schofield et al., 2007). In Study 1, we found that aside from shy boys’ difficulty recognizing sad expressions, shyness was not related to facial expression recognition. Study 2 was designed to examine whether it is the interpretation of emotions, rather than the recognition of emotions that is linked to shyness.

Interpretations of and reactions to the facial expressions of others have been examined in several studies with clinical samples of socially anxious participants. One study found that socially anxious adults rated the consequences of interacting with someone displaying a threatening facial expression as more negative than did individuals low in social anxiety (Schofield et al., 2004). Another study found that socially anxious adults rated happy faces as less approachable than did their non-anxious counterparts (Campbell et al., 2009). A similar study found that socially phobic adults rated happy and neutral faces as less friendly than did non-anxious individuals (Stevens, Gerlach, & Rist, 2008). In addition, a study using eye-tracking technology found that shy children tended to spend more time looking at the eye area and less time looking at the mouth area compared to non-shy children. These findings suggest that shy

children may be more sensitive to evaluative cues and intentions in others conveyed by the eyes than are those who are less shy (Brunet, Heisz, Mondloch, Shore, & Schmidt, 2009). Finally, a recent neuroimaging study found that shyness was related to increased neural activation in response to negatively valenced facial expressions (Tatham, Schmidt, Beaton, Schulkin, & Hall, 2013), suggesting that shy individuals are impacted differently by seeing negative emotions than are non-shy individuals.

The studies reviewed above suggest that shy individuals may respond differently to facial cues of emotion than do those who are less shy. Our study pursued this issue further. In the present study, in addition to examining whether shy children were inclined to perceive dislike in the facial expressions of others, we also explored whether shyness was related to predicting a higher likelihood of and greater negative consequences of interacting with someone displaying a threatening facial expression. Understanding the way in which shy children interpret facial expressions may have important implications for interventions with children who are extremely shy.

One mechanism that may link shyness with biases in the interpretation and judgments of others' facial expressions is *rejection sensitivity*. Rejection sensitivity refers to the inclination to anticipate and perceive negative interpersonal events readily (Downey & Feldman, 1996; Feldman & Downey, 1994). Individuals high in rejection sensitivity are “people who expect rejection and for whom the prospect of rejection is anxiety provoking across a range of interpersonal situations” (Feldman & Downey, 1994, p. 235). Rejection sensitivity is similar to the notion of fear of negative evaluation. What distinguishes the two constructs, however, is that fear of negative evaluation is a broad construct related to apprehension about how others will evaluate the individual, whereas rejection sensitivity relates more specifically to fear of rejection (Fang et al.,

2011). The rejection-sensitivity model was created to explain, in social-cognitive terms, why experiencing rejection in important relationships (e.g., with parents and peers) during childhood predicts interpersonal difficulties later on (Downey & Feldman, 1996). The model proposes that experiences of rejection can lead children to expect further rejection in the future. Thus, during interpersonal situations in which there exists a possibility of rejection, individuals high in rejection sensitivity easily feel threatened and scan their environment vigilantly for signs of rejection (Downey, Lebolt, Rincón, & Freitas, 1998). As a result, those high in rejection sensitivity expect to be rejected, look for cues of rejection, readily perceive intentional rejection, and experience rejection as highly distressing.

From as early as kindergarten, shyness in children tends to be associated with peer rejection and exclusion (Gazelle & Ladd, 2003). This exclusion increases across childhood as the peer group views shy/withdrawn behaviour more and more negatively (Younger, Gentile, & Burgess, 1993). Indeed, although shy children keep to themselves and do not usually bother others, the peer group's negative view of their behaviour may result in shy children's being targeted for victimization (Hanish & Guerra, 2004; Kochenderfer-Ladd, 2003). Given this connection of shyness with peer rejection and exclusion (Gazelle & Ladd, 2003, Ladd 2006; Oh et al., 2008; Younger et al., 1993), we predicted that shy children would be more sensitive to rejection than would their less shy peers, possibly leading them to perceive disapproval or dislike more readily in the facial expressions of others. In addition, we predicted that if they were rejection-sensitive, shy children may be more inclined to hold biased expectations regarding the likelihood and negative consequences of being looked at with a threatening facial expression. Given that peer perceptions of shy children tend to become increasingly negative in late childhood and early adolescence (Younger & Boyko, 1987; Younger & Piccinin, 1989; Younger,

Schwartzman, & Ledingham, 1985, 1986), and that the emotional salience of peer approval likewise tends to increase during this age period (London, Downey & Bonica, 2007; Steinberg & Morris, 2001), we examined the relation between shyness, rejection sensitivity, and biased facial expression interpretation in a sample of older children who were 12 to 14 years of age.

A few studies with adults have found a link between shyness and sensitivity to rejection (Jackson, Fritch, Nagaska, & Gunderson, 2002; Jackson, Towson, & Narduzzi, 1997; Stritzke, Nguyen, & Durkin, 2004). In addition, a small number of studies with children and adolescents have found a similar connection between rejection sensitivity and constructs similar to shyness, such as anxious solitary behaviour (Gazelle & Druhen, 2009), loneliness (Qualter et al., 2013), and social anxiety (Howarth, Guyer, & Pérez-Edgar, 2013; London et al., 2007). As well, a series of neuroimaging studies has examined the response to social acceptance and rejection in socially anxious and non-anxious adolescents. One study found greater amygdala activation in socially anxious adolescents when appraising potential evaluation from peers whom they viewed as less desirable for an anticipated social interaction (Guyer et al., 2008). Another study reported greater activation in the amygdala-hippocampal complex in response to peer rejection among socially anxious adolescents than among those who were non-anxious (Lau, Guyer, Tone, Jenness, & Parrish, 2011).

Only one study to date has specifically examined shyness and its link to rejection sensitivity (Howarth et al., 2013). This study found that shy boys, compared to those who were not shy, reported higher levels of sadness when rejected by a child with whom they wanted to play. As noted by the authors, the findings of this study were limited however, as only self-report of emotional reactions to rejection was measured. In our current study, we went beyond simple reports of emotional reactions to rejection, using a self-report measure of rejection sensitivity.

In line with previous research in the area, and with the aim of replicating the results from Study 1, in the present study we evaluated the association between shyness and the ability to recognize and label facial expressions accurately. More central to our study, however, was the evaluation of how shy children interpret facial expressions. Study 2 was designed to improve upon some of the methodological shortcomings of Study 1. Specifically, because children had trouble understanding some of the wording used in the measure of shyness used in Study 1, Study 2 measured shyness using a self-report instrument that was specifically designed for children. In addition, while Study 1 used pictures of adult faces, Study 2 used facial expression stimuli consisting of child models in order to specifically examine children's interpretations of the facial expressions of their peers (See figure 1).



Figure 1. Sample facial expressions (from Linda Camras' [1980] repertoire).

The present study examined the relation between shyness in children and a heightened tendency to perceive dislike in potentially threatening facial expressions such as anger and disgust. We also looked at the association between children's shyness and judgment biases, such as the tendency to overestimate the probability and negative consequences of being looked at with a potentially threatening facial expression. Finally, we examined the relation between shyness and rejection sensitivity. Based on past research that has found differences between boys

and girls in facial expression processing (see McLure, 2000), and based on our findings from Study 1 indicating that boys and girls process sadness differently, we included sex in our analyses as a potential moderator of facial expression recognition and interpretation.

Given the cognitive biases displayed by socially anxious individuals when interpreting social cues (Clark & Wells, 1995; Rapee & Heimberg, 1997) and the importance of social-skills training in the correction of such biases (Spence, Donovan, & Brechman-Toussaint, 2000), it is important to investigate whether shy children display biases when interpreting the facial expressions of others. We expected shyness to be associated with (a) the tendency to see dislike in the facial expressions of others and (b) cognitive biases such as overestimating the likelihood and negative consequences of being looked at with a negative facial expression and underestimating the probability and positive consequences of being looked at with a positive facial expression. Furthermore, we expected shyness to be related to rejection sensitivity. Finally, we predicted that rejection sensitivity would serve as a mediator in the links between shyness and the tendency to display biases when interpreting facial expressions.

Method

Participants

Participants were 64 boys and 59 girls recruited from 12 Grade 7 and 8 classes in two private, elementary schools in eastern Ontario, Canada ($M_{\text{age}} = 12.93$ years, $SD = 0.56$). Informed consent of parents was obtained in the autumn of the school year, with 70% percent permission obtained in one school and 50% permission in the other (see Appendix G for Information letter and parental consent form). In addition to parental consent, participation also required student consent (see Appendix H). There were no additional inclusion or exclusion criteria.

Materials

Demographic information. General demographic information, including age, sex, school, and grade was collected. Information on ethnicity was not gathered, at the request of the schools.

Shyness. Shyness was measured with the Children's Shyness Questionnaire (CSQ; Crozier, 1995). The CSQ is a 26-item, self-report measure based on children's perceptions of shyness (i.e., derived from children's responses to the question; "What comes to mind when you hear the term *being shy*?"). The CSQ includes items tapping discomfort during social interaction, discomfort being the focus of attention, and general embarrassment. Sample items include: "I find it hard to talk to someone I don't know" and "I feel shy when the teacher speaks to me" (see Appendix E). Scores on the CSQ range from 25 to 75 with *lower* scores reflecting *higher* levels of shyness. We reversed these scores in order for higher scores to reflect higher levels of shyness. We included 25 of the 26 items in our study; one item was excluded because it has been previously found to not contribute any unique variance to the scale ("I enjoy singing aloud when others can hear me"; Crozier, 1995). The CSQ has been found to have good internal consistency, with inter-item correlations ranging from .77 to .88 (Crozier, 1995; Findlay, et al., 2009; Spooner & Evans, 2005). Cronbach's alpha in the present study was .80.

Rejection sensitivity. Rejection sensitivity was measured using the Children's Rejection Sensitivity Questionnaire (CRSQ; Downey et al., 1998). The CRSQ has two subscales: (1) Angry Expectations of Rejection, and (2) Anxious Expectations of Rejection. In the present study, we were interested only in the Anxious Expectations of Rejection score, as our measure of rejection sensitivity. The CRSQ presents children with six peer- and six teacher-related vignettes in which the possibility of rejection exists (see Appendix F). Children are asked to report, using

multiple-choice options, how they would feel in the presented situations. An example of a vignette is as follows: “Imagine that a kid in your class tells the teacher that you were picking on him/her. You say you didn’t do it. The teacher tells you to wait in the hallway and she will speak to you. You wonder if the teacher will believe you.” After each of the 12 scenarios, children answered the following three questions: (1) How *nervous* would you feel, *right then*, about whether or not the teacher will believe your side of the story? (anxious expectations); (b) How *mad* would you feel, *right then*, about whether or not the teacher will believe your side of the story? (angry expectations); (c) Do you think she will believe your side of the story? (rejection expectations). Each question was answered on a 6-point scale, with possible responses ranging from “not nervous” to “very, very nervous,” “not mad” to “very, very mad,” and “definitely no” to “definitely yes.” The score for anxious expectations of rejection was computed by averaging across all 12 situations. The internal consistency of the Anxious Expectations of Rejection subscale score has been shown to be good (Cronbach’s $\alpha = .79$; Downey, et al., 1998). In the present study, Cronbach’s α was .79.

Facial expression stimuli. The visual stimuli used were 14 black-and-white, 15.5 x 10.5 cm pictures of facial expressions of a boy and a girl, approximately 13 years old taken from Linda Camras’ (1980) repertoire. The expressions represent six basic emotions: happiness, fear, anger, disgust, sadness, and surprise, as well as a neutral expression. This set of stimuli was chosen because to our knowledge it is the only set of stimuli comprised of child faces that has been standardized according to the Facial Action Coding System (FACS; Ekman & Friesen, 1978). The visual stimuli were presented on the screens of two laptop computers, using the SuperLab pro Experimental Lab Software program, version 2.0.4 developed by Cedrus Corporation. Each participant was shown both the boy and the girl versions of all seven

emotional expressions.

Procedure

Students participated individually in the study during class time, as agreed to by their teachers. They were escorted individually from the classroom by the principal researcher or her assistant to quiet room (e.g., the school library) in which the study took place. Participation in the study consisted of two main tasks: (1) the facial expression task and (2) completion of the three self-report questionnaires: the CSQ, the CRSQ, and the sheet asking for demographic information.

Part 1: Facial expression task. Each trial consisted of the presentation of one facial expression, after which the participant was asked one of four questions about the expression presented followed by multiple-choice response options: (1) “What is this person feeling?” (a) happy, (b) sad, (c) disgusted, (d) afraid, (e) angry, (f) surprised, (g) neutral.; (2) “What are the chances of someone at school looking at you this way in the next week?” (a) very high, (b) high, (c) neither high nor low, (d) low, (e) very low; (3) “If you had to work on a group project with someone looking at you this way, what would it be like for you?” (a) It would be very bad for me; (b) It would be bad for me, (c) It would be neither good nor bad for me; (d) It would be good for me; (e) It would be very good for me; and (4) “If someone at school looked at you this way, what are they thinking about you?” (a) they definitely don’t like me, (b) they probably don't like me, (c) they feel neutral about me, (d) they probably like me; (e) they definitely like me.

Participants responded by pressing the appropriate key on an external keyboard. Each of the four questions was asked once per male and once per female exemplar for each of the seven facial expressions presented (2 exemplars x 7 emotions x 4 questions + 4 practice trials = 60 trials). Ratings of both exemplars (male and female) were averaged for each emotion to yield a

continuous score. The order of presentation of the facial stimuli and the question following it was random. Stimuli were each presented for 15 seconds. If participants did not respond during the allotted time, the next stimulus appeared, and the previous item was coded as missing.

Prior to viewing the experimental stimuli, each participant received four practice trials to ensure the procedure was understood. The facial stimuli used for the practice trials came from Matsumoto and Ekman's (1989) Japanese and Caucasian Facial Expressions of Emotion JACFEE. These practice trials involved emotional expressions displayed by different actors than those used in the study proper (in this case adult faces), in order to avoid practice effects. Each of the four questions described above was presented once during the four practice trials.

Part 2: Self-report questionnaires. Participants then completed the CSQ, the CRSQ, and a sheet requesting demographic information. Prior to completing the CSQ and the CRSQ, the researcher went over two practice examples with each participant. Following completion of this phase, the children were thanked for their participation, given a debriefing form explaining the purpose of the study (see Appendix I), and taken back to class.

Statistical Analysis

Sequential regression analyses were used to examine the relation between shyness, sex, and the interaction between shyness and sex in the prediction of facial expression recognition and interpretation outcome variables. Shyness was entered first, followed by sex and the interaction between shyness and sex. As suggested by Tabachnik and Fidell (2007), we chose the order of entry of the independent variables based on theoretical considerations. Specifically, cognitive theories of social anxiety suggest that shyness is linked to biased interpretations of social cues. Although research has found sex differences in the way facial expressions are interpreted (McLure, 2000), we felt that shyness was more important than sex of participant in

assessing biased facial expression and it was therefore accorded a higher level of entry. To test for a significant indirect effect of rejection sensitivity on facial expression interpretation, we used the Baron and Kenny (1986) method, followed by the Preacher and Hayes (2004) macro for implementing the Sobel test with a bootstrapping procedure.

Results

The mean age of the children in the study was 12.93 years ($SD = .57$). The mean overall score on the CSQ was 50.34 ($SD = 6.33$). The mean total score on the CRSQ (anxious expectations of rejection scale) was 10.0 ($SD = 3.53$).

Preliminary Analyses

Independent samples t-tests examined whether grade or school resulted in differences in the dependent variables. Given the large number of comparisons, a Bonferonni-corrected alpha level was used. No differences were found with respect to grade or school.

Less than 2% of data were missing from the facial expression task, and there were no missing data from the self-report questionnaires. These missing facial-expression data resulted from the automatic coding of responses as missing when a participant did not respond within the 15-second time limit (as described in the procedure). Univariate outliers were reduced in value to be less extreme and in the case of probability estimates for happy faces two outliers were deleted (Tabachnick & Fidell, 2007). Skewed distributions were normalized. Specifically, ratings of liking for angry faces were positively skewed and corrected with an inverse transformation. Multivariate outliers were detected by calculating Mahalanobis distance for each regression analysis and were removed (Tabachnick & Fidell, 2007).

Facial Expression Recognition

The *unbiased* hit rate (Wagner, 1993) was calculated for each of the seven emotional expressions in order to measure recognition accuracy. As detailed in Study 1, the unbiased hit rate was used because unlike the *hit rate*, it takes into consideration both misses and false alarms when calculating accuracy, which is necessary when measuring the accuracy of specific emotions.

Means and standard deviations of accuracy scores are displayed in Table 1. Sequential linear regression analyses were conducted to examine the relation between shyness, sex, and the interaction between sex and shyness and children's ability to recognize facial expressions displaying happiness, sadness, anger, disgust, fear, surprise, and a neutral expression. A separate regression analysis was conducted for each facial expression. No significant relation was found between shyness and recognition of any of the seven facial expressions presented. No effects of sex and no interaction effects between shyness and sex were found.

Table 1

Recognition Accuracy (Unbiased Hit Rate) for Each Emotional Expression for Total Sample

	Anger	Disgust	Fear	Happiness	Neutral	Sadness	Surprise
Mean	.76	.70	.59	.82	.77	.84	.86
SD	.31	.30	.35	.30	.31	.28	.24

Relation between Shyness and Rejection Sensitivity

A Pearson correlation was used to examine the relation between shyness and rejection sensitivity. Shyness and rejection sensitivity were significantly related $r = .39, p < .01$.

Relation between Shyness and Facial Expression Interpretation Outcomes

Participants' responses were converted into numeric values varying between 1 and 5, with 5 corresponding to "very high" for probability estimates, to "definitely like me" for ratings of liking, and to "very good for me" for ratings of the consequences for the self. Means, standard deviations, and ranges of all variables involved in the regression analyses and their intercorrelations appear in Table 2. As one can see from this table, shyness was negatively correlated with probability estimates for happiness expressions, and also negatively correlated with ratings of liking for anger, disgust, and sadness expressions.

Sequential linear regression analyses were conducted to examine the relationship between shyness, sex, and the interaction between sex and shyness and each of the four dependent variables for each type of facial expression. Shyness was entered into the equation first, followed by sex, and the interaction between shyness and sex. The results of those analyses are presented in Table 3.

Table 2

Mean Scores (untransformed), Standard Deviations, and Ranges for Facial Expression Interpretation Variables and their Correlations with Shyness and Sex

Variable	M (SD)	Range	Correlation with shyness	Correlation with sex
Shyness				.075
Sex (boys = 0; girls = 1)				
Probability estimates: Anger	1.70 (.78)	1-5	.009	-.174
Probability estimates: Disgust	1.80 (.68)	1-4.5	-.023	-.087
Probability estimates: Fear	2.0 (.64)	1-4	.008	-.021
Probability estimates: Happiness	4.11 (.72)	2-5	-.192*	.243**
Probability estimates: Neutral	3.07 (.66)	1-5	.157	.057
Probability estimates: Sadness	2.17 (.74)	1-4	-.021	-.073
Probability estimates: Surprise	2.64 (.81)	1-4.5	.112	.118
Consequences: Anger	1.44 (.58)	1-4	-.004	-.011
Consequences: Disgust	1.68 (.54)	1-3	-.124	-.085
Consequences: Fear	2.04 (.61)	1-4	.055	-.044
Consequences: Happiness	4.32 (.67)	2.5-5	-.086	.280**
Consequences: Neutral	2.67 (.50)	1-4	.030	-.030
Consequences: Sadness	2.16 (.54)	1-3.5	-.150	-.124
Consequences: Surprise	2.79 (.67)	1.5-4.5	-.018	.018
Ratings of liking: Anger	1.49 (.74)	1-5	-.192*	.038
Ratings of liking: Disgust	1.60 (.50)	1-4	-.203*	-.138
Ratings of liking: Fear	2.22 (.65)	1-4	-.090	-.039
Ratings of liking: Neutral	2.73 (.52)	1.5-5	-.094	-.128
Ratings of liking: Happiness	4.20 (.67)	2-5	-.088	.104
Ratings of liking: Sadness	2.36 (.60)	1-4	-.266**	-.113
Ratings of liking: Surprise	2.87 (.70)	1-4.5	.052	-.116

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

Probability estimates. Sequential regression analyses were conducted to examine the relation between shyness, sex, and the interaction between sex and shyness and children's estimates of the probability of being looked at with different types of facial expressions (happiness, sadness, fear, disgust, anger, and surprise, and a neutral expression). Shyness was entered into the equation first, followed by sex, and the interaction between shyness and sex. A separate regression analysis was conducted for each facial expression.

For happy facial expressions, regression analyses revealed that shyness added in step 1 ($R^2 = .046$, $F_{inc}(1, 117) = 5.68$, $p = .019$) reliably improved R^2 . Sex added in step 2 ($R^2 = .053$,

$F_{\text{inc}}(1, 117) = 6.91, p = .01$) reliably improved R^2 . The interaction between shyness and sex added in step 3 did not reliably improve R^2 . None of the 3 steps served to significantly increase R^2 for faces displaying anger, disgust, fear, sadness, surprise and a neutral expression.

Consequences for the self. Sequential regression analyses were conducted to examine the relation between shyness, sex, the interaction between sex and shyness and children's estimates of consequences for the self when interacting with someone displaying expressions of happiness, sadness, fear, disgust, anger, surprise, and a neutral expression. Shyness was entered into the equation first, followed by sex, and the interaction between shyness and sex. A separate regression analysis was conducted for each facial expression. For the expression of disgust, steps 1 and 2 did not reliably improve R^2 . In step 3, the interaction between shyness and sex reliably improved R^2 ($R^2 = .044, F_{\text{inc}}(1, 118) = 5.64, p = .019$) and was further examined by testing the simple slopes. Results indicated that, for girls ($b = .031, p = .004$), the slope was different from zero, whereas for boys it was not ($b = -.005, p = .64$). Specifically, for girls only, as shyness levels increased, estimates of the positive consequences of being looked at by someone displaying a disgusted facial expression decreased. For happy expressions, sex was the only variable to significantly increase R^2 ($R^2 = .089, F_{\text{inc}}(1, 119) = 10.97, p = .001$). Specifically, girls (mean = 4.3, SD = .68) rated more positive consequences of interacting with someone displaying a positive expression than did boys (mean = 4.0, SD = .66), although both boys and girls predicted positive consequences. None of the 3 steps served to significantly increase R^2 for faces displaying anger, fear, sadness, surprise or a neutral expression.

Ratings of liking. Sequential regression analyses were conducted to examine the relation between shyness, sex, and the interaction between shyness and sex, and ratings of liking in the facial expressions. Shyness was entered into the equation first, followed by sex, and the

interaction between shyness and sex. A separate regression analysis was conducted for each facial expression. For facial expressions of disgust, results from regression analyses revealed that shyness reliably improved R^2 ($R^2 = .044$, $F_{\text{inc}}(1, 118) = 5.48$, $p = .02$). The addition of sex and interaction between shyness and sex in steps 2 and 3 did not reliably improve R^2 . For facial expressions of anger, results from regression analyses revealed that shyness ($R^2 = .046$, $F_{\text{inc}}(1, 118) = 5.73$, $p = .018$) reliably improved R^2 . The addition of sex and interaction between shyness and sex in steps 2 and 3 did not reliably improve R^2 . For facial expressions of sadness, the regression analyses revealed that shyness ($R^2 = .077$, $F_{\text{inc}}(1, 118) = 10.04$, $p = .002$), reliably improved R^2 . The addition of sex and interaction between shyness and sex in steps 2 and 3 did not reliably improve R^2 . None of the 3 steps served to significantly increase R^2 for faces displaying fear, happiness, surprise, or a neutral expression.

Table 3

Summary of Sequential Regression Analysis Predicting Facial Expression Interpretation Variables for Shyness, Sex, and Shyness x Sex

Variable	Predictor	B	SE B	b	R2 change
Probability estimates: Happiness	Step 1				
	Shyness	-.023	.010	-.213	.046*
	Step 2				
	Shyness	-.025	.009	-.231	
	Sex	.312	.119	.230	.053**
	Step 3				
	Shyness	-.023	.014	-.213	
Ratings of consequences for the self: Disgust	Sex	.487	.943	.360	
	Sex x Shyness	-.004	.019	-.133	.000
	Step 1				
	Shyness	-.014	.008	-.160	.026
	Step 2				
	Shyness	-.013	.008	-.155	
	Sex	-.097	.096	-.091	.008
Ratings of liking: Disgust	Step 3				
	Shyness	.005	.011	.059	
	Sex	1.70	.762	1.60	
	Sex x Shyness	-.036	.015	-1.73	.044*
	Step 1				
	Shyness	-.015	.006	-.209	.044*
	Step 2				
Ratings of liking: Anger	Shyness	-.015	.006	-.203	
	Sex	-.099	.080	-.111	.012
	Step 3				
	Shyness	-.009	.009	-.120	
	Sex	.489	.646	.545	
	Sex x Shyness	-.012	.013	-.671	.007
	Step 1				
Ratings of liking: Sadness	Shyness	.009	.004	.213	.046*
	Step 2				
	Shyness	.008	.004	.210	
	Sex	.033	.045	.067	.004
	Step 3				
	Shyness	.005	.005	.120	
	Sex	-.319	.360	-.641	
Ratings of liking: Sadness	Sex x Shyness	.007	.007	.724	.008
	Step 1				
	Shyness	-.026	.008	-.278	.077**
	Step 2				
	Shyness	-.025	.008	-.272	
	Sex	-.116	.101	-.101	.010
	Step 3				
Ratings of liking: Sadness	Shyness	-.024	.012	-.257	
	Sex	.023	.823	.020	
	Sex x Shyness	-.003	.016	-.124	.000

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

Rejection Sensitivity as Mediator between Shyness and Facial Expression Interpretation Biases

The final analyses concerned the role of rejection sensitivity as a potential mediator of the relations between shyness and facial expression interpretation. To test for a significant indirect effect of Rejection Sensitivity on facial expression interpretation biases, we used the Baron and Kenny (1986) method, as well as the Preacher and Hayes (2004) macro, which consists of the Sobel test with a bootstrapping procedure. Direct and total effects were tested for each outcome variable found to be significantly related to shyness: consequences for the self ratings with facial expressions displaying disgust, ratings of liking with faces displaying anger, disgust, and sadness, and probability estimates with faces displaying happiness. Results are displayed in Table 4.

Results indicated that the relation between shyness and consequences for the self ratings with faces displaying disgust, and ratings of liking with faces displaying disgust and anger were significantly mediated by rejection sensitivity. However, for probability estimates with faces displaying happiness, and for ratings of liking with faces displaying sadness mediation was not supported (the 95% confidence intervals overlapped 0).

Table 4

Rejection Sensitivity as a Mediator of Shyness and Children's Facial Expression Interpretation Outcomes

Facial Expression	Predictor	Outcome	Control	Coeff	SE	t	p	95% CI	Mediation according to Preacher & Hayes
Happiness	Shyness	Probability estimates		-.023	.010	-2.38	.02	-.009 to	NO
	Shyness	Rejection sensitivity		.215	.047	4.55	<.001	.006	
	Shyness	Probability estimates	Rejection sensitivity	-.021	.010	-2.06	.04		
Disgust*	Shyness	Consequences		-.031	.011	-2.84	<.01	-.023 to	YES
	Shyness	Rejection sensitivity		.213	.076	2.82	<.01	-.002	
	Shyness	Consequences	Rejection sensitivity	-.021	.011	-1.87	.07		
Disgust	Shyness	Ratings of liking		-.015	.006	-2.34	.02	-.014 to	YES
	Shyness	Rejection sensitivity		.212	.048	4.41	<.001	-.002	
	Shyness	Ratings of liking	Rejection sensitivity	-.008	.007	-1.17	.25		
Anger	Shyness	Ratings of liking		.009	.004	2.39	.02	.001 to	YES
	Shyness	Rejection sensitivity		.212	.048	4.41	<.001	.007	
	Shyness	Ratings of liking	Rejection sensitivity	.005	.004	1.40	.16		
Sadness	Shyness	Ratings of liking		-.026	.008	-3.17	<.01	-.01 to	NO
	Shyness	Rejection sensitivity		.212	.048	4.41	<.001	.003	
	Shyness	Ratings of liking	Rejection sensitivity	-.022	.009	-2.50	.01		

*A relation between shyness and ratings of consequences for the self for faces displaying disgust was found only in girls. Therefore mediation analysis was performed to determine if rejection sensitivity mediated this effect for girls only.

Discussion

In this study, we examined whether shyness in children is associated with the way in which facial expressions are interpreted. Based on cognitive conceptualizations of social anxiety, which posit that shy, socially anxious individuals negatively misinterpret social cues (Clark & Wells, 1995; Rapee & Heimberg, 1997), we predicted that shyness would be related to misinterpretations of the facial expressions of others. Results indicated that this was indeed the case. Although the accuracy with which children could identify facial expressions was not related to their degree of shyness, their interpretations of the meanings of the facial expressions were. Indeed, shy children showed interpretation biases when presented with both positive and threatening facial expressions.

In terms of children's interpretations of facial expressions, shyness was related to

perceiving higher levels of dislike in faces displaying disgust, anger, and sadness. Moreover, as we predicted, rejection sensitivity appeared to mediate many of these biased interpretations. Indeed, rejection sensitivity was found to be significantly related to shyness. Such a link between shyness and rejection sensitivity in children is consistent with similar findings from studies with adult participants (Jackson et al., 2002; Jackson et al., 1997; Stritzke et al., 2004). In fact, in view of the well-established relation between shyness, peer rejection, and exclusion (Gazelle & Ladd, 2003, Ladd 2006; Oh et al., 2008; Younger et al., 1993), it makes sense that shyness in children would be related to rejection sensitivity.

Interestingly, rejection sensitivity mediated children's biased interpretations for faces displaying anger and disgust, but not sadness. One explanation may be that anger and disgust are more likely to be seen by children as signs of rejection than is sadness. In fact, research does show that facial expressions of disgust convey rejection (Amir et al., 2005). Furthermore, children frequently confuse facial expressions of anger and disgust (Gosselin & Simard, 1999), suggesting that these expressions may convey similar information to children. Although we might expect that even non-shy children would perceive dislike in an angry or disgusted face, our findings suggest that this effect is enhanced in shy children who are also sensitive to rejection, perhaps as a result of their negative social experiences. This finding fits with the literature on attribution style, which has found that hostile attributions of social interactions are more common in children who are rejected than in those who are not (Feldman & Dodge, 1987; Sandstrom & Cillessen, 2003).

We also hypothesized that shy children would display interpretation biases such as overestimating the probability and negative consequences of being looked at with negative facial expressions. Indeed, our findings showed that shyness was significantly related to children's

negative reaction to the facial expression of disgust, a link that was mediated by rejection sensitivity. However, this effect was only evident in the responses of girls; similar effects were not found for boys. This observation fits with findings of sex differences in the peer rejection and aggression literature. Specifically, boys are more often involved in direct physical and verbal aggression, whereas girls are more likely to intimidate indirectly, using relational forms of aggression such as gossiping, or negative facial expressions and eye rolling (Björkqvist, Lagerspetz, & Kaukiainen, 1992; Crick, 1997, Velásquez, Santo Saldarriaga, López, & Bukowski, 2010). It may be that shy girls are more sensitive to non-verbal relational signs of rejection such as a “dirty look” than are boys, as this is the type of aggression with which they may be most familiar. This finding is also consistent with previous research with adults. For example, Schofield and colleagues (2007) found that socially anxious adults rated the consequences of interacting with someone displaying a disgusted facial expression as more negative than did those low in social anxiety. The current findings suggest that similar to shy adults, shy girls are impacted more negatively by facial expressions conveying disgust than are children who are less shy.

We also found that shy children rated being looked at with a happy facial expression as less likely to occur than did children who are less shy. It would appear that shy children may not only be more likely to have negative biases when encountering threatening facial expressions, but also when dealing with positive facial expressions. This fits with findings reported by Burgess and Younger (2006), who found that shy/withdrawn children endorsed not only more negative self-descriptors but also fewer positive self-descriptors than did non-withdrawn children. Burgess and Younger (2006) suggest that shy/withdrawn children lack the positive bias shown in well-adjusted individuals, making it difficult for them to maintain a positive emotional

state. Likewise, if shy children, perhaps because of their history of negative interactions with others, do not expect to receive positive emotional expressions from their peers, this may serve to maintain a negative self-concept as well as their social discomfort. Interestingly, this bias concerning positive facial expressions was not mediated by rejection sensitivity. Our results suggest that sensitivity to rejection is specifically linked to biases in the interpretation of negative facial expressions, but not to the interpretation of facial expressions that are positive.

Some of our hypotheses concerning the link between shyness and cognitive biases were not confirmed. Specifically, although shy children's interpretations of negative facial expressions differed from those of children who were less shy, their expectations concerning the likelihood of receiving negative expressions did not. Thus, it appears that shy children have different expectations concerning the likelihood of negative consequences versus the importance of negative consequences. Such differences have been reported in the adult literature on anxiety. Foa and Kozak (1985), for example, proposed that different types of anxiety vary in terms of the degree to which the probability bias and the expectations of negative consequences bias affect individuals' appraisals of social situations. Individuals with panic disorder, for instance, tend to overestimate the probability of rare situations, such as having a heart attack, but are realistic in their estimation that such an event would be disastrous. Individuals with social phobia display the opposite pattern; they fear events that are likely to occur, such as being rejected by a member of the opposite sex, but react with excessive anxiety because of the unrealistic disastrous cost they assign to such an event (Foa, Franklin, Perry, & Herbert, 1996). In line with this reasoning, it may well be that shy children, rather than exaggerating the *likelihood* of experiencing negative social interactions (e.g., being looked at with a threatening facial expression), may be more prone to exaggerate the negative *consequences* of such negative social interactions.

The present study also examined the relation between shyness and facial expression recognition, a topic that has yielded mixed results in the literature. In line with findings from the small number of previous studies (Melfsen & Florin, 2002; Philippot & Douilliez, 2005; Schofield et al., 2007), our results showed that shyness was not significantly related to children's ability to recognize facial expressions. Shy children were no less accurate in terms of evaluating the emotional content of most facial expressions than were non-shy children. As proposed by Philippot and Douilliez (2005), and confirmed in the present study, it appears that the salience of facial expressions for socially anxious individuals lies not in the individual's ability to label facial expressions accurately, but rather in the personal relevance the anxious individual attributes to such expressions. Although shy children may be able to identify the emotion displayed in a person's face, our findings suggest that they are more likely than non-shy children to perceive disapproval or to have an adverse reaction to viewing a negative emotion. This kind of bias is likely to lead to avoidance of social situations, which can serve to maintain symptoms of social anxiety (Rapee & Heimberg, 1997).

One interesting question raised by the results we obtained is whether the participants responded to specific discrete emotions or to emotional valence. That is, did the participants give a specific meaning to the various facial expressions or did they give them a more general meaning based on whether the emotion was positive or negative? It is possible to answer this question by looking at the pattern of results for each emotion considered in this study. If the participants only responded to the facial expressions in terms of valence, one would expect the negative emotions (fear, anger, disgust, and sadness) to share the same pattern of responses. Our results indicate this was not the case. Indeed, we found a relation between shyness and consequences to the self in the case of disgust expressions, but not for fear, anger and sadness.

Likewise, shyness was associated with the perception of being liked for expressions of disgust, sadness, and anger, but not for fear. The performance in the recognition task also favours the differentiation hypothesis. The high level of performance in the recognition task is a clear indication that the participants gave a specific meaning to the facial expressions.

Our findings have implications for interventions geared toward children who are extremely shy. Current evidence-based treatments for social anxiety in both adults and children focus on correcting cognitive biases related to probability and cost estimates regarding social outcomes (Barlow et al., 2004; Hoffman, 2004; 2007; Nelson, et al., 2010). Our findings suggest that judgmental biases with which socially anxious children struggle extend to their interpretations of facial expressions. Although they are able to identify the facial expressions of others accurately, their estimations of the likelihood and negative consequences of being looked at with certain facial expressions may be biased. We also found that shyness was associated with negative perceptions of being liked and negative expectations concerning potentially threatening facial expressions. It might be worthwhile, therefore, to incorporate a discussion of probability and cost estimates, as well as of social attributions around the facial expressions of peers, into existing interventions.

Although the current study contributes in a number of important ways to the shyness literature, there are some limitations and recommendations that should be considered. First, Camras' (1980) stimuli, which we employed in this study, include only two exemplars of each facial expression, one male and one female. This could limit the sensitivity of our method (Battaglia et al., 2010). In addition, these stimuli are relatively dated, which may have influenced participants' perceptions of the facial expressions. Nevertheless, we chose Camras' stimuli because to our knowledge these are the only representations of children's faces that

include all six basic emotions and that have been standardized according to the FACS (Ekman & Friesen, 1978). Although there exist other facial expression stimuli with more than one model representing each expression (e.g., the JACFEE; Matsumoto & Ekman, 1989), the emotions in these stimuli are represented by adult faces. It was our view that models close in age to our participants were most appropriate to examine how shy children interpret facial expressions of their peers. Had we used adult faces, we would perhaps have been addressing a different question; that is, how shy children interpret emotions displayed by adults. Nevertheless, it would be interesting for future research to develop pictorial stimuli that include several models of both boys and girls displaying each facial expression. The development of several models would also facilitate research that includes gender of the pictorial model, in addition to sex of participants, as an independent variable.

Second, our sample is relatively small in size, which may have limited power in detecting small to medium size effects. As many developmental researchers have found, it has become increasingly difficult to get schools to participate in research on peer relations. We recruited children from private schools; however, class sizes were small. It is not clear whether there might be characteristics of participants in our study, such as income level and school performance that could differentiate them from children in public schools. In addition, although we were interested the relation between shyness and facial expression interpretation in a non-clinical sample, it is possible that we would have found a larger effect had we used a sample of children diagnosed with social phobia. Nevertheless, our use of a non-clinical sample allowed us to broaden the relevance of our findings to the classroom. Third, as was the case in Study 1, the participating schools requested that information on ethnicity not be collected. As mentioned, some research indicates that children perform better on facial expression recognition tasks when

presented with expressions modeled by people in their own cultural group (McLure, 2000). Because we were not able to assess ethnicity in our sample, we chose to use facial expressions modeled by only European-American models. Researchers conducting future investigations in this area might benefit from including facial expression stimuli modelled by people of different ethnicities, if such stimuli are available. The use of models of different ethnicities could allow researchers to examine whether facial expression recognition accuracy is indeed higher when the expressions are modelled by someone from a child's own ethnic group. Finally, although facial expressions would seem to be a form of social cue that is high in ecological validity, we do not know whether children's emotional experience when looking at pictures is congruent with their experience in face-to-face interactions with real-life peers. As Vassilopoulos and Banerjee (2012) have suggested, future studies might attempt to investigate this further by using stimuli such as videos of children making different facial expressions or by using face-to-face interactions.

In sum, the results of this study are consistent with cognitive theories that link social anxiety with biased social processing. They indicate that these biases can be seen in a non-clinical sample of shy children and extend to the interpretation of facial expressions. Most importantly, this was one of the first studies to link shyness and rejection sensitivity. Our findings contribute to the shyness literature in an important way and may also help to refine current clinical interventions for extremely shy children.

General Discussion

Summary of Primary Results, Strengths, and Global Implications

The overarching focus of this thesis was whether and how shyness influenced the way children processed facial expressions of emotion. Two studies were conducted to examine these questions. In the first study, we investigated whether shyness was related to accuracy of children's recognition of facial expressions of emotion. In the second study, we shifted our focus to the relation between shyness and facial expression interpretation. Correspondingly, given the important and established link between shyness and peer rejection (Gazelle & Ladd, 2003), an additional aim was to examine the mediating role of rejection sensitivity on the relation between shyness and facial expression interpretation in children.

In Study 1, we investigated the relation between shyness and children's ability to accurately recognize six basic facial expressions -- anger, disgust, fear, happiness, sadness and surprise, as well as a neutral expression -- in a school sample of 12- to 14-year-old children. Facial expressions displayed by adult models were presented at both 50% and 100% intensity in order to determine whether level of ambiguity influenced the children's facial expression recognition. The methodological and theoretical strengths of Study 1 included using a standardized set of facial expression stimuli, using Wagner's (1993) unbiased hit rate to measure accuracy, and using well-established cognitive models of social anxiety to guide our hypotheses. It was found that for most of the facial expressions, shyness was not related to recognition accuracy. However, for boys only, higher levels of shyness were associated with lower levels of recognition accuracy for sad faces at both 50% and 100% intensity. This effect was more pronounced in the 50% intensity condition compared to the 100% intensity condition. As detailed in the discussion section of Study 1, shy boys' difficulty recognizing low intensity sad

expressions may be linked to socialization practices: parents have been reported to speak more with their daughters about sadness than they do with their sons (e.g., Fivush et al., 2000).

Notwithstanding, the overall results from both studies suggest that contrary to what we had hypothesized, shy children are indeed able to recognize accurately the emotional content of most facial expressions.

Based on the findings of Study 1, our focus in Study 2 shifted from the *recognition* of emotions to the *interpretation* of emotions. Study 2 was designed to investigate whether shyness is related to the way children interpret both positive and negative facial expressions. Specifically, the aim was to examine whether shyness is related to a) the tendency to see dislike in the facial expressions of others and b) cognitive biases such as overestimating the likelihood of and negative consequences of being looked at with a negative facial expression or such as underestimating the probability of and positive consequences of being looked at with a positive facial expression. In addition, rejection sensitivity was evaluated as a potential mediator of the link between shyness and facial expression interpretation. Like Study 1, Study 2 used a school-based sample of 12- to 14-year-old children and presented children with the same six basic facial expressions (anger, disgust, fear, happiness, sadness and surprise) and a neutral expression. As mentioned in the discussion section of Study 1 and in the introduction section of Study 2, this second study was designed to improve on some of the shortcomings of the first study. Specifically, we used facial expression stimuli consisting of children's faces rather than adult faces in order to better tap into shy children's reactions to the facial expressions of their peers. In addition, we used a different measure of shyness in Study 2, a measure that was specifically designed for children.

As we had predicted, shyness was significantly related to rejection sensitivity. Also in line with our hypotheses, shyness was significantly related to the tendency to perceive dislike in faces displaying anger, disgust, and sadness. This effect was mediated by rejection sensitivity for faces displaying anger and disgust but not for faces displaying sadness. Also mediated by rejection sensitivity was the significant relation between shyness and children's ratings of consequences to the self when interacting with someone displaying a facial expression of disgust (an effect that was found only for girls.) In addition, children's level of shyness was related to their predicting a low probability of being looked at with a happy facial expression.

Another finding of Study 2 was that shyness was not related to facial expression recognition. This finding is partially consistent with what we found in Study 1, where in most cases shyness was found to also be not related to children's ability to recognize facial expressions accurately. However, in Study 1, we found that shy boys had difficulty recognizing sad faces compared to non-shy boys in the 50% intensity condition. This discrepancy between the findings of Study 1 and Study 2 in regard to shy boys' recognition of sad faces is most likely accounted for by the intensity of emotions presented. In Study 1, the relation between shyness and recognition of sad faces in boys was significant with 50% intensity sad faces but only approached significance with 100% intensity sad faces. In Study 2, however, only 100% intensity emotions were used. Perhaps the same effect would have been found in Study 2 had 50% intensity sad faces also been used. Nevertheless, because the main goal of Study 2 was to examine how shy children responded to clear representations of both positive and negative emotions, lower intensity expressions were not included.

An additional possible reason for different findings between the two studies in regard to sad faces is that in Study 1 we used adult facial expressions, whereas in Study 2 we used facial

expressions modeled by children. Although this is a plausible explanation for the differences, previous research has found that children's facial expression processing ability and age of the stimulus are unrelated (McLure, 2000). Furthermore the high level of recognition accuracy for full intensity sad faces in both studies (Study 1: mean = .84; Study 2: mean = .84) is a clear indication that children did not have greater difficulty recognizing emotions when the faces were adults, compared to when they were children.

A major strength of Study 2 was its use of an original mediation model incorporating rejection sensitivity to explore the link between shyness and facial expression interpretation. Moreover, Study 2 improved upon the ecological validity of previous studies by examining social-cue interpretation and its relation with shyness using facial expressions instead of written descriptions of hypothetical social situations (Campbell et al., 2009).

In general, the results of Study 1 and Study 2 suggest that it is the interpretation of emotions rather than the recognition of emotions that is relevant for shy children. Specifically, it seems that shy children who are also sensitive to rejection tend to interpret both positive and negative facial expressions in a negatively biased manner. Overall, the two studies presented in this thesis lend a significant contribution to the literature in terms of their originality, their relevance to the childhood shyness and rejection sensitivity literature, and their focus on clarifying inconsistencies in the literature regarding shyness and its relation with facial expression recognition. Moreover, the studies are solidly based on cognitive theories of social anxiety and have yielded findings that have practical implications relevant to very shy children. Altogether, the examination of shyness and its relation to facial expression recognition and interpretation, using an innovative model with rejection sensitivity as a mediator, provides valuable insights regarding the link between shyness and how children process social cues.

The findings of these studies have important relevance for the field of education and may explain some of the difficulties shy children encounter at school, such as their reluctance to participate in class. It is possible that shy children may worry about being disliked by peers, and if they have negative biases in the way they interpret the facial expressions of others, this worry may be exacerbated. Problems interpreting facial expressions might play a role in peer interactions outside the classroom as well. For example, a shy child who is sensitive to rejection and who may be considering approaching a group of peers might interpret an expression on someone's face as a sign of dislike and might then feel unwelcome to join in.

Of course, this example is simply speculation based on our findings that shyness is related to perceiving dislike in the facial expressions of others. How this tendency actually translates to social interaction remains to be examined in further studies. In particular, it would be interesting to examine whether perceiving dislike in the face of one's peers leads to behaviours such as withdrawal or avoidance. This is an especially important research question, given that biased interpretations of social cues have been said to lead to avoidance of social situations (Rapee & Heimberg, 1997). Indeed, it is not difficult to imagine how negatively biased interpretations of social cues could contribute to and maintain shy children's social anxiety in an array of interpersonal situations.

In terms of clinical implications, the results of the present research can inform interventions for children who are very shy. Specifically, interventions such as cognitive behavioural therapy, which targets distorted thinking, would be relevant here. As mentioned in the introduction section of Study 2, social anxiety has been linked with the tendency to underestimate the probability of a positive social event's taking place (Lucock & Salkovskis, 1988; Taylor & Wald, 2003). The results of Study 2, which found that shyness was related to

underestimating the probability of being looked at with a happy expression, expands our understanding of the cognitive biases displayed by shy children to include biased expectations involving others' facial expressions. Similarly, social anxiety is related to overestimating the negative consequences of negative social events (Barlow et al., 2004). This was found in Study 2 to be the case with shyness in girls, which was related to predicting negative consequences when being looked at with an expression of disgust. Cognitive distortions are problematic, because making negative predictions about how situations will play out can lead to avoidance of these situations (Barlow et al., 2004; Rapee & Heimberg, 1997). This avoidance makes it impossible for fears to be disconfirmed, and, as a result, anxiety levels are maintained. The findings of Study 2 suggest that shy children may benefit from cognitive-behavioural interventions that can help challenge some of their cognitive distortions related to others' facial expressions.

Limitations and Future Directions

Despite the strengths of the two studies in this thesis, several limitations also merit discussion. The limitations that are particular to each individual study have already been addressed in the respective discussion sections of Study 1 and Study 2. Below, the limitations that apply to both studies and to the research as a whole are noted.

First, in both studies the sample size was relatively small, which can limit the power of statistical analyses. However, as we pointed out in the discussion section of Study 2, a major reason why our samples were not larger is the difficulties we encountered recruiting schools to participate in our research, a problem that plagues much research on children's peer relations. Second, as we mentioned earlier in the discussions sections of both Study 1 and Study 2, there are both advantages and disadvantages of examining facial expression processing in a community sample, in contrast to a clinical sample of socially anxious children. On the one hand,

had we used a clinical sample of children experiencing social anxiety disorder, we might have found larger effects in both studies. On the other hand, our goal had been specifically aimed at learning how shy children process facial expressions of emotion, so that our results could be generalized to the classroom. As we noted in the general introduction section, the majority of past research has examined facial expression processing in clinical samples. Although shyness is not a diagnosable mental illness, it is associated with an array of negative outcomes for children. It seemed, therefore, expedient to conduct research that can be applied to shy children in the community and not just to those with social anxiety disorder.

Third, at the request of the participating schools, information on ethnicity was not collected in either study. As mentioned, McLure (2000) found that children perform better on facial expression recognition tasks when presented with expressions modeled by people in their own cultural group. Without information on ethnicity, we were not able to examine whether children are indeed better at recognizing facial expressions of other children from their own ethnic group and therefore only European-American models were used in both studies. Researchers conducting similar studies in the future, may benefit from using facial expression stimuli consisting of models from different ethnicities in order to examine a possible interaction between ethnicity of the child and ethnicity of the facial expression.

Fourth, although 50% intensity facial expressions were used in order to examine the relation between shyness and low intensity facial expressions, it is possible that 50% intensity expressions are not sufficiently ambiguous, thus limiting the ability to detect the effect of shyness on emotion recognition. It would be worthwhile for future studies to present participants with less intense facial expressions.

Finally, as mentioned in the discussion sections of both studies, the use of pictures of facial expressions is an improvement in ecological validity over past studies that have used written descriptions of social situations (e.g., Campbell et al., 2009) in order to assess the interpretation of social cues. However, future research could perhaps increase the ecological validity of the stimuli even further by using videos of children making different facial expressions or even by using face-to-face interactions (Vassilopoulos & Banerjee (2012).

In addition to the limitations described above, there remain several research questions that were not addressed within the current thesis, which could prospectively further our understanding of shyness, rejection sensitivity, and the interpretation of social cues. First, as mentioned earlier, our finding that shy children tend to see higher levels of dislike in sad, angry, and disgusted faces suggests a bias to interpret these expressions negatively. An interesting question, however, is whether the above findings represent a negative interpretation bias or whether they represent instead the lack of a positive bias. As discussed by Burgess and Younger (2006), healthy, non-depressed individuals show positive biases in the way they view themselves (see Abramson & Alloy, 1990). In their study, Burgess and Younger found that socially withdrawn children endorsed fewer positive self-descriptive words than did non-withdrawn children. This finding suggests that shy, withdrawn children may lack the protective bias that other less-shy children may have. Given that shy children are often rejected, excluded, and victimized, it would make sense that they would find it difficult to maintain such a positive bias. In relation to our results, shy children's tendency to perceive dislike in sad, angry, and disgusted faces may suggest that shy children may perhaps actually be realistic in their assumptions that others do not like them.

Related to the previous point is the important finding that shyness is related to rejection sensitivity. Based on the link between shyness and peer rejection, we expected these two constructs to be significantly related. However, the causal direction of this relation is not clear. It is logical to assume that shy children would become sensitive to rejection because of experiences of being rejected by peers. However, it is also possible that shyness, which may result from behavioural inhibition (as discussed in the general introduction section; Kagan & Snidman, 1991), may be linked temperamentally to higher levels of rejection sensitivity, even for children who have not actually experienced peer rejection. It is also possible that rejection sensitivity in shy children may be related to rejection by important people other than peers, such as parents. In fact, the rejection sensitivity model was created to explain how rejection in any important relationships could lead to the expectation of future rejection (Downey & Feldman 1996). Past research has found a link between insecure attachment and rejection sensitivity (Erozkan, 2009; Gitanjali, Somasundaram & Sundaram, 2011), as well as a link between insecure attachment and shyness (Booth-LaForce & Oxford, 2008; Borelli, et al., 2010; Chen, 2012). Such links suggest that parental rejection could indeed play a role in the development of rejection sensitivity in shy children. The nature and direction of the relation between shyness and rejection sensitivity could be explored in future studies. Specifically, it would be interesting in future research to explore the mediating role of peer or of parental rejection.

Another interesting question that might be considered is whether the developmental concerns of children aged 12 to 14 years contributed to our findings. As mentioned in the introduction section of Study 2, peers' perceptions of shy children tend to become increasingly negative in late childhood and early adolescence (Younger & Boyko, 1987; Younger & Piccinin, 1989; Younger, Schwartzman, & Ledingham, 1985, 1986). Given such age-related changes in

how children view their shy peers, along with the findings showing that attunement to signs of peer acceptance and rejection tends to intensify during this age period (London, Downey & Bonica, 2007; Steinberg & Morris, 2001), it is possible that the shy children in our sample were particularly vigilant in their sensitivity to signs of dislike and more likely to have negative expectations of future social situations. It would be interesting for future studies to examine facial expression interpretation in younger children, or in a sample of children with a wider age range, to determine whether there is a developmental pattern to shy children's interpretations and expectations regarding others' facial expressions.

Future research might also explore whether biased facial expression interpretation occurs in children who exhibit problematic behaviours other than social anxiety and withdrawal. For example, childhood aggression is also linked to a variety of social problems (Cleverly, Szatmari, Vaillancourt, Boyle, & Lipman, 2012; Crick, 1995; Crick, Cass, & Nelson, 2002; Crick, Ostrov, & Werner, 2006). However, with aggressive children, it is disruptive behaviour rather than inhibited behaviour that is problematic. There is some evidence that aggression in adults is related to problems recognizing certain facial expressions (Sato, Uono, Matsuura, & Toichi, 2009), but there is little research on facial expression processing in aggressive children. In Study 2, rejection sensitivity – specifically, anxious expectations of rejection – mediated the relation between shyness and biased interpretations of certain facial expressions. Given that angry expectations of rejection, rather than anxious expectations of rejection, are related to aggressive behaviour in children (London et al., 2007, Zimmer-Gembeck & Nesdale, 2013), it would be interesting to examine whether such angry expectations mediate the relation between aggressive behaviour in children and their interpretations of facial expressions.

Conclusions

The current research successfully achieved its aim of conducting a comprehensive examination of facial expression processing in shy children. The results of both studies illuminated the importance of biases in the interpretation of emotions rather than errors in the recognition of emotions for shy children. Specifically, the present studies clarified that while shy children can recognize most facial expressions, they tend to interpret facial expressions in a negatively biased manner. This important finding is in line with cognitive theories of social anxiety, which posit that shyness is linked to biased interpretations of social cues (Rapee & Heimberg, 1997). Our findings highlight facial expressions as a specific type of social cue, the meaning of which may be misinterpreted by shy children. Moreover, the finding that rejection sensitivity mediates the relation between shyness and biased facial expression interpretation in children is a novel discovery that may shed new light on shy children's social struggles. Specifically, it appears that it is not shy children per se, but shy children who are rejection sensitive that are vulnerable to biased facial expression interpretation. Our findings suggest that special attention should be paid to shy children who are rejected, excluded, or victimized. It is possible that these aversive social experiences, which are linked with depressive symptoms in shy children (Gazelle & Ladd, 2003), may also be linked to the way shy children interpret the facial expressions of their peers. The findings of the current thesis are valuable, particularly in terms of their practical implications for shy, rejection sensitive children, who may benefit from cognitive therapy that incorporates the interpretation of facial expressions into its protocol.

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Appendix A

Study 1: Information letter and Consent Form for Parents

(Printed on University of Ottawa letterhead)

Facial Expression Recognition in Shy and Non-Shy Children

Primary investigator: Alastair Younger, Ph.D., School of Psychology, University of Ottawa, Ottawa, Ontario, K1N 6N5.

Dear parents (or primary guardians of the child),

I am a professor of the School of Psychology at the University of Ottawa and I do research in the area of child development. At the moment, my assistants and I are planning a study to determine whether there is a relationship between children's ability to recognize different facial expressions of emotion and their level of shyness/outgoingness. Your child's participation in this study will help to further the understanding of shyness and how it may effect the social development of children. I would like to know if you would permit your child to participate in this research. This project has already received approval from both the Research Ethics Board at the University of Ottawa and the Ottawa-Carleton Research Advisory Committee as well as from the principal of the school.

This study will take place during class, at a time designated by the teacher. The study requires participation limited to 25 minutes. Each child will be met individually in a room close to the classroom. The children will see different facial expressions on a portable computer and will be asked to identify each emotion (for example, happiness, anger, fear) by pressing on a button on an external keyboard. Following this activity, the children will be asked to complete 2 questionnaires asking them how comfortable they feel in interactions with others and about concerns they may have about what others think about them. No information will be collected from files or records for the individual students.

Most children enjoy participating in studies involving recognizing facial expressions; however, the participation of your child is strictly voluntary. Your child may refuse to participate or may withdraw from the study at any time without giving a reason, without his or her grades being affected and without being penalized in any way. In such an event, all of his or her responses collected until the time of withdrawing would be destroyed. It is possible that some children may feel some slight discomfort when divulging personal information. In such an event, they will be assured that their responses are confidential and will be kept anonymous. The experimenter will also answer any questions or concerns they may have. In this study anonymity and confidentiality will be respected. Only the primary investigator and his assistants will have access to the data derived from this study, which will be kept locked up in a filing cabinet in Dr. Younger's laboratory. Names of participants will be changed to a numerical code for the purposes of data analysis and any identifying information will be locked up in Dr. Younger's laboratory. Only group averages will be reported in the results of the study. Study results will not appear in any school records. The data from this study will be conserved for 10 years following the publication of the results, after which they will be destroyed.

It will be possible for you to receive a copy of a summary

of the results of this study. An abstract containing the results of the study will be distributed in class at the end of the school year, based on the data that have been collected to that date. I ask you to please discuss the idea of participating in this study with your child. If you and your child both agree on your child's participation, please locate the consent form that is attached to this letter and sign the two copies of the form. Please keep one of the copies for yourself and ask your child to return the other copy to a box in the school office in the next few days. On the day of your child's participation in the study he or she will be

asked to sign a consent form before participating. Your child will sign two copies of this consent form, one of which he or she will keep for future reference.

For any information concerning your right as the parent of a child participating in a research study, you can contact members of Research Grants and Ethics Services, University of Ottawa, Tabaret Hall, room 159, 562-5841, ethics@uottawa.ca. If you have any questions about the study you can contact Dr. Younger at the telephone number listed at the top of this page.

I would like to sincerely thank you for your cooperation.

Alastair Younger Ph.D, C. Psych.

Professor

Consent Form

The information collected for this project is confidential and protected under the Municipal Freedom of Information and

Protection of Privacy Act, 1989.

I have read and understood the request for my child to participate in the study of Facial Expression Recognition in Shy and Non-shy Children. I have discussed it with my child and ...

☐

I give permission for him/her to participate.

I do not give permission for my child to participate.

Name of Student: *(please print)* _____ Date _____

Name of Parent/Guardian: *(please print)* _____

Signature of Parent/Guardian: _____

Appendix B

Study 1: Child Consent Form

Facial Expression Recognition in Shy and Non-Shy children**Child consent form**

I agree to participate in a study on emotions and shyness. My participation in this study is important because it will help researchers understand how different children's personalities may be related to how they understand emotions. My mother, father, or guardian has explained to me what I will need to do in order to participate in the study. I will be shown pictures of people making expressions with their face. I will need to press a button on a keyboard that matches the emotion that I see on the screen. After this activity I will fill in 2 short questionnaires asking about how I feel in different social situations. In total this will take about 25 minutes.

I know that I can refuse to participate in the study or stop participating at any time without giving any reason and without being penalized. All I have to do is the person who is doing the study. There is a chance that I may feel some slight discomfort answering personal questions, however I know that my information is confidential, which means that it will be locked up in Dr. Younger's laboratory and nobody other than those working with him will have access to it. Also, the only person at my school who will know that I participated in this study is my teacher. I know that if Dr. Younger ever writes a paper about this study, my name will never be mentioned. There are two copies of this consent form, one for Dr. Younger and one for me to keep.

Primary investigator: Alastair Younger, Ph.D., School of Psychology, Ottawa University, Ottawa, Ontario, K1N 6N5.

Name in printed form

Participant signature

Researcher/Research assistant signature

Appendix C

Study 1: Debriefing Form

Facial Expression Recognition in Shy and Non-Shy Children

Primary investigator: Alastair Younger, Ph.D., School of Psychology, University of Ottawa, Ottawa, Ontario, K1N 6N5.

Dear student,

Thank you very much for participating in our study on emotions and shyness. The purpose of our study was to examine whether different children's personalities may relate to how they understand emotions. People differ in how well they understand different facial expressions of emotion. One of the things that may relate to this is how shy or outgoing somebody is. Your participation helped us examine this question.

If you have any questions about the study, you can contact Dr. Younger at the phone number at the top of this form. Questions concerning the ethics of this study can be addressed to members of Research Grants and Ethics Services, University of Ottawa, Tabaret Hall, room 159, 562-5841, ethics@uottawa.ca.

Thanks again for your help,

Alastair Younger, Ph.D., C. Psych

Jessica Kokin, B.A.

Revised Cheek and Buss Shyness Scale

Shyness Scale

INSTRUCTIONS: Please read each item carefully and decide to what extent it is characteristic of your feelings and behavior. Fill in the blank next to each item by choosing a number from the scale printed below.

1 = Strongly disagree

2 = Disagree

3 = Neutral

4 = Agree

5 = Strongly agree

___ 1. I feel tense when I'm with people I don't know well.

___ 2. I am socially somewhat awkward.

___ 3. I do not find it difficult to ask other people for information.

___ 4. I am often uncomfortable at parties and other social functions.

___ 5. When in a group of people, I have trouble thinking of the right things to talk about.

___ 6. It does not take me long to overcome my shyness in new situations.

___ 7. It is hard for me to act natural when I am meeting new people.

___ 8. I feel nervous when speaking to someone in authority.

___ 9. I have no doubts about my social competence.

___ 10. I have trouble looking someone right in the eye.

___ 11. I feel inhibited in social situations

___ 12. I do not find it hard to talk to strangers.

___ 13. I am more shy with members of the opposite sex.

___ 14. During conversations with new acquaintances, I worry about saying something foolish.

Appendix E
Children's Shyness Questionnaire

Children's Shyness Questionnaire (CSQ)

INSTRUCTIONS: Please read each item carefully and decide to what extent it is characteristic of your feelings and behavior. Fill in the blank next to each item by choosing a number from the scale printed below.

1 = Yes
2 = Sometimes
3 = No

- ___ 1. I find it hard to talk to someone I don't know.
- ___ 2. I am easily embarrassed.
- ___ 3. I am usually quiet when I am with others.
- ___ 4. I blush when people sing "Happy Birthday" to me.
- ___ 5. I feel nervous when I am with important people.
- ___ 6. I feel shy when I have to read aloud in front of the class.
- ___ 7. I feel nervous about joining a new class.
- ___ 8. I go red when someone teases me.
- ___ 9. I say a lot when I meet someone for the first time.
- ___ 10. I am usually shy in a group of people.
- ___ 11. I feel shy when I am the centre of attention.
- ___ 12. I blush a lot.
- ___ 13. I feel shy when the teacher speaks to me.
- ___ 14. If the teacher asked for someone to act in a play, I would put my hand up.
- ___ 15. It is easy for me to make friends.
- ___ 16. I would be embarrassed if the teacher put me in the front row on stage.
- ___ 17. When grown-ups ask me about myself I often do not know what to say.
- ___ 18. I go red when the teacher praises my work.
- ___ 19. I feel shy when I have to go into a room full of people.
- ___ 20. I am embarrassed when my friends look at photos of me when I was little.
- ___ 21. I would be too shy to ask someone to sponsor me for a good cause.
- ___ 22. I enjoy having my photograph taken.
- ___ 23. I usually talk to only one or two close friends.
- ___ 24. I am usually shy when I meet girls/boys.
- ___ 25. I go red whenever I have to speak to a girl/boy of my age.

Appendix F

Children's Rejection Sensitivity Questionnaire (CRSQ)

Children's Rejection Sensitivity Questionnaire

Please imagine yourself in each of the following situations described here and tell us how you would feel in each.

1. Imagine you want to buy a present for someone who is really important to you, but you don't have enough money. So you ask a kid in your class if you could please borrow some money. The kid says, "Okay, wait for me outside the front door after school. I'll bring the money." As you stand outside waiting, you wonder if the kid will really come.

How NERVOUS would you feel, RIGHT THEN, about whether or not the kid will show up?

not nervous						very, very nervous
1	2	3	4	5	6	

How MAD would you feel, RIGHT THEN, about whether or not the kid will show up?

not mad						very, very mad
1	2	3	4	5	6	

Do you think the kid will show up to give you the money?

YES!!!						NO!!!
1	2	3	4	5	6	

2. Imagine you are the last to leave your classroom for lunch one day. As you're running down the stairs to get to the cafeteria, you hear some kids whispering on the stairs below you. You wonder if they are talking about YOU.

How NERVOUS would you feel, RIGHT THEN, about whether or not those kids were badmouthing you?

not nervous						very, very nervous
1	2	3	4	5	6	

How MAD would you feel, RIGHT THEN, about whether or not those kids were badmouthing you?

not mad						very, very mad
1	2	3	4	5	6	

Do you think they were saying bad things about you?

YES!!!

1

2

3

4

5

NO!!!

6

3. Imagine that a kid in your class tells the teacher that you were picking on him/her. You say you didn't do it. The teacher tells you to wait in the hallway and she will speak to you. You wonder if the teacher will believe you.

How **NERVOUS** would you feel, **RIGHT THEN**, about whether or not the teacher will believe your side of the story?

not nervous

1

2

3

4

5

very, very nervous

6

How **MAD** would you feel, **RIGHT THEN**, about whether or not the teacher will believe your side of the story?

not mad

1

2

3

4

5

very, very mad

6

Do you think she will believe your side of the story?

YES!!!

1

2

3

4

5

NO!!!

6

4. Imagine you had a really bad fight the other day with a friend. Now you have a serious problem and you wish you had your friend to talk to. You decide to wait for your friend after class and talk with him/her. You wonder if your friend will want to talk to you.

How **NERVOUS** would you feel, **RIGHT THEN**, about whether or not your friend will want to talk to you and listen to your problem?

not nervous

1

2

3

4

5

very, very nervous

6

How **MAD** would you feel, **RIGHT THEN**, about whether or not your friend will want to talk to you and listen to your problem?

not mad

1

2

3

4

5

very, very mad

6

Do you think he/she will want to talk to you and listen to your problem?

YES!!!

1

2

3

4

5

NO!!!

6

5. Imagine that a famous person is coming to visit your school. Your teacher is going to pick five kids to meet this person. You wonder if she will choose you..

How NERVOUS would you feel, RIGHT THEN, about whether or not the teacher will choose you?

not nervous						very, very nervous
1	2	3	4	5	6	

How MAD would you feel, RIGHT THEN, about whether or not the teacher will choose you?

not mad						very, very mad
1	2	3	4	5	6	

Do you think the teacher will choose YOU to meet the special guest?

YES!!!						NO!!!
1	2	3	4	5	6	

6. Imagine you have just moved and you are walking home from school. You wish you had someone to walk home with. You look up and see in front of you another kid from class, and you decide to walk up to this kid and start talking. As you rush to catch up, you wonder if he/she will want to talk to you.

How NERVOUS would you feel, RIGHT THEN, about whether or not he/she will want to talk to you?

not nervous						very, very nervous
1	2	3	4	5	6	

How MAD would you feel, RIGHT THEN, about whether or not he/she will want to talk to you?

not mad						very, very mad
1	2	3	4	5	6	

Do you think he/she will want to talk to you?

YES!!!						NO!!!
1	2	3	4	5	6	

7. Now imagine that you're back in class. Your teacher asks for a volunteer to help plan a party for your class. Lots of kids raise their hands so you wonder if the teacher will choose YOU.

How NERVOUS would you feel, RIGHT THEN, about whether or not the teacher will choose you?

not nervous						very, very nervous
1	2	3	4	5	6	

How MAD would you feel, RIGHT THEN, about whether or not the teacher will choose you?

not mad						very, very mad
1	2	3	4	5	6	

Do you think the teacher will choose YOU?

YES!!!						NO!!!
1	2	3	4	5	6	

8. Imagine it's Saturday and you're carrying groceries home for your family. It is raining hard and you want to get home FAST. Suddenly, the paper bag you are carrying rips. All your food tumbles to the ground. You look up and see a couple of kids from your class walking quickly. You wonder if they will stop and help you.

How NERVOUS would you feel, RIGHT THEN, about whether or not those kids will want to stop and help you?

not nervous						very, very nervous
1	2	3	4	5	6	

How MAD would you feel, RIGHT THEN, about whether or not those kids will want to stop and help you?

not mad						very, very mad
1	2	3	4	5	6	

Do you think they will offer to help you?

YES!!!						NO!!!
1	2	3	4	5	6	

9. Pretend you have moved and you are going to a different school. In this school, the teacher lets the kids in the class take home a video game to play with on the weekend. Every week so far, you have watched someone else take it home. You decide to ask the teacher if YOU can take home the video game this time. You wonder if she will let you have it.

How NERVOUS would you feel, RIGHT THEN, about whether or not the teacher will let you take the video game home this time?

not nervous						very, very nervous
1	2	3	4	5	6	

How MAD would you feel, RIGHT THEN, about whether or not the teacher will let you take the video game home this time?

not mad						very, very mad
1	2	3	4	5	6	

Do you think the teacher is going to let you take home the video game this time?

YES!!!						NO!!!
1	2	3	4	5	6	

10. Imagine you're back in your classroom, and everyone is splitting up into groups to work on a special project together. You sit there and watch lots of other kids getting picked. As you wait, you wonder if the kids will want you for their group.

How NERVOUS would you feel, RIGHT THEN, about whether or not they will choose you?

not nervous						very, very nervous
1	2	3	4	5	6	

How MAD would you feel, RIGHT THEN, about whether or not they will choose you?

not mad						very, very mad
1	2	3	4	5	6	

Do you think the kids in your class will choose you for their group?

YES!!!						NO!!!
1	2	3	4	5	6	

11. Imagine that your family has moved to a different neighborhood, and you're going to a new school. Tomorrow is a big math test, and you are really worried because you don't understand this math at all! You decide to wait after class and speak to your teacher. You wonder if she will offer to help you.

How NERVOUS would you feel, RIGHT THEN, about whether or not the teacher will offer to help you?

not nervous						very, very nervous
1	2	3	4	5	6	

How MAD would you feel, RIGHT THEN, about whether or not the teacher will offer to help you?

not mad						very, very mad
1	2	3	4	5	6	

Do you think the teacher will offer to help you?

YES!!!						NO!!!
1	2	3	4	5	6	

12. Imagine you're in the bathroom at school and you hear your teacher in the hallway outside talking about a student with another teacher. You hear her say that she really doesn't like having this child in her class. You wonder if she could be talking about YOU.

How NERVOUS would you feel, RIGHT THEN, about whether or not the teacher was talking about you?

not nervous						very, very nervous
1	2	3	4	5	6	

How MAD would you feel, RIGHT THEN, about whether or not the teacher was talking about you?

not mad						very, very mad
1	2	3	4	5	6	

Do you think the teacher meant YOU when she said there was a kid she didn't like having in the class?

YES!!!						NO!!!
1	2	3	4	5	6	

Appendix G

Study 2: Information letter and Consent Form for Parents

(Printed on University of Ottawa letterhead)

How Do Shy and Non-Shy Children Interpret Facial Expressions of Emotion?

Primary investigator: Jessica Kokin, Ph.D candidate. School of Psychology, University of Ottawa, Ottawa, Ontario, K1N 6N5

Dear parents (or primary guardians of the child),

I am a doctoral student at the School of Psychology at the University of Ottawa and I do research in the area of child development. At the moment, Dr. Alastair Younger (my thesis supervisor) and I are planning a study to examine the relationship between the way children interpret different facial expressions of emotion and their level of shyness/outgoingness. Your child's participation in this study will help to further the understanding of shyness and how it may effect the social development of children. I would like to know if you would permit your child to participate in this research. This project has already received ethical clearance from the Research Ethics Board at the University of Ottawa and has received approval from Ottawa-Carleton Research Advisory Committee as well as from the principal of your child's school.

This study will take place during class, at a time designated by the teacher. The study requires participation limited to 25 minutes. Each child will be met individually in a room close to the classroom. The children will see different facial expressions on a laptop computer and will be asked to (a) identify each emotion (for example, happiness, anger, fear) and (b) answer 3 questions about their reactions to each emotion by pressing on a button on an external keyboard. Following this activity, the children will be asked to complete 3 questionnaires asking them how comfortable they feel in interactions with others and about concerns they may have about what others think about them. No information about the students will be collected from school files or records.

Most children enjoy participating in studies involving facial expressions; however, the participation of your child is strictly voluntary. Your child may refuse to participate or may withdraw from the study at any time without giving a reason, without his or her grades being affected and without being penalized in any way. In such an event, all of his or her responses collected until the time of withdrawing would be destroyed. It is possible that some children may feel some slight discomfort when divulging personal information. In such an event, they will be assured that their responses are confidential and will be kept anonymous. The experimenter will also answer any questions or concerns they may have. In this study anonymity and confidentiality will be respected. Only the primary investigator and her supervisor will have access to the data derived from this study, which will be kept locked in our laboratory. Names of participants will be changed to a numerical code for the purposes of data analysis and any identifying information will be locked up in our laboratory. Only group averages will be reported in the results of the study. Study results will not appear in any school records. The data from this study will be conserved for 10 years following the publication of the results, after which they will be destroyed.

It will be possible for you to receive a copy of a summary of the results of this study. An abstract containing the results of the study will be distributed in class at the end of the school year, based on the data that have been collected to that date. I ask you to please discuss the idea of participating in this study with your child. If you and your child both agree on your child's participation, please locate the consent form that is attached to this letter and sign the two copies of the form. Please keep one of the copies for yourself and ask your child to return the other copy to his or her homeroom teacher in the next few days. On the day of your child's participation in the study he or she will be asked to sign a consent form before

participating. Your child will sign two copies of this consent form, one of which he or she will keep for future reference.

For any information concerning your right as the parent of a child participating in a research study, you can contact members of the Office of Research Ethics and Integrity, University of Ottawa, Tabaret Hall, room 159, 562-5387, ethics@uottawa.ca. If you have any questions about the study you can contact me at the telephone number listed at the top of this page.

I would like to sincerely thank you for your cooperation.

Jessica Kokin, B.A.

Ph.D candidate

Consent Form

The information collected for this project is confidential and protected under the Municipal Freedom of Information and

Protection of Privacy Act, 1989.

I have read and understood the request for my child to participate in the study of Facial Expression Recognition in Shy and Non-shy Children. I have discussed it with my child and ...

☐

I give permission for my child to participate.

☐

I do not give permission for my child to participate.

Name of Student: *(please print)* _____ Date _____

Name of Parent/Guardian: *(please print)* _____

Signature of Parent/Guardian: _____

Appendix H

Study 2: Child Consent Form

How Do Shy and Non-Shy Children Interpret Facial Expressions of Emotion?**Child consent form**

I agree to participate in a study on emotions and shyness. My participation in this study is important because it will help researchers understand how different children's personalities may be related to how they understand and interpret emotions. My mother, father, or guardian has explained to me what I will need to do in order to participate in the study. I will be shown pictures of people making expressions with their face. I will need to answer 4 questions about each face by pressing a button on a keyboard that matches my answer. After this activity I will fill in 3 short questionnaires asking about how I feel in different social situations. In total this will take about 25 minutes.

I know that I can refuse to participate in the study or stop participating at any time without giving any reason and without being penalized. All I have to do is tell the person who is doing the study. There is a chance that I may feel some slight discomfort answering personal questions, however I know that my information is confidential, which means that it will be locked up in Dr. Younger's laboratory and nobody other than those working with Jessica and Dr. Younger will have access to it. I know that if Jessica or Dr. Younger ever writes a paper about this study, my name will never be mentioned. There are two copies of this consent form, one for Jessica and one for me to keep.

Primary investigator: Jessica Kokin, B.A., Ph.D candidate, School of Psychology, Ottawa University, Ottawa, Ontario, K1N 6N5

Name in printed form

Participant signature

Researcher/Research assistant signature

Appendix I
Study 2: Debriefing Form

How Do Shy and Non-Shy Children Interpret Facial Expressions of Emotion?

Primary investigator: Jessica Kokin, Ph.D candidate, School of Psychology, University of Ottawa, Ottawa, Ontario, K1N 6N5

Dear student,

Thank you very much for participating in our study on emotions and shyness. The purpose of our study was to examine whether different children's personalities may relate to how they interpret other people's emotional expressions. People differ in how well they interpret different facial expressions of emotion. One of the things that may relate to this is how shy or outgoing somebody is. Your participation helped us examine this question.

If you have any questions about the study, you can contact Jessica Kokin at the phone number at the top of this form. Questions concerning the ethics of this study can be addressed to members of the Office of Research Ethics and Integrity, University of Ottawa, Tabaret Hall, room 159, 562-5387, ethics@uottawa.ca.

Thanks again for your help,

Jessica Kokin, B.A.

Alastair Younger, Ph.D., C. Psych