The Role of Expression Recognition in Social Information Processing and Poor Social Adjustment

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Abstract

Children with poor social adjustment are at risk for a number of maladaptive outcomes in adolescence and adulthood, such as psychopathology, conduct problems, and substance abuse. Social information processing (SIP) theory consists of six distinct but interrelated steps through which individuals process and respond to incoming social information. The ability of individuals to accurately process social information at all six steps has been used to predict aspects of social adjustment such as aggression and social skills. Similarly, the ability of individuals to accurately process and recognize facial expressions of emotion has also been used to predict social adjustment. However, despite the presence of facial expressions as an important piece of social information, no researchers have attempted to examine the specific role of expression recognition in social information processing, or to determine whether or not expression recognition ability may contribute to the predictive power of the SIP model. The goal of the current study is to demonstrate that expression recognition is an integral yet overlooked aspect of SIP, specifically of the first two steps of processing, encoding, and interpretation of cues. Seventy-four elementary school students in grades three and four participated in this study. Verbal and nonverbal measures of encoding were used, as well as an attribution task to measure children’s ability to interpret cues. Participants completed measures of expression recognition accuracy and cognitive ability, and teachers were asked to respond to standardized questionnaires regarding the social skills and aggressive behaviour of participating students. Children who were accurate at recognizing facial
expressions were also more accurate at processing social information. However, after accounting for the variance explained by age, ethnic group, and cognitive ability, expression recognition did not account for a significant amount of variance in teacher reports of aggression or social skills. Based on these findings, further research is recommended to clarify the role of expression recognition in SIP.
Résumé

Les enfants éprouvant des difficultés au plan de l’ajustement social présentent un risque élevé de vivre des problèmes d’ajustement à l’adolescence et à l’âge adulte, notamment la psychopathologie, les difficultés de conduite, et l’abus de substances. La théorie du traitement de l’information sociale (social information processing theory – SIP) inclue six étapes associées mais distinctes au fil desquelles les individus traitent et répondent à l’information sociale leur étant présentée. L’habileté des individus à correctement traiter l’information sociale à chacune des six étapes du modèle SIP a été utilisée comme prédicteur de divers aspects de l’ajustement social, incluant l’agressivité et les habiletés sociales. De la même façon, l’habileté des individus à correctement traiter et reconnaître les expressions faciales de diverses émotions a également été utilisée comme prédicteur de l’ajustement social. Toutefois, malgré l’importance des expressions faciales en tant que source d’information sociale, les chercheurs n’ont pas tenté d’examiner le rôle spécifique de la reconnaissance des expressions faciales dans le traitement de l’information sociale, ou de déterminer si l’habileté à reconnaître les expressions faciales contribue au pouvoir prédicteur du modèle SIP. Le but de la présente étude est de démontrer que la reconnaissance des expressions faciales est une partie intégrale mais négligée du SIP, spécifiquement des deux premières étapes du traitement, soit l’encodage et l’interprétation des indices sociaux.

Soixante-quatorze élèves de la troisième et quatrième année du primaire ont participé à cette étude. Des tâches d’encodage verbal et non-verbal ont été utilisées, ainsi qu’une tâche d’attribution mesurant l’habileté des enfants à
interpréter les indices sociaux. Les participants ont complété des tâches de
reconnaissance des expressions faciales et d’habiletés cognitives, tandis que les
enseignant(e)s ont répondu à des questionnaires standardisés concernant les
habiletés sociales et l’agressivité des élèves participants. Les résultats indiquent
que les enfants reconnaissant correctement les expressions faciales sont également
plus justes dans leur traitement de l’information sociale. Toutefois, lorsque la
variance attribuable à l’âge, le groupe ethnique, ainsi que les habiletés cognitives
est contrôlée, la reconnaissance des expressions faciales ne prédit pas de façon
significative les évaluations de l’agressivité et des habiletés sociales faites par les
professeurs. À la lumière de ces résultats, de futures études clarifiant la
contribution de la reconnaissance des expressions faciales au SIP sont
recommandées.
CHAPTER I

Introduction

Statement of the Problem

Children who demonstrate behaviour problems in elementary school are at risk for a variety of maladaptive outcomes throughout their developmental course (e.g., Dodge et al., 2003; Miller-Johnson et al., 2002; Nelson & Dishion, 2004). Childhood aggression, for example, has been shown to predict future problems such as antisocial behaviour (Hinshaw, Lahey, & Hart, 1993), conduct disorder (Miller-Johnson et al., 2002), substance abuse (Reinherz, Giaconia, Hauf, Wasserman, & Paradis, 2000), and poor academic standing (Flanagan, Bierman, & Kan, 2003). Early social problems are also predictive of later difficulties including aggression (Fraser, Day, Galinsky, Hodges, & Smokowski, 2004), antisocial behaviour (Laird, Jordan, Dodge, Pettit, & Bates, 2001), and externalizing problems (Laird et al., 2001). Furthermore, in a 14-year study of Dutch children, parent perceptions of behavioural and emotional problems in their children, between 4 and 16 years of age, predicted the likelihood of a DSM-IV diagnosis later in life (Hofstra, Van Der Ende, & Vurhulst, 2002). These indications that early adjustment problems may persist into later stages of development underscore the need for a better understanding of the factors contributing to social maladjustment in children.

Social adjustment is a term that is frequently used to describe adaptive social skills and behaviour in children, although specific definitions of the term vary slightly (e.g., Chen, Chang, He, & Liu, 2005; Lemerise, Gregory, &
Fredstrom, 2005; Tur-Kaspa, 2004). One definition, proposed by Crick and Dodge (1994), describes social adjustment as comprising the ability of children to show adaptive social behaviour and inhibit aggression or other antisocial behaviour. The term social adjustment does not limit research to one behaviour, such as physical aggression, and it is clinically relevant in that the behaviours associated with poor social adjustment are predictive of emotional and behavioural problems in later childhood and into adulthood (e.g., Dodge et al., 2003; Miller-Johnson, Coie, Maumary-Gremaud, & Bierman, 2002; Rubin, Hymel, & Mills, 1989). Furthermore, researchers have often studied social information processing in terms of its relevance to, and prediction of, poor social adjustment (e.g., Crick & Dodge, 1994; Dodge et al., 2003; Lemerise et al., 2005).

Given this breadth, clinical utility, and common use in the relevant literature, the research reviewed in the following sections will be discussed in terms of relevance to social adjustment, which includes acceptance by peers, inhibition of aggression, and the absence of social withdrawal.

One theory that has been proposed to explain individual variations in social adjustment is social information processing (SIP) theory. SIP is described as a process through which individuals interpret and use incoming information related to social interactions. Researchers investigating social information processing theory suggest that individual differences in the processing of social information are related to patterns of social interactions and behaviour (Crick & Dodge, 1994; Dodge, 1986; Dodge et al., 2003). Some individuals may be more accurate or efficient than others at processing social information, as is the case
with other cognitive processes. Six steps have been described by Crick and Dodge in the SIP process, and although described as distinct steps, they are hypothesized to operate in parallel rather than in sequential order. Thus, more than one step in the process may occur at the same time, and information processed at each step simultaneously affects processing at other steps. Throughout SIP, the child’s processing is influenced by information in memory, including schemas or learned social rules, which are the individual’s latent knowledge structures of social information. The first step, encoding of cues, involves attending to and creating an internal representation of social information about others and the environment. In the second step, interpretation of cues, the individual must infer the meaning of the encoded information and make attributions about its meaning. At the third step, goal clarification, situational goals are generated and refined, which may influence the level of arousal depending on the salience or requirements of the chosen goal. During the fourth step, response access, the child will generate possible responses to a situation; and in the fifth step, response decision, the child will appraise these possible responses and select an option. In the last step of processing, behavioural enactment, the child will perform the chosen response; this may generate a new set of social cues from those in the situation for the child to encode (see Figure 1; for a review see Crick & Dodge, 1994).
In several studies, researchers have demonstrated that SIP is related to socially maladjusted behaviour, although the results have not been consistent for all aspects of processing. For example, children with aggressive behaviour are less accurate in aspects of SIP such as response evaluation, goal clarification, and response enactment (e.g., Crick & Dodge, 1996; Schultz & Shaw, 2003; Quiggle, Garber, Panak, & Dodge, 1992). Furthermore, Dodge et al. (2003) concluded that children who were rejected by peers or aggression were more likely to have deficits in one or more areas of social information processing ability.

Encoding of cues, the first step in SIP, has not been studied as extensively as other steps, such as interpretation of cues or response generation. Despite
promising findings linking encoding to aggression (Coy et al., 2001), and some indication that poor encoding ability is linked higher rates of peer rejection (Criss, Pettit, Bates, Dodge, & Lapp, 2002) and withdrawal (Harrist, Zaia, Bates, Dodge, & Pettit, 1997), the measurements used to understand encoding processes have several limitations. Researchers have asked children to recall what was presented in a vignette and rated the relevance of the child’s answers, without consideration for either the quality (i.e., what aspects of the situation the child attends to) or number of details that were recalled (e.g., Coy et al., 2001; Criss et al., 2002). Furthermore, current measures of encoding rely heavily on the verbal ability of the participants. However, the relationships found between social maladjustment and encoding, despite the imperfections of encoding measures, suggest that encoding of cues may be an important part of SIP and warrants more detailed exploration with improved methodology. Furthermore, Crick and Dodge (1994) concluded that there is a need for further research into children’s abilities to attend to and encode social cues, in part because these early steps of processing are likely to influence subsequent steps of processing.

Attribution bias may occur during the second step of SIP, known as interpretation of cues (Crick & Dodge, 1994). Hostile attribution biases occur when an individual frequently attributes negative intentions or emotions to others when the social cues are neutral or ambiguous. Hostile attribution bias has frequently been associated with peer rejection (e.g., Waas, 1998) and aggression (e.g., Schultz, Izard, & Ackerman, 2000). Thus, interpretation of cues by children and adolescents has been shown to relate to problem behaviours that have
implications for long-term maladaptive outcomes such as conduct disorder (Miller-Johnson et al., 2002) or poor academic performance (Flanagan et al., 2003). The most widely studied aspect of the interpretation step, attribution bias, has been shown repeatedly to relate to peer rejection and aggression, but not all researchers have been able to demonstrate that attribution bias is related to higher rates of peer rejection or aggression (e.g., Dodge et al., 2003).

Maladaptive social information processing, including encoding and interpretation of cues, is related to behaviour problems in childhood. However, to be able to apply the current understanding of social information processing to prevention or intervention efforts, an understanding of how maladaptive social processing patterns develop is critical. For example, if SIP patterns are formed by experience, then they may be more amenable to intervention than if they are predetermined by genetics. Several researchers have investigated the relationship between family or social factors and SIP to further the understanding of how maladaptive patterns of SIP develop.

One way to investigate the development of SIP is to look at the relationship of early parenting and individual differences in processing. Demonstrations of relationships between parenting behaviour and child processing variables support the idea that social processing patterns are learned through early experiences, although common biological predispositions of parents and children cannot be ruled out. Weiss, Dodge, Bates, and Pettit (1992), found that harsh discipline in early childhood predicted maladaptive SIP in children, even after factors such as temperament and SES had been controlled for. Teisl and
Chicchetti (2008) found that children who had been maltreated and had a history of physical abuse were more likely to make errors in cue interpretation and other areas of SIP. Some researchers have tested more complex models, to test the hypothesis that SIP moderates the relationship between experience and behaviour. For example, Gomez, Gomez, DeMello, and Tallent (2001) demonstrated that high levels of maternal control and low levels of maternal support for children’s emotional needs were associated with maladaptive patterns of SIP, which were, in turn, associated with hostile social behaviour including aggression.

Researchers have also investigated the relationship between parental depression and children’s SIP. Schultz, Izard, and Ackerman (2000) found that caregiver depression and family instability predicted attribution bias in children, which, in boys, predicted aggression. However, Schultz and Shaw (2003) found that maternal depression and low SES predicted some aspects of SIP, but not specifically attribution bias. Although studies of parenting and SIP do not show that early parenting experiences account for all variations in social processing, they indicate that various aspects of early experiences do influence the social processing of children, and may influence children’s behaviour problems through maladaptive processing. These findings are consistent with the prediction of theorists (e.g., Dodge & Pettit, 2003) who assert that social processing is influenced by multiple factors, including family, biological, cultural, and social experiences.

Sex differences and cognitive ability have both been demonstrated to be significant predictors of social maladjustment (e.g., MacBrayer, Milich, &
Hundley, 2003; Coy et al., 2001); however, gender and cognitive ability have rarely been included in studies of SIP. The exclusion of gender and cognitive ability when studying social processing may mean overlooking important and relevant variables. Given that both gender and cognitive ability have been shown to predict social maladjustment, researchers may be attributing effects to SIP variables when the variance in social maladjustment could also be explained by gender or cognitive ability. In addition to relating to SIP, both gender and cognitive ability have been shown to be important in research on facial expression recognition (e.g., Blair & Coles, 2000).

Like SIP, expression recognition (ER) ability has also been linked to social maladjustment; however, only one published study has addressed the link between expression recognition and SIP (i.e., Lemerise, 2005). On a daily basis, individuals use the facial expressions of others to make inferences about their motives or intentions. Walker-Andrews and Dickson (1997) note that a facial expression can change or contradict the meaning of a verbal message or action, and therefore the understanding of facial expressions is essential to effective and productive communication. Within the first year of life, infants learn to use facial expressions and other forms of non-verbal communication to understand those around them, and researchers have suggested that the understanding of facial affect displays is critical to the formation of attachments, successful social interactions (Walker-Andrews & Dickson, 1997), and understanding the perspectives of others (Hala & Carpendale, 1997).
Despite the assertion of several researchers that expression recognition plays an important role in socialization (e.g., Ekman, Friesen, & Elsworth, 1972; Herba & Phillips, 2004), a relatively small number of researchers have investigated the relationship between recognition of emotional expressions and social adjustment. In terms of peer acceptance, the findings of researchers generally suggest that there is a relationship between expression recognition skills and peer acceptance (Arsenio, Cooperman, & Lover, 2000; Izard et al., 2001; Mostow et al., 2002, Walden & Field, 1990). Furthermore, the majority of researchers have concluded that expression recognition is also related to aggressive behaviour (Blair & Coles, 2000; Izard et al., 2001; McCown, Johnson, & Austin, 1986; Stevens, Charman, & Blair, 2001), that is, individuals who are more accurate at recognition of facial expressions are less likely to be aggressive.

In the only published study to examine the link between SIP and ER, Lemerise et al. (2005) found that emotional displays in videotaped vignettes influenced performance on SIP tasks; however, they did not find significant relationships between the accurate recognition of these emotional displays and social adjustment. Although Lemerise et al. did not document attempts to carefully control the emotional presentations by actors in the video vignettes and only examined a limited number of emotions, the results of this study clearly indicate that children use the emotional displays of their peers when processing social information, and the authors indicate that further research is needed to clarify the role of affective displays in SIP.
To summarize, there is considerable evidence to children who are accurate at encoding social information, interpreting social cues, and recognizing facial expressions of emotion are less likely to be aggressive or rejected by their peers. The first two steps of SIP theory, encoding and interpretation of cues, involve responding to visual stimuli in social situations, which are likely to include facial expressions of emotion. However, to date, researchers studying SIP have not directly examined the role of facial expression recognition in social processing. Although researchers have studied how much information children encode in social situations, they have not considered how facial expressions are encoded. And when studying how children interpret social cues, researchers have not investigated the ways that children might interpret, or misinterpret facial expressions.

Based on the current understanding of the processes of expression recognition and social information processing, together with the literature indicating that both expression recognition and SIP are predictive of similar behavioural patterns such as higher levels of aggression and peer rejection, it is suggested here that the recognition and understanding of facial displays of affect in others is an important, and overlooked, part of social information processing. Specifically, the ability to correctly understand facial expressions may affect behavioural outcomes via the encoding and interpretation of incoming social information. Therefore, based on SIP theory (Crick & Dodge, 1994), it is suggested that children who do not encode, or attend to, facial expressions may be impaired because they are missing critical social information; furthermore, if the
facial configuration is identified, but labelled incorrectly in the interpretation step, children may misunderstand the intentions of others in social situations.

**Purposes and Original Contributions**

Although there is substantial evidence to suggest that both social information processing and expression recognition are both related to social maladjustment in children; to date only one study of SIP has included facial expression recognition, and the link between expression recognition and SIP has not been directly investigated. The original contribution and primary purpose of the present study is to examine the possibility that expression recognition is an integral, yet overlooked, aspect of social information processing. A second original contribution of this study is improvement upon the current methods for studying encoding of cues, given that the methods used in the past allow for little specificity and ignore critical aspects of encoding. Additional benefits of this study are that it will provide further clarification of the role of SIP and expression recognition in predicting social maladjustment in children.
CHAPTER II

Literature Review

This chapter is comprised of four sections. First, social adjustment will be defined, and the relevance of social adjustment to child development and social cognition will be discussed. Secondly, social information processing theory will be delineated and discussed in terms of its predictive value regarding social adjustment. In the third section, expression recognition will be defined, its relationship to social adjustment will be explained, and the role of expression recognition in social processing will be explored. In the last section, the research questions to be addressed in the current study will be outlined.

Social Adjustment

Crick and Dodge (1994) define social adjustment as “the degree to which children get along with their peers; the degree to which they engage in adaptive, competent social behaviour, and the extent to which they inhibit aversive, incompetent behaviour” (p.82) and argue that social maladjustment warrants the attention of researchers due to its prediction of future and concurrent adjustment difficulties. Given this definition of social adjustment, three commonly studied areas were identified that provide measures of social adjustment: acceptance by peers, aggression toward peers, and withdrawal from peers (Crick & Dodge, 1994), and the term social adjustment is frequently used in the current research literature to refer to one or more of these areas (e.g., Chen et al., 2005; Lemerise et al., 2005; Tur-Kaspa, 2004).
Researchers studying peer acceptance have found robust relationships between both concurrent (e.g., Vargo, 1995) and future (e.g., Parker & Asher, 1987) adjustment difficulties. In a review of the literature, Parker and Asher (1987) concluded that low levels of peer acceptance, as determined by sociometric ratings, predicted increased rates of school dropout, delinquency, and adult psychopathology. In more recent examples, rejection by peers has been shown to predict future problems such as conduct problems in boys (Miller-Johnson, Coie, Maumary-Gremaud, & Beirman, 2002; Snyder, Prichard, Schrepferman, Patrick, & Stoolmiller, 2004), substance abuse and sexual risk-taking behaviour in girls (Prinstein & La Greca, 2004), aggression (Dodge et al., 2003), and adolescent externalizing behaviour (Laird, Jordan, Dodge, Pettit, & Bates, 2001). Furthermore, children who were rejected or isolated by their peers are more likely to have higher antisocial behaviour, poorer academic outcomes, and a higher number of arrests (Nelson & Dishion, 2004). Thus, extant literature indicates that acceptance by peers in childhood has important implications for future adjustment.

Aggression is another widely studied behaviour that has a well-established relationship with maladaptive outcomes. In addition to the disruption that externalizing behaviour problems may cause in the classroom or at home, children demonstrating behaviour problems in elementary school are at risk for a variety of negative outcomes throughout their developmental course, such as victimization by peers (Schwartz et al., 1999), conduct disorder (Miller-Johnson et al., 2002),
antisocial behaviour (Hinshaw et al., 1993), and poor academic standing (Flanagan et al., 2003).

The third aspect of social adjustment, social withdrawal, also has implications for later adaptation. Early social withdrawal has been shown to predict future difficulties such as internalizing problems in later childhood (Rubin, Hymel, & Mills, 1989; Vargo, 1995). However, not all researchers have concluded that withdrawal is related to maladaptive outcomes (e.g., Risi, Gerhardstein, & Kistner, 2003). In a review of the literature on social withdrawal, Rubin and Coplan (2004) concluded that, despite some conflicting findings, children who are withdrawn in early childhood are at an increased risk for a variety of negative outcomes, including peer rejection, loneliness, and depression in later childhood and adolescence. Therefore, we see that children who are rejected by peers, aggressive, or withdrawn are at risk for concurrent and future adjustment problems.

Together, these three components of social adjustment have significant value, in that higher levels of peer rejection, aggression, and withdrawal are associated with negative outcomes throughout development and into adulthood. Thus, we can expect that children with early adjustment problems are at higher risk for problems in later stages of development. This underscores the need for improved understanding of early maladjustment. Understanding the factors that lead to poor social adjustment is critical to the improvement of existing prevention and intervention programs, or potential development of newer and more effective programs.
The term social adjustment will be used for the purposes of this review and study due to its comprehensive scope. Social adjustment does not limit research to one behaviour, such as physical aggression, and it is clinically relevant in that the behaviours associated with poor social adjustment are predictive of difficulties in later childhood and into adulthood. Furthermore, social information processing has frequently been studied in terms of its relevance to, and prediction of, poor social adjustment, therefore using this construct will facilitate comparisons between current and past research in the field. In later sections, this comparison will involve another skill studied in relation to the behaviours that comprise social adjustment; that is, the ability to understand facial expressions of emotion.

*Social Cognition*

Several researchers have attempted to explain how children develop the ability to process social information, and how these skills affect behaviour. Among the earliest and most influential were Piaget and Vygotsky. Piaget saw children as active participants in constructing knowledge based on the environment around them, and although he did not directly address the processes involved in social understanding, his work continues to influence our understanding of social cognition (Carpendale, 1997). Another early influence, Vygotsky, stressed the importance of interpersonal activity in the development of higher mental functions (Fernyhough, 1997). Many decades later, theorists have built upon the work of Piaget and Vygotsky in attempting to explain how the individual and the social context interact and influence one another. Some
theorists use perspective taking (the ability to understand the internal state of another) and empathy to explain the development of prosocial behaviour, or lack thereof (Eisenberg et al., 1991; Warden & MacKinnon, 2003). While perspective taking has been shown to predict prosocial behaviour in some studies, results have been mixed. Theories of perspective taking also have limited use, as there are many factors which appear to moderate the relationship between perspective taking and behaviour, such as motivation or competence (Eisenberg, Losoya, & Guthre, 1997; Eisenberg, Zhou, & Koller, 2003). The contextual social-cognitive model, as described by Lochman and Wells (2002) suggests that there are two general steps of processing: appraisal and problem solution. These two steps are believed to affect children’s reactions to social situations, along with schemas and contextual variables that may affect processing of social information. The social information-processing model (SIP; Dodge, 1986, Crick & Dodge, 1994) has received much attention by researchers, because it provides much greater specificity than other social cognitive theories and addresses a number of factors that may influence individual behaviour, including motivation, child competence, and past experiences. Described in the next section, the SIP model has been selected for further study because of its detailed and comprehensive description of social processing, and because of the impressive number of studies conducted using this model.

_Social information processing._ A model of social information processing (SIP) in children was initially described by Dodge (1986) as a means of consolidating the growing literature on social cognition, and attempting to explain
the relationship between cognitive processing of social information and individual differences in social adjustment and behaviour. The original linear model was comprised of five steps: encoding, representation, response search, response decision, and enactment process. Factors hypothesized to influence processing were the child’s biological capabilities, existing knowledge structures, and social cues. In 1994, Crick and Dodge reviewed and reformulated the SIP model based on recent research, and summarized the findings up to that date on the relationship between each step of processing and social and behavioural difficulties. The reformulated model reflects the understanding of cognitive processing as many components that operate in a parallel, as opposed to linear, fashion (see Figure 1). According to Dodge and Pettit (2003), an important guiding influence on all steps of SIP is the individual’s database, or knowledge structure, of stored social information. This database is the critical link between pre-existing factors, such as SES or early life experiences, and behavioural outcomes, such as aggression. SIP theory indicates that social and cultural factors, biological predisposition, and life experiences all have an influence on the formation of knowledge structures that guide an individual’s behaviour.

The SIP current model consists of six distinct but interrelated steps. Although considered distinct steps, they are hypothesized to operate in a parallel process with ongoing feedback from the database of latent knowledge. The social processing that takes place is hypothesized to occur through both automatic and controlled processes, meaning that the individual may or may not be aware of these cognitive processes (Dodge, 2008). Researchers have shown that each step
in processing is related to social adjustment and behaviour problems such as aggression (Crick & Dodge, 1994; Lansford et al., 2006). The model predicts that, because these are independent but related steps, individual performance on each step will have a moderate relationship with performance on other steps, and make an independent contribution to the overall predictive value of the model.

The first step, encoding, involves encoding of social cues, wherein information about others and cues from the environment are attended to by the individual and internal representations are formed. In the second step, interpretation, the individual must infer the meaning of information and make attributions about what has been encoded. At the third step, goal clarification, situational goals are set and refined. During the fourth step, response access, the child will generate possible responses to a situation; and in the fifth step, response decision, the child will appraise possible responses and select an option. In the last step of processing, behavioural enactment, the child will perform the chosen response; this may generate a new set of social cues from those in the situation for the child to encode (for a detailed review see Crick & Dodge, 1994).

Crick and Dodge’s (1994) model of social processing has been widely shown to relate to social adjustment in children. Two aspects of SIP, encoding of cues and interpretation of cues, have particular relevance to the purpose of this study, because these are the steps in which facial expressions are processed. During these first two steps, facial expressions are attended to and labelled by the individual; therefore I review and examine the relevant literature regarding the encoding and interpretation of cues in children here. I review studies that include
one or both of the relevant steps in social processing and investigate the relationship between SIP and social adjustment. To better understand the complex ways in which SIP may relate to child behaviour, I also review research that relates either of the first two steps of SIP (i.e., encoding, and interpretation of cues) to social adjustment (i.e., peer acceptance, aggression, and withdrawal). I then analyze the selected research with regard to the methods used to measure SIP variables, the results obtained by researchers, and other variables that may be involved such as age, gender, and cognitive ability.

**Encoding of cues.** The first step in processing, known as encoding, involves attending to social information and cues. At this stage, children direct their focus to specific aspects of a given situation, and encode this information into memory. This is not a purely objective absorption of information; Crick and Dodge (1994) suggest that encoding is guided by the child’s existing schemata, and individuals make inferences during encoding that influence how information is understood and remembered.

Encoding has received considerably less research attention than other steps in SIP such as interpretation of cues or response generation. As yet, researchers have not reached consensus on how to operationalize encoding, or how it should be measured. Often, encoding is studied by asking children what they recall from a story or video, and the responses are scored as relevant, partly relevant, or not relevant. While this does provide an estimate of the attention a child paid to the situation and his ability to verbalize what he saw, this method does not measure selective attention or biases that may be affecting processing,
and therefore is inconsistent with the more qualitative perspective used in the study of other steps of SIP.

In an early study of encoding, Dodge and Tomlin (1987) gave children hypothetical situations and asked them about the intent of the characters involved, then asked them to relate the reasons for their beliefs. The authors found that children who were aggressive were more likely to give irrelevant reasons for their conclusions that were not based on the information presented in the story. Findings of other researchers suggest that aggressive children make less use of cues when in social situations (Dodge & Newman, 1981), and selectively attend to aggressive information in social situations (Gouze, 1987). Some researchers (Criss et al., 2002; Coy et al., 2001; Harrist et al., 1997; Weiss et al., 1992) have studied encoding by asking children to describe what happened in a videotaped vignette after viewing. The examiner rated each child’s response based on the relevance of the child’s response to the actual story. Criss et al. found that encoding skill was related to peer acceptance, while Coy et al. found that children who had been referred to a clinic for disruptive, aggressive, or defiant behaviour encoded more irrelevant information than those in a community comparison sample. Similarly, Weiss et al. concluded that measures of child aggression were significantly related to the child’s attention to relevant cues. Harrist et al. (1997) found that withdrawn children were more likely to encode irrelevant information when asked to recall videotaped scenarios. Thus, researchers have shown that encoding of social situations is related to all three aspects of social maladjustment.
Despite promising findings linking encoding to aggression, and some indication that encoding relates to peer rejection and withdrawal, the measurements used to understand encoding processes have several limitations. First, asking a child about a video after viewing provides only a rough estimate of what the child attended to in the video, as the quality of the child’s report relies on his expressive verbal ability in addition to his actual perceptions. Furthermore, the scoring systems used are vague and do not take into account either the quantity (i.e., how much information is encoded) or quality (i.e., what features of the situation the child selectively attends to) of the response provided by the child. None of the measures used provide any indication of what the child attended to specifically, therefore no information is gathered about which cues the child was attending to. For example, no researchers have looked at the nonverbal communication shown in the videotapes, or how children may have encoded it. However, the relationships found between social maladjustment and encoding, despite the imperfections of these measures, suggest that encoding of cues may be an important part of SIP and warrants more detailed exploration. Development of more precise measures to study encoding may reveal that this step is a more important predictor of social adjustment than previously thought, or they may reveal that past findings were a function of inadequate measures or a lack of attention to other sources of variance such as cognitive ability. Overall, more detailed and precise study of encoding is needed.

Crick and Dodge (1994) also concluded that there is a need for further research into children’s abilities to attend to, use, and remember social cues, in
part because the early steps of processing, such as encoding, are likely to influence subsequent steps of processing. Children who do not properly encode social cues are then less able to interpret these cues, and are basing other steps of processing, such as response generation, on incomplete information.

*Interpretation of cues.* Once cues have been attended to and encoded, the individual makes interpretations about the meaning of this information. Attributions are made about the causes of events and intents of others involved in the situation. This second step of processing, interpretation of cues, involves both causal and intent attributions, as well as other interpretations of the situation (Crick & Dodge, 1994). When interpreting cues, the individual uses information obtained during the encoding phase, as well as information and schemata stored in the database, to make judgements about why certain events have taken place.

Interpretation is generally measured by presenting an individual with an ambiguous or provocative hypothetical situation, then asking questions about the intentions of characters, or causes of events, in the situation. By coding the responses, researchers can determine the accuracy of attributions and look for patterns where individuals may show bias towards a particular response. Of particular interest to researchers is hostile attribution bias, wherein individuals may show tendencies to mistakenly attribute hostile intent to others, especially when the outcome of the situation is negative. Those individuals who are more likely to attribute hostile intent to others are referred to as having a hostile attribution bias (Crick & Dodge, 1994). A large body of literature supports the association between interpretation of cues, specifically attribution of intent, and
behaviour (e.g., Weiss et al., 1992), and Crick and Dodge (1994) concluded after a review of the literature that there is a robust relationship between hostile biases and social maladjustment, yet the conclusions of researchers have not been entirely consistent.

Experimental measurement of attribution biases usually involves presentation of a hypothetical situation to a child, for example, “You are getting ready for your turn on the monkey bars. You see two boys playing baseball nearby. Just as you start across the bars, you get hit hard in the back with the baseball.” (Hughes, Meehan, & Cavell, 2004). The presentation of the situation may be a verbal story alone (e.g., Schultz, Izard, & Bear, 2004) or accompanied by a picture or drawing (e.g., Coy et al., 2001; Hughes et al., 2004; Price & Landsverk, 1998; Schultz & Shaw, 2003); an audio taped story (e.g., Orobio de Castro et al., 2003); a live experimental set-up with acting confederates (e.g., Steinberg & Dodge, 1983), or the portrayal of a story by actors in a videotaped vignette (e.g., Dodge et al., 2003; Weiss et al., 1992). Although researchers often use actors or drawings of characters to illustrate the scenario for children, there has been no mention of effort to control for, or measure the effects of the facial expressions or nonverbal communication of the characters in these illustrations. Although researchers often pilot tested video vignettes or illustrations (e.g., Dodge et al., 2003), no specific methodology has been described to ensure that the facial expressions of characters were neutral or appropriate to the story. Given the importance that SIP theory places on the use of social cues, it is noteworthy that facial expressions have not been carefully controlled in these measures as a
pivotal social cue. The importance of facial expressions will be further discussed in the next section.

Following presentation of the story, participants may be asked to explain what happened in the story and questioned informally until the experimenter understands their interpretations of the intents of story characters (e.g., Waas, 1988). Alternatively, experimenters may ask a series of specific questions (e.g., Gomez et al., 2001), forced choice questions (e.g., Aydin & Markova, 1979; Crick & Dodge, 1996; Crick, Grotpeter, & Bigbee, 2002; Shultz, Izard, & Ackerman, 2000) or have the children rate different interpretations of the intents of characters (e.g., Camodeca et al, 2003; VanOostrum & Horvath, 1997).

Researchers have used these methods to investigate the relationship between attribution bias and peer acceptance or social skills. Aydin and Markova (1979) found that popular elementary students attributed more positive intentions than their unpopular peers, and Waas (1988) found that peer rejection was related to hostile attributions. Children who were well accepted by their peers were more likely to interpret ambiguous social cues as positive or neutral than neglected and rejected children (Dodge, Murphy, & Bushsbaum, 1984; Feldman & Dodge, 1987). Cirino and Beck (1991) found that elementary school aged girls who had higher levels of attribution bias were more likely to have lower social status among their peers, but they did not find a similar pattern among boys. However, more recent research efforts have failed to find a relationship between attribution biases and social status (Dodge et al., 2003; Dorch & Keane, 1994; Orobio de Castro et al., 2003; Shultz, Izard, & Bear, 2004). Thus, the relationship between
attribution bias and peer rejection has found mixed support in the research literature, and may be less reliable than the relationship with aggressive behaviour, to be discussed next. The more recent failures to document this relationship may be due to changing methodologies in the study of SIP. Standardized presentations of scenarios are now frequently used, such as audio (Orobio de Castro et al., 2003) or video (Dodge et al., 2003) taped scenarios, which may eliminate extraneous factors that could have led to higher rates of attribution bias.

Many researchers have investigated the relationship between aggressive behaviour and a tendency to frequently attribute hostile intent to others in social situations. Researchers have shown that negative attribution biases are related to increased aggressive behaviour in both children (Crick & Dodge, 1996; Crick, Grotpeter, & Bigbee, 2002; Dodge, 1980; Gomez et al., 2001; MacBrayer, Milich, & Hundley, 2003; Schultz, Izard, & Ackerman, 2000; Schultz, Izard, & Bear, 2004; Quiggle et al., 1992; Weiss et al., 1992) and adolescents (Burks et al., 1999; Nasby, Hayden, & DePaulo, 1979; Schippel et al., 2003; Steinberg & Dodge, 1983; VanOostrum & Horvath, 1997). Using variations on common methodologies, researchers have also found more complex relationships between attribution bias and aggression. For example, Dodge and Frame (1982) found that when aggressive boys were presented with a story about something bad happening to a peer, their responses did not differ from their nonaggressive peers. However, when the aggressive children were asked to think about a situation with a negative outcome for themselves they did show hostile attribution biases.
Additionally, Orobio de Castro et al. (2003) found that aggressive children made more hostile attributions when negative affect was induced by the experimental situation, but not when the experimental situation was neutral.

Barth and Bastiani (1997) investigated attribution bias in a preschool sample using photographs of facial expressions, rather than social scenarios, to elicit attributions of emotion from 4-year-old children. Their findings indicate that angry recognition biases (i.e., a tendency to mistakenly label facial expressions as angry) were related to social and behavioural difficulties. This study is an exception, in that it did not use scenarios to elicit attribution bias, but facial expressions, and showed that the expression recognition of young children can also be affected by bias.

However, not all researchers have found significant relationships between aggression and attribution bias. Dodge et al. (2003) found no relationship between attributions and aggression in Grade 2 students, Waas (1988) also found aggression was unrelated to attribution bias in 3rd and 5th grade boys, and Dodge and Tomlin (1987) did not find a significant relationship in a study of early adolescent boys. Dodge et al. (2003) found that attribution bias in elementary school children was predicted by aggression three years earlier, but was not related to current aggression. Other researchers (Dodge et al., 2002; Camodeca et al., 2003) have failed to document a clear relationship between aggression and attribution bias. Furthermore, although attribution bias has often been found in aggressive children, researchers studying children with specific externalizing behaviour disorders such as oppositional defiant disorder (Coy et al., 2001) and
conduct disorder (Schultz and Shaw, 2003) have failed to find attribution bias, suggesting that these biases may have a specific relationship to aggressive behaviour, but not to conduct problems or more general antisocial behaviour that may or may not include physical aggression.

No published studies have reported a significant relationship between attribution bias and withdrawn behaviour. One study (Waldman, 1988) did investigate this relationship but did not find significant results. Despite a call by Crick and Dodge (1994) for further investigation of attribution bias in children with nonaggressive behaviour problems, no research supports a relationship with social withdrawal.

When comparing children at different developmental stages, many researchers have found that performance on SIP tasks, specifically attribution bias tasks, varied according to the age of the child (e.g., Cirino & Beck, 1991; Schultz, Izard, & Ackerman, 2000). Despite the ongoing development of SIP during childhood and adolescence, attribution bias has been shown to predict social maladjustment, especially aggression, at different developmental stages, including early elementary school (e.g., Schultz, Izard, & Bear, 2004), late elementary school (e.g., Gomez et al., 2001), and adolescence (e.g., Schippel et al., 2003). However, few studies to date have investigated SIP in preschoolers and younger children, possibly due to the inherent difficulties when measuring SIP in children who are still developing both social processing and verbal expression skills. Current measures of attribution bias rely heavily on the ability of the individual to accurately express their thoughts verbally (e.g., Weiss et al., 1992; Dodge et al.,...
2002). Weiss et al. (1992) found that aggression in kindergarten students was related to hostile attribution bias, and Schultz, Izard, and Ackerman (2000) found a similar relationship in 5-year-old boys. The ongoing development of SIP during childhood, as well as verbal ability and other skills that may affect performance, indicates a need to control for potential age effects on performance. Although the findings of the researchers described in this section suggest that attribution biases are present and correlated with behaviour and social problems early in development, methodological difficulties in studying the cognitive processes of young children results in a better understanding of the relationship between attribution bias, and social maladjustment is better understood in older children and adolescents.

Gender differences in social functioning are a robust and widely accepted finding. In the study of attribution bias, many researchers have limited samples to male participants (Dodge, 1980; Dodge & Frame, 1982; Nasby, Hayden, & DePaulo, 1979; Orobio de Castro et al., 2003; vanOostrum & Horvath, 1997; Waas, 1988). When females were included in samples, some researchers have found that gender differences moderated the relationship between attribution bias and social adjustment (Cirino & Beck, 1991; Feldman & Dodge, 1987; MacBrayer, Milich, & Hundley, 2003; Price & Landsverk, 1998; Schippel et al., 2003; Schultz, Izard, & Ackerman, 2000; Steinberg & Dodge, 1983), while other found similar relationships across variables in both girls and boys (Camodeca et al., 2003; Crick & Dodge, 1996; Dodge & Tomlin, 1987; Gomez et al, 2001; Schultz, Izard, & Bear, 2004). Gender has been shown to significantly affect
results in a number of studies, and although not all researchers agree, the number of studies that have found significant gender differences indicates that the omission of gender in data analysis (in studies using both male and female participants), may lower the predictive value of the results obtained.

Although the methods used to measure attribution bias all depend on the cognitive ability of the child, as it is necessary for participants to understand situations and describe their thoughts verbally, few researchers have included cognitive functioning or intelligence in analyses. MacBrayer, Milich, and Hundley (2003) investigated a sample of clinic-referred and non-clinic referred patients, and found that there was a significant difference in cognitive functioning between the two groups, but chose not to include this as a covariate in their analysis. Other researchers (Nasby, Hayen, & DePaulo, 1979; VanOostrum & Horvath, 1997) have included measures of cognitive functioning as descriptive variables, but have not entered cognitive ability as variables in the analyses when testing the link between attributions and behaviour. In one of the earlier studies to use cognitive functioning variables as covariates in a study of attribution bias, Waas (1988) did not find that cognitive functioning had a significant effect on attribution bias in aggressive and rejected children. However, the estimate of cognitive functioning consisted of the vocabulary subtest of a standardized intelligence measure (WISC-R), which had limited reliability (Sattler, 2001) in predicting the overall cognitive ability of children. More recently, Coy et al. (2001) found that both verbal intelligence and vocabulary ability were significantly correlated with some measures of social information processing,
although this association was not found for attribution bias. Schultz, Izard, and Ackerman (2000) found that receptive vocabulary skills, which are a reliable predictor of general intelligence (Dunn & Dunn, 1997), were significantly related to attribution bias. Therefore, the effects of cognitive functioning on the attribution biases of children have not been widely studied, but the findings of some researchers suggest that cognitive functioning may have an effect on a child’s ability to make accurate attributions.

Thus, the interpretation of cues by children and adolescents has been shown to relate to problem behaviours that have implications for long-term maladaptive outcomes. The most widely studied aspect of the interpretation step, attribution bias, has been shown repeatedly to relate to peer rejection and aggression, although findings have not been entirely consistent. Two variables that may related to performance on SIP tasks and influence behaviour are gender and cognitive (or verbal) ability; however, these variables have rarely been included in studies of SIP and are suggested as a partial explanation for the inconsistent findings. The link between attribution bias and the third aspect of social maladjustment, withdrawal, has yet to be demonstrated, and since no data is available, it is impossible to say if attribution bias has any relationship to withdrawal.

The preceding discussion of SIP suggests that two steps of processing, known as encoding and interpretation of cues (or attributions), have strong relationships with social maladjustment in childhood and adolescence. I selected the first two steps for discussion because it is during encoding and interpretation
of cues that individuals attend to and label facial expressions of emotions, although researchers have largely ignored this important social cue. In the next section, I further discuss the process known as expression recognition and the relationship of expression recognition to social maladjustment. Furthermore, I explore the potential role of expression recognition in SIP.

Expression Recognition

Expression recognition (ER) is one term used to refer to the ability of an individual to evaluate a facial display, and accurately assess an associated emotional state (e.g., Barth & Bastiani, 1997; Camras et al., 1990; Stevens, Charman, & Blair, 2001). Despite the vast number of researchers who have studied abilities similar to expression recognition, little consensus exists regarding the precise term for this process. Facial affect recognition (Brosgole & Weisman, 1995), emotion recognition, (Simon et al., 1995), facial expression processing (McClure, 2000), facial expression decoding (Bouhuys, Geerts, & Gordijn, 1998; Lenti, Lenti-Boero, & Giacobbe, 1999), and facial affect processing (Oster, Daily, & Goldenthal, 1989) have all been used to describe a similar process, in which an individual uses the facial configuration of another to infer emotion. The term emotion understanding has been used to include recognition of facial expressions, contextual cues to emotion, and responses to hypothetical situations (e.g., Smith & Walden, 1998). Emotion labelling, the accurate identification of facial expressions shown in pictures, has been operationalized as a part of emotion knowledge (Fine et al., 2003), while Schultz et al. (2001) referred to performance on a highly similar task as emotion expression recognition. The term receptive
nonverbal accuracy has also been used (Hall et al. 1999; Lancelot & Nowicki, 1997) to refer to the ability to discriminate among facial expressions, postures, gestures, and voice tones. Some researchers have distinguished between emotion recognition, which occurs when an individual selects a facial expression to match the emotion word provided by the examiner; and emotion labelling, which occurs when an individual produces a name or label for the facial expression shown (e.g., Izard et al., 2001). Given the number of different terms to refer to a similar process, and the need for clarity to compile the findings of past research in this area, the present study will use the term most commonly used in the relevant research and the one that refers most specifically to the process being studied. Expression recognition will be used to refer to any process by which a facial expression is used to make inferences about the internal emotional state of another.

To measure facial expression recognition abilities of children, several variations on a basic method have been used. In most cases, photographs of individuals posing different emotional expressions are presented, and the child is asked to identify the emotion indicated. These may be photographs of adults (e.g., Blair & Coles, 2000; Fine et al., 2003; Shultz et al., 2001), children (e.g., Mostow et al., 2002; Lancelot & Nowicki, 1997), or actual peers of the child being assessed (e.g., Barth & Bastiani, 1997). In some instances, drawings (Walden & Field, 1990) or puppets (Arsenio, Cooperman, & Lover, 2000) have been used as models of emotional expressions for children. Once an emotion has been presented, the child is asked to select the name of the expression shown from a list
of choices (e.g., Barth & Bastiani, 1997). With young children, researchers have also used matching procedures, where a child is asked to select an example from an array that matches a word or example of an emotion (e.g., Walden & Field, 1990).

The importance of expression recognition. “An individual who is handicapped in decoding facial expressions is dually impaired. Like the rhesus monkeys raised by mothers without the ability for facial expression, these individuals would likely demonstrate a generalized socialization deficit.” (Ekman, Friesen, & Elsworth, 1972, p.174).

On a daily basis, individuals use the facial expressions of others to make inferences about their motives or intentions. A facial expression can change or contradict the meaning of a verbal message or action, and therefore the understanding of facial expressions is essential to effective and productive communication. Within the first year of life, infants learn to use facial expressions, and other forms of nonverbal communication, to understand those around them. Researchers on social referencing (e.g., Rosnay, Cooper, Tsigiras, & Murray, 2005; Walden & Baxter, 1989) have shown that infants use the facial expressions of their caregivers to determine the safety of a new situation or a stranger, and base their actions on the information provided by the affective display. Findings such as these have led researchers to assert that the understanding of facial affect displays is critical to the formation of attachments, successful social interactions (Braungart-Reiker, Garwood, Powers, & Wang, 2003; Walker-Andrews & Dickson, 1997), and understanding the perspectives of
others (Hala & Carpendale, 1997). As expression recognition ability develops in
children, they are “… well on the way to developing a more advanced and
multifaceted understanding of the self and others” (Walker-Andrews & Dickson,

Given the frequency with which expression recognition skills are used in
social situations, it may not be surprising that this skill has been studied in
relation to a number of mental disorders. Expression recognition deficits have
been found in populations with bipolar disorder (Guyer et al., 2007; McClure,
Pope, Hoberman, Pine, & Leibenluft, 2003), schizophrenia (Shaw et al., 1999;
Silver, Shlomo, Turner, & Gur, 2002) and autism (Rochat, 2001; Teunisse &
Gelder, 2001). Individuals who have been convicted of violent crimes show
deficits in facial expression recognition (Hastings, Tangney, & Stuewig, 2008;
Hoaken, Allaby, & Earle, 2007) Researchers have also found that children who
have been abused or neglected (Camras, Sachs-Alter, & Ribordy, 1996; Camras et
al., 1990), and children of mothers who suffer from depression or other mood
disorders (Cohn, Campbell, Matias, & Hopkins, 1990) have more difficulty than
their peers when asked to label emotional expressions. The reduced ability to
label emotions in children who come from deprived environments may suggest
that expression recognition abilities are learned to some extent; however, the
exact mechanisms through which expression recognition abilities develop are not
yet fully understood.

*Development of expression recognition.* The ability to recognize the facial
expressions of others develops throughout infancy, childhood, and adolescence.
However, this skill appears to develop unevenly, with recognition of certain expressions developing before others (DeSonneville et al., 2002; Vicari, Reilly, Pasqualetti, Vizzotto, & Caltagirone, 2000). Herba and Phillips (2004) suggest that, although expression recognition is an essential part of social interaction and functioning, little is known about the processes and developmental course involved in expression recognition. The ability to recognize and interpret the facial expressions of others develops from infancy, and researchers have demonstrated that infants as young as 5 months of age are able to differentiate among basic facial expressions (Bornstein & Arterberry, 2003). The abilities of infants and preschoolers to understand facial expressions have been more widely studied than those of school-age children and adolescents, despite indications that development of expression recognition skills continue during this period (Herba & Phillips, 2004; McClure, 2000).

In one of the few studies to investigate the development of expression recognition skills in childhood (Gosselin & Simard, 1999), improvements were found in recognition accuracy for fearful and surprised expressions during childhood. In this study, 5 and 6 year-olds were able to accurately discriminate between fearful and surprised expressions approximately 70% of the time, while 9 and 10 year-olds were able to make this distinction in 81% of trials.

A more comprehensive study was conducted by Lenti, Lenti-Boero, and Giacobbe (1999), and the authors found that recognition accuracy varies depending on both the age of the child and the type of expression presented. It appears that age related differences exist more notably when looking at
expressions such as fear, surprise, and sadness. According to Lenti et al., most children between the ages of 8 and 16 are able to recognize happiness and disgust more than 92% of the time, with little variation among the different age groups. The authors note that the higher recognition rates in young children may indicate that the recognition of happy and disgusted expressions is generally mastered before eight years of age. Furthermore, the findings by Lenti et al. suggest that fear, sadness, and surprise are the most difficult of the basic expressions to recognize, and the ability to accurately identify them develops well into adolescence. Each of these expressions exhibits a different learning curve. Researchers studying development of expression recognition in adolescents and adults have found that these skills continue to develop after childhood, with adolescents developing the ability to read emotions from certain cues such as the eyes (Tonks, Williams, Frampton, Yates, & Slater, 2007), and adults showing more sensitivity to subtle changes in expression (Thomas, De Bellis, Graham, & LaBar, 2007).

Thus, we can conclude that expression recognition is a skill that begins development in early infancy and does not develop uniformly, suggesting that multiple pathways or processes may be involved (Vicari et al., 2000). Of the basic expressions, research suggests that mastery of happy expressions appears first, while accuracy at identifying sad, surprised, or angry expressions improves later, and fearful expressions appear to be the most difficult to recognize, even for older children (Gosselin & Simard, 1999; Lenti et al, 1999; Blair & Coles, 2000).
It is often assumed that females will be more accurate in recognition of expressions than males (Herba & Phillips, 2004). Findings, however, do not consistently support this assumption. Several researchers have found that the participant’s gender did not affect his or her ability to accurately recognize expressions (Arsenio et al., 2000; Mostow et al., 2002; Schultz et al., 2001; Walden & Field, 1990). On the other hand, in preschool (Barth & Bastiani, 1997), as well as early adolescence (Blair & Coles, 2000), females were found to be more accurate than males at recognizing expressions overall. Although the findings are not unanimous, in a review of gender differences in emotion processing, McClure (2000) concluded that females do tend to perform slightly better on expression recognition tasks, from infancy to adolescence. McClure suggests that the inconsistencies in finding gender differences may be due to the small effect sizes found, and complex interactions of neurological maturation and socialization effects that fluctuate over the course of development. Thus, one may expect small, but significant, gender differences in performance on expression recognition tasks. It is important to evaluate the role of gender when studying expression recognition, because it has been shown to predict both expression recognition and social maladjustment, therefore when gender of the participants is not considered researchers may be attributing effects to expression recognition or other variables when the variance in social maladjustment could also be explained by gender.

*Expression recognition and social adjustment.* Despite the assertion of several researchers that expression recognition plays an important role in
socialization (e.g., Herba & Phillips, 2004; Ekman, Friesen, & Elsworth, 1972), a relatively small number of researchers have investigated the relationship between recognition of emotional expressions and social adjustment. However, this relationship has been investigated to some extent, through a variety of measures and procedures.

Some researchers study “emotion knowledge” based on a composite of expression recognition ability and other related skills. For example, Schultz et al. (2003) created an emotion knowledge score that was comprised of each child’s accuracy at recognizing facial expressions in pictures and the emotions of characters in stories. Although this composite skill was related to later social skills and behaviour problems, it is not known which aspect of emotion knowledge was useful in prediction. Thus, while emotion knowledge or emotion understanding composites may provide a measure of general emotional skills in children and thus generalize better, the general ability does not allow an understanding of the distinct contributions of each skill.

A link between expression recognition and peer acceptance in children has been investigated, although researchers have used varied definitions of acceptance by peers. The most common measure of peer acceptance or rejection is sociometric or peer nominations (Crick & Dodge, 1994); however, other researchers have shown relationships between expression recognition and teacher or parent perceptions of social skills, and these findings will be considered here as well, as they may add to our understanding of expression recognition in general.
In one of the first studies in this area, Walden and Field (1990) examined the ability of preschool children to discriminate among emotion expressions shown in schematic line drawings and photographs. The children in this study were shown several pictures and asked to choose the picture that showed happy, sad, or other expressions. The authors concluded that the ability of children to discriminate among emotion expressions predicted social preference by peers, while the ability of children to label affective displays from photographs was unrelated to social measures. Drawings limit the presence of emotion irrelevant stimuli, and may exaggerate relevant features, thus making it easier for children to identify expressions; however, a child’s ability to identify emotions in simple line drawings may not have had as much relevance for social situations as would photographs or videos (Herba & Phillips, 2004).

Furthermore, Arsenio, Cooperman, and Lover (2000) found that preschool children who had higher emotion knowledge, including expression recognition, were more accepted by peers, and had better social skills. This study is similar to the work by Walden and Field (1990) in that participants were asked to label emotions in animated, non-human characters, thus limiting the generalization to real social situations. Although the findings suggest a link between responses to animated characters and performance in real social situations, one could expect that responses to human stimuli would have greater predictive value, as they more closely approximate reality (Herba & Phillips, 2004).

In a longitudinal study, Izard et al. (2001) found that, after controlling for gender, verbal ability, and temperament, expression recognition in preschool
predicted third grade social skills and behaviour problems. Providing more
evidence for the directionality of this relationship, Mostow et al. (2002) found that
lower emotion knowledge in grade 1 and 2 students predicted social skills
difficulty later in the school year, but social skills early in the school year did not
predict emotion knowledge later that year. Miller et al. (2005) found that
kindergarten and first grade students who had stronger expression recognition
skills were more likely to be accepted by their peers and less likely to report
negative peer interactions.

Together, the findings of these researchers suggest that there is a
relationship between expression recognition skills and peer acceptance or social
skills. Despite varying definitions of social ability, a number of researchers have
consistently demonstrated that the ability to recognize facial expressions of
emotions is related to peer acceptance.

A relationship between expression recognition and aggressive behaviour
has also been demonstrated in children. Arsenio, Cooperman, and Lover (2000),
found that aggression in preschoolers was related to emotion labelling accuracy
when emotions were modeled by puppets. Izard et al. (2001) found that the
expression recognition ability of preschoolers predicted externalizing behaviour
problems in Grade 3. McCown et al. (1986) found that incarcerated adolescents
were less accurate at identifying facial expressions than were a non-incarcerated
comparison group. Blair and Coles (2000) found that adolescents who had
conduct problems were more likely to show deficits in expression recognition
ability. Specifically, in this study of 11 – 14 year-olds, it was found that
expression recognition was significantly poorer in those students with conduct problems, but deficits were most distinct when looking at faces showing fear and sadness. In another study, focused on 9-15 year-olds who demonstrated conduct problems, a comparable pattern of results was found (Stevens et al., 2001). Marsh and Ambady (2007) demonstrated that individuals who were shown fearful or sad expressions were more likely to express sympathy and a desire to help others, and individuals who were more accurate at identifying fearful facial expressions were likely to show stronger pro-social responses to these facial cues.

However, not all researchers have found a significant relationship between expression recognition and aggressive or externalizing behaviour. Barth and Bastiani (1997) asked preschoolers to model facial expressions and photographed them, then asked their classmates to label the emotion shown in the picture. They did not find a significant association between emotion labelling accuracy and behaviour problems in a preschool population. Although the use of pictures of familiar people may improve the validity and generalization of the data, the expressions modeled by preschoolers may not be accurate or may be inconsistent with widely accepted norms. Using standardized photographs allows researchers to ascertain that the critical universal elements of each emotion, as discussed in Ekman (1974), are present.

Lancelot and Nowicki (1997) found that emotion labelling ability was significantly associated with externalizing problems in girls, but this relationship was not significant for boys. However, this particular study was limited to a small sample. Furthermore, in Lancelot and Nowicki’s work, internalizing and
externalizing behaviour was estimated based on reviews of school records, a method that does not account for symptoms that may not be noticed by school staff, and could be vulnerable to recording biases of school staff. However, in a larger study of first grade students, Fine et al. (2003) also failed to find a relationship between emotion knowledge and externalizing problems.

Thus, although there has been limited study of the relationship between expression recognition and aggression, the majority of researchers have concluded that these variables are related. Certainly, there is a need for further research to clarify the pathways through which expression recognition is related to externalizing or aggressive behaviour, and the specific types of deficits or behaviours involved.

Only one study to date has directly investigated the link between expression recognition and withdrawal. Schultz et al. (2001) failed to find a significant relationship between expression recognition and social withdrawal in mainstream elementary school children.

As was the case with social information processing, a factor that may affect performance on expression recognition tasks is cognitive ability. Herba and Phillips (2004) suggest that intelligence may affect the child’s ability to attend to stimuli and to conceptualize emotions. Researchers who have included verbal ability, intelligence, or other estimates of cognitive ability in their studies have generally found that these factors are related to expression recognition accuracy (e.g., Blair & Coles, 2000; Izard et al., 2001; Mostow et al., 2002; Schultz et al., 2001; Walden & Field, 1990). However, in many cases researchers have included
measures of cognitive ability in their descriptions of participants (i.e., mean IQ of the sample) but have not analyzed the potential impact on results (e.g., Lancelot & Nowicki, 1997; McCown, et al., 1986) or have not measured the cognitive ability of participants at all (Arsenio et al. 2000; Barth & Bastiani, 1997). In light of the robust association found between cognitive abilities and expression recognition, failure to examine the effects of cognitive ability risks overlooking an important source of variance in expression recognition ability.

Together, studies of the expression recognition abilities of children with social adjustment problems suggest a robust relationship. Researchers have not found a relationship between expression recognition and withdrawal; however, the trend is clear: young children with social adjustment difficulties are more likely to have deficits in expression recognition. There are some limits to these findings. To date, studies of expression recognition abilities and poor social adjustment have focused on preschool and early-elementary students, and findings have not been extended to older children or adolescents. Furthermore, the majority of studies described here have been carried out by the same team of researchers (Fine et al., 2003; Izard et al., 2001; Mostow et al., 2002; Schultz et al., 2001), suggesting a need for external replication. Another limitation is that the participants in many studies (e.g., Izard et al., 2001) were recruited from Head Start programs; and although research from Head Start programs provides important information about the development of children from low-income families, these findings do not necessarily generalize to children from all backgrounds.
With regard to the concept of social adjustment, introduced earlier, researchers have demonstrated significant relationships between SIP and expression recognition, and two of the three aspects of social adjustment. However, the third aspect of social adjustment, withdrawal, has not been shown to have a relationship with expression recognition or attribution bias.

Only one published study to date has directly looked at children’s ability to recognize emotional expressions in relation to SIP. Lemerise et al. (2005) studied SIP in elementary school children by showing videotaped vignettes that included emotion displays by the provocateur. The provocateur in the vignette displayed either a happy, sad, or angry affect while being depicted doing something that had a negative outcome for another child, but the intent was ambiguous (e.g., knocking a cup of water on another child’s painting).

Lemerise et al. (2005) found that emotional displays did influence children’s SIP. For example, participants in this study made more hostile attributions of intent when the provocateur was depicted as angry. However, differences in accuracy at identifying the emotional displays were not related to peer rejection or aggression, and accuracy was not related to performance on other SIP tasks. The authors also found that children were more likely to use affective displays in SIP when asked about the provocateur’s emotion directly, and rarely mentioned emotion without prompts, indicating that asking about the emotion may encourage more reflective responding.

Several limitations of this study should be noted, however. The authors indicate that all children gave an unusually high number of hostile responses, and...
suggest that the negative outcomes in all vignettes used may have influenced children more than the emotional displays. Furthermore, the authors do not describe how they depicted the affective displays in the video vignettes, whether the emotions were expressed by facial expressions, voice tone, or gestures. Thus, it is difficult to know how accurately emotions were depicted or how easy they were to recognize. Lastly, only three basic expressions were used in the study, and some authors have suggested that specific emotions, such as fear, may be more predictive of aggression than others (e.g., Blair & Coles, 2000). Lemerise et al. (2005) call for further study into the effects of emotion processes on SIP, as the findings indicate that affective cues provide important information about the intentions of others, and influence SIP.

**Purposes of the Present Study**

In the preceding sections, the concept of social adjustment has been defined, and expression recognition and components of social information processing theory have been discussed in terms of their relevance to social adjustment in children. Expression recognition has been explained as the process by which individuals identify the facial expressions of others, and use these facial displays to interpret the internal emotional state of another. I propose that expression recognition is an important, and neglected, aspect of social information processing. Only one study to date has explicitly incorporated facial expressions into measures of SIP, despite the clear importance of facial expressions as a social cue to be encoded and interpreted.
As discussed, Crick and Dodge (1994) assert that we can expect SIP variables to have modest correlations with one another, and to each make individual contributions to the prediction of social adjustment in children. Therefore, the purpose of this study is to examine the relationship of expression recognition to more traditional measures of SIP, and thereby to investigate whether expression recognition should be explicitly included as part of social information processing research. I hypothesize that the addition of expression recognition to SIP will add to the prediction of social adjustment and enhance the utility of the SIP model for both clinical (improving the interventions based on SIP) and academic (improving the accuracy of the model) purposes.

In pursuit of the main goal of this study, we will also be able to expand current knowledge in related areas. I examine the ability of school-aged children to recognize different expressions of emotions and to encode and interpret other social information. The relationship of expression recognition and SIP to the two relevant aspects of social adjustment will be explored, with careful control of variables such as age, cognitive ability, and gender, which have been shown to relate to performance on expression recognition and SIP tasks. The roles of cognitive ability and gender as covariates in the prediction of social adjustment are of special interest, as these variables have been ignored in previous research despite indications that they may have a significant impact on the outcome variables.

Therefore, the predictions to be addressed in the present study are as follows:
Prediction 1

Children’s expression recognition accuracy will be related to accuracy at encoding and attributions. Social information processing theory suggests that performance on encoding and interpretation of cues tasks, as distinct steps in SIP, should show a moderate relationship.

Prediction 2

Expression recognition accuracy will explain a significant amount of the variance in teacher reports of social skills, over and above that explained by demographic variables, cognitive ability, and SIP patterns.

Prediction 3

Expression recognition accuracy will explain a significant amount of the variance in teacher reports of aggression, over and above that explained by demographic variables, cognitive ability, and SIP patterns.
CHAPTER III

Method

Research Design

Participants. Participants in this study are 74 third and fourth grade students, recruited from public schools in Springfield, Illinois. Schools were randomly selected for participation by the Springfield Public School District. In the three participating schools, all third and fourth grade students were given information and consent forms to bring home to their parents. All students who brought back signed consent forms were invited to participate in the study. Children were also informed of their rights at the beginning of testing and asked for verbal assent. One child asked to leave during testing, due to missing a preferred activity in class.

Of the students who participated in the study, 24 were African-American (32.4%), 2 were of South Asian decent (2.7%), and 48 were Caucasian (64.9%). Forty-one participants were female (55.4%) and 33 were male (44.6%). All participants were in the third (n = 43) or fourth grade (n = 31). Ages ranged from 95 to 140 months of age. The average age of participants was 116.8 months, or approximately 9 years, 8 months.

The three participating schools varied in their average socio-economic status and other demographic factors. Students were assigned to a SES group (low, medium, or high) based on the school they attended and the demographic information about the surrounding area. Information from the US Census Bureau
and www.eneighborhoods.com, a service that provides detailed local information to real-estate agents, are provided in Table 1.

Table 1

<table>
<thead>
<tr>
<th>Demographic Information for City and School Attendance Areas</th>
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<tr>
<td>Springfield, IL</td>
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<tr>
<td>School 1</td>
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<tr>
<td>School 2</td>
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<tr>
<td>School 3</td>
</tr>
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</table>

The three schools varied in their ethnic make-up as well. In this study, at School 1, there were 12 African-American participants and 2 Caucasian participants. At School 2, 22 participants were Caucasian, 11 were African-American, and 1 child was South Asian. The majority of participants at School 3 were Caucasian (24) with 1 African-American and 1 South Asian student.

Cognitive ability and intelligence have been associated with various measures of emotion knowledge and social information processing (e.g., Coy et al., 2001; Izard et al., 2001; Schultz, Izard, & Ackerman, 2000; Walden & Field, 1990), and therefore may be expected to affect performance on SIP and expression recognition tasks. The focus of the present study is to better understand SIP and expression recognition in mainstream elementary school
children with behaviour problems; therefore, in the interest of parsimony and due to the limitations of current measures, children were excluded from participation in this study if they had a diagnosis of a developmental disorder, including autism spectrum disorders, or mental retardation. Furthermore, children were excluded if they had a vision, language, or auditory difficulty that would have reasonably interfered with testing. However, based on teacher reports and observations by examiners, no children who returned consent forms were excluded using these criteria.

Measures

In the following section, I describe in detail the measures used in the current study, and review their psychometric properties.

Social Skills. To learn about the social skills of participants, a teacher rating scale was used. The Social Skills Rating Scale (SSRS: Gresham & Elliott, 1990) is a standardized questionnaire designed to measure both prosocial behaviours and problem behaviours in children ages 3 to 18. For the purposes of this project, only the social skills composite was used, which includes skills such as cooperation, assertion, responsibility, empathy, and self-control. Teachers were asked to rate how frequently (never, sometimes, or often) each student displayed certain behaviours such as “Controls temper in conflict situations with peers”, “Invites others to join activities”, and “Makes friends easily”. The standardization sample for the SSRS included over 4000 males and females, and controlled for gender, ethnicity, geographic region, community size, and SES. Separate norms are provided for different age groups and each gender. The SSRS
has strong content and construct validity, and internal reliability for the teacher rating of social skills ranges from (0.93 to 0.94). Test-retest reliability is also high (0.85).

Teacher Report Form. The Teacher Report Form (TRF; Achenbach & Rescorla, 2001) is a standardized questionnaire designed to measure teacher perceptions of the functioning of children aged 6 to 18. The TRF questionnaire consists of 113 questions about student’s behavioural, emotional, and social problems. Respondents were asked to rate behaviours such as “Acts too young for his/her age”, “Physically attacks people”, or “Talks out of turn” on a 3-point scale (0 = not true, 1 = somewhat or sometimes true, or 2 = very true or often true). Items refer to specific maladaptive behaviours that are related to internalizing problems (including subscales of anxious/depressed, withdrawn/depressed, somatic complaints), externalizing problems (including subscales of aggressive behaviour, rule-breaking behaviour), or other problems (including subscales of thought problems, social problems, and attention problems). The TRF also includes questions regarding the child’s academic performance, social relations, and activities, as indicators of the child’s social competence. For the purposes of this study, the aggression subscale was used.

The TRF was standardized on a sample of 4,437 children, resulting in \( t \)-scores with a mean of 50 and standard deviation of 10, where a score of 70 or higher is considered in the clinical range, and scores from 65 to 69 are considered in the borderline clinical range (Achenbach & Rescorla, 2001). This measure has been used to successfully discriminate between children who are clinic-referred or
non-referred (Achenbach & Rescorla, 2001). Teacher ratings of child behaviour on the TRF have been shown to be consistent with the ratings of parents ($r = 0.28$), and with other teachers ($r = 0.64$), suggesting that the inter-rater reliability is considerably higher for raters who have similar roles in the child’s life (Achenbach, McConaughy, & Howell, 1987). The TRF has good test-retest reliability overall ($r = 0.85$) and the alpha coefficient is high for the relevant subscale of aggressive behaviour (0.95) (Achenbach & Rescorla, 2001).

_Wechsler Abbreviated Intelligence Test._ The Wechsler Abbreviated Intelligence Test (WASI; Wechsler, 1999) is a brief screening measure of intellectual functioning. The WASI consists of 4 subtests, vocabulary, block design, similarities, and matrix reasoning, which are individually administered by a trained examiner. The test may be administered in a four-subtest or two-subtest form. The two-subtest form was used in the current study, which includes the vocabulary and matrix reasoning subtests. The vocabulary subtest is provided orally and requires participants to define words. In the matrix reasoning subtest the individual is shown patterns with parts missing, and asked to point to a picture that would best complete the pattern. The specific questions that each child is asked depend on the age and performance of the individual, as start and stop points are determined both by age and accuracy on previous questions. Scoring will result in $t$-scores ($M = 50.0; SD = 10.0$) for each subtest, and a standard intelligence composite score (mean = 100; $SD = 15$).

The WASI has been standardized for use on individuals aged 6 to 89. The test was standardized on a sample of 1100 children and 1145 adults, based on
1997 U.S. census data to be representative of gender, ethnicity, education level, and geographic region (Wechsler, 1999). The reliability coefficients of the two-subtest IQ score range from 0.92 to 0.95 when used with children. To show construct validity, correlations between WASI scores and the Wechsler Intelligence Scale for Children- Third Edition (WISC-III) were calculated. The two-subtest IQ score shows a correlation coefficient of 0.82 with scores from the full version of the WISC-III.

**Encoding.** A common encoding task (Criss et al., 2002; Coy et al., 2001; Harrist et al., 1997; Lemerise et al., 2005; Weiss et al., 1992) has been modified to fill a void in the research literature. Current measures of encoding provide a vague measure of how much a child attends to, but do not measure what details the child directs attention towards. In the modified task, children were shown detailed line drawings of social situations and instructed to look carefully at the pictures. Similar to the procedure for the expression recognition task, the drawings were shown on a laptop computer screen. Five different drawings were shown, each depicting a scene familiar to elementary school-aged students, such as a classroom or playground. Each scene involved three children, an ambiguous action, and some background detail. One drawing was shown on the screen for a total of 5 seconds, followed by a blank screen. The child was then asked to describe what he or she saw, and the examiner recorded responses verbatim. Following the testing session, the child’s response was scored according to the procedure described by Harrist et al. (1997), children received a score of 0 for an irrelevant response, 1 for a partially relevant response, and 2 for a totally relevant
response. This comprised the score for the measure Encoding 1. Harrist et al. found the original measure (using video vignettes) had inter-rater reliability ranging from 0.65 to 0.85, and internal consistency ranged from 0.62 to 0.76.

Following the free-recall task, three nearly identical drawings were shown on the screen simultaneously, and the child was asked to choose which one was most like the drawing first presented. Each of these three drawings was identical to the original drawing with one detail changed. The original drawing was not shown, therefore the child had to choose from a drawing where there was a change to a background detail (e.g., a plant on a shelf was changed to a globe), or an action changed that was central to the picture (e.g., the child throwing a ball has his arms by his sides), or one where a central character had a changed valence of facial expression (e.g., a character who was smiling is frowning). The order of presentation of the three drawings was different for each item. If the child did not respond within 30 seconds, the experimenter prompted the child to choose the best match or ask for a guess. The examiner recorded the child’s choice, and a score from 0 to 2 was given for each answer. Choosing the drawing with a different background detail was scored a 2, choosing a central detail was scored a 1, and choosing a drawing with a facial expression was scored 0. This procedure was repeated for each of the five pictures. The entire encoding test resulted in two scores for each individual, a relevance score based on the free-recall questions (encoding 1), and an accuracy score based on the matching task (encoding 2). Each score ranged from 0 to 10.
**Social-Cognitive Ability Profile-Revised.** The Social-Cognitive Ability Profile-Revised (SCAP; Hughes, Meehan, & Cavell, 2004) is a gender-balanced interview measure of social information processing. The SCAP was designed to measure aspects of children’s SIP (attribution, generation of solutions, outcome expectancies, and self-efficacy) in response to peer provocation situations. In the current study, the encoding and interpretation of cues steps of SIP are of interest. The SCAP does not provide a measure of SIP, but attribution is the most commonly studied aspect of the interpretation of cues step. Therefore, in the current study, only the attributions section of the SCAP is used. The SCAP consists of 7 vignettes and accompanying drawings, with parallel forms and drawings for boys and girls. For the purposes of this study 5 vignettes were chosen at random. Each participant was given the same 5 vignettes. As the experimenter described the vignette, the child was presented with drawings depicting the vignette and asked to imagine that they were the child in the story. Children were asked what happened in the vignette, and if their response did not include an attribution of intent, they were asked “why do you think he/she did that?”. Responses were recorded verbatim and scored 2 if the intent was not hostile, 1 if the intent was hostile, and 0 if the child could not state the intent even after prompts. This resulted in individual attribution scores ranging from 0 to 10.

The attributions subtest of the SCAP has been demonstrated to have an alpha coefficient of 0.60, and inter-rater reliability was measured by a kappa coefficient of 0.86 (Yoon, Hughes, Cavell, & Thomson, 2000). Hughes et al. (2004) also demonstrated adequate internal consistency (0.65) and inter-rater
reliability (0.86). Test retest reliability ranged from $r = 0.67$ to 0.83 (Hughes et al., 2004). Other researchers (Arnold, Yoon, Hughes, & Cavell, 1995; Dickey, 1993; Hughes et al., 1993) have demonstrated similar patterns of consistency and reliability. Furthermore, the attributions section of the SCAP has been used to successfully discriminate between aggressive and nonaggressive elementary-school children; that is, aggressive children inferred significantly more hostile attributions than nonaggressive children (Hughes et al., 1993; Hughes et al., 2004; Yoon & Dickey, 1994, Yoon et al., 2000).

**Expression Recognition.** Pictures of posed facial expressions from the Pictures of Facial Affect (Ekman & Friesen, 1974) set were presented in random order on a 15-inch laptop computer screen. The computer was placed on a table with the screen at an approximately 90-degree angle to the table; children were seated so that the centre of the screen was at eye level. Each child was shown pictures of facial expressions depicting happy, sad, fearful, surprised, angry, disgusted, and neutral faces. When presented with a picture, the child was asked to name the emotion that the individual in the picture is feeling, and the experimenter recorded the child's responses verbatim. The seven possible emotions were presented orally in random order at the beginning of the presentation and after every 10 pictures (Blair & Coles, 2000; Fine et al., 2003; Schultz et al., 2001). The list of emotions was provided whenever the child asked what his choices are, or paused for more than 5 seconds. This information was continually provided to further ensure that the expression-labelling task did not depend on verbal ability, and to discourage the child from using additional
emotional labels that were not included in the sample. Common synonyms, such as mad for anger, were accepted.

Three pictures of males and three of females demonstrating each expression were randomly selected from the Ekman and Friesen (1974) set, creating six pictures of each emotion and a total of 42 stimulus pictures, which were presented in random order. Children received one point for correctly identifying each facial expression. This resulted in a total accuracy score between 0-42.

To assess the role of hostile attribution bias in recognition of facial expressions, a separate score was calculated. The number of instances that children attributed anger or disgust incorrectly was calculated. Children received 1 point for each time they mistakenly attributed a hostile emotion during the task for a total score that could potentially range from 0 to 30. The ER Bias score was expected to have inverse relationships with the other SIP variables, as a high score on this measure indicates high levels of hostile attribution bias, which is believed (e.g., Cirino & Beck, 1991) to have an adverse effect on social adjustment.

To learn more about the role of recognizing specific facial expressions, a score was calculated that assessed children’s ability to recognize fear and anger. This was based on Blair and Coles’ (2000) hypothesis that individuals who do not recognize fear and anger are more likely to have behaviour problems such as aggression. Children were given 1 point for each time they correctly recognized fear and sadness, for a total score that could range from 0-12.

Procedure
Consent forms and a description of the study were sent home with all children in 14 participating classrooms. Parents were asked for permission for their child to participate in the teacher reporting and individual assessment activities. A total of 308 consent forms were sent home, and 75 parents (24%) returned the forms to say that they were willing to allow their child to participate in the study.

Each participant took part in an individual testing session, lasting approximately 30-40 minutes. Testing took place in a quiet room in the child’s school, and the child was asked to leave class at a time planned to minimize interruption to class activities. Testing was completed by the lead researcher or one of three trained research assistants. All examiners had university level training in child psychology, experience working with school-age children, and were trained and supervised in use of the measures in this study. The purpose and procedures of the study were explained by the experimenter, in child-friendly language, and each child was asked for verbal assent to continue. All participants gave verbal assent to participate in the study. Once the child agreed to participate, the WASI, SCAP, encoding test, and the expression recognition test were administered in random order by an experimenter with training in child psychology. All tasks placed relatively low demand on the participant, and were generally enjoyed by children. At the conclusion of the testing session the child was thanked for participating and allowed to choose a small toy as a prize. They then returned to the classroom.
Teachers of participating children were asked to complete only the relevant portions of the TRF and SSRS (questions that related to the subscales being used in this study) regarding the behaviour of each participating child. To reduce potential experimenter bias that might result from knowing the behavioural profile of each child, these questionnaires were not completed until after the individual testing session.
CHAPTER IV

Results

Descriptive Statistics

Table 2 presents descriptive statistics for the children who participated in this study. The 74 children who participated in this study were comparable to national norms with regard to cognitive ability (i.e., full scale intelligence quotient and standard deviation) according to data provided by the test developers (Harcourt Assessment, 1999). Study participants were also comparable to national norms in terms of teacher ratings of their social skills (Gresham & Elliott, 1990) and aggressive behaviour (Achenbach & Rescorla, 2001).

Table 2

<table>
<thead>
<tr>
<th>Measure</th>
<th>M</th>
<th>SD</th>
<th>SE</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>FSIQ</td>
<td>99.94</td>
<td>14.82</td>
<td>1.72</td>
<td>73</td>
</tr>
<tr>
<td>Encoding 1</td>
<td>8.12</td>
<td>1.40</td>
<td>0.16</td>
<td>74</td>
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<tr>
<td>Encoding 2</td>
<td>7.70</td>
<td>2.00</td>
<td>0.23</td>
<td>74</td>
</tr>
<tr>
<td>Attribution</td>
<td>7.06</td>
<td>1.39</td>
<td>0.17</td>
<td>73</td>
</tr>
<tr>
<td>ER</td>
<td>54.24</td>
<td>8.19</td>
<td>0.96</td>
<td>73</td>
</tr>
<tr>
<td>ER Bias</td>
<td>3.10</td>
<td>2.71</td>
<td>0.32</td>
<td>73</td>
</tr>
<tr>
<td>ER Fear/Sad</td>
<td>6.84</td>
<td>2.37</td>
<td>0.28</td>
<td>73</td>
</tr>
<tr>
<td>TRF</td>
<td>57.83</td>
<td>9.86</td>
<td>1.20</td>
<td>73</td>
</tr>
<tr>
<td>SSRS</td>
<td>107.67</td>
<td>18.33</td>
<td>2.15</td>
<td>73</td>
</tr>
</tbody>
</table>
Reliability. Cronbach’s alpha was used to calculate the internal consistency of the measures of expression recognition, verbal encoding, nonverbal encoding, and attribution. The alpha statistic is a measure of average inter-item correlation. The inter-item reliability for expression recognition ($\alpha = 0.725$, 42 items) was acceptable (Garson, 2008). For verbal encoding, $\alpha = 0.424$ with 5 items and $n = 73$. For nonverbal encoding, $\alpha = 0.385$, and for attribution $\alpha = 0.475$. For each of these 3 SIP variables, there were 5 items used. Measures of inter-item reliability are highly influenced by the number of items included, therefore scales with few items are likely to have lower alpha statistics. Low reliability of a variable may indicate attenuation, which can lead to underestimates of regression coefficients (Garson, 2008). Furthermore, smaller samples sizes can lead to instability in the alpha statistic.

Outliers. Casewise diagnostics were used to detect the presence of any significant outliers in the data set that could affect the regression coefficient. No cases were found to have a standard residual greater than 3.0. Standardized and studentized residuals were also within acceptable ranges (Garson, 2008), with no values greater than +/- 3. Furthermore, Cook’s Distance ($D$) and Mahalabobis Distance did not indicate the presence of any observations with undue influence.

Multicollinearity. To assess for excessive correlation among predictor variables, multiple Pearson correlations were computed (see Table 3). There were no correlations among predictor variables (ethnicity, cognitive ability, gender, and SES) in this data set that were higher than 0.4, indicating that correlations were not excessive (Garson, 2008). Finally, the collinearity statistics for the regression
coefficients, tolerance and the variable inflation factor (VIF), were within acceptable ranges (Garson, 2008).

Table 3

Pearson correlations among study variables (n = 73)

<table>
<thead>
<tr>
<th>Measure</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Age</td>
<td>__</td>
<td>.09</td>
<td>.00</td>
<td>-.01</td>
<td>.08</td>
<td>.03</td>
<td>-.11</td>
<td>.09</td>
<td>.28*</td>
<td>.16</td>
<td>-.36*</td>
</tr>
<tr>
<td>2. Eth.</td>
<td>__</td>
<td>-.40**</td>
<td>.08</td>
<td>-.56**</td>
<td>-.19</td>
<td>-.23*</td>
<td>-.22</td>
<td>-.52*</td>
<td>-.33**</td>
<td>-.19</td>
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<td>3. Cog.</td>
<td>__</td>
<td>-.03</td>
<td>.33**</td>
<td>.15</td>
<td>.17</td>
<td>.21</td>
<td>.38**</td>
<td>.19</td>
<td>.08</td>
<td></td>
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<td>4. Gen.</td>
<td>__</td>
<td>-.13</td>
<td>.00</td>
<td>-.15</td>
<td>.07</td>
<td>-.14</td>
<td>-.05</td>
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<td></td>
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<tr>
<td>5. SES</td>
<td>__</td>
<td>.13</td>
<td>.18</td>
<td>.26*</td>
<td>.34**</td>
<td>.18</td>
<td>.02</td>
<td></td>
<td></td>
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<tr>
<td>6. VE.</td>
<td>__</td>
<td>.00</td>
<td>-.02</td>
<td>.29*</td>
<td>.02</td>
<td>.27*</td>
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</tr>
<tr>
<td>7. N.E.</td>
<td>__</td>
<td>.23</td>
<td>.27*</td>
<td>.17</td>
<td>.05</td>
<td></td>
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<td></td>
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<tr>
<td>8. Att.</td>
<td>__</td>
<td>.29*</td>
<td>.18</td>
<td>-.16</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. ER</td>
<td>__</td>
<td>.34**</td>
<td>.06</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. SS</td>
<td>__</td>
<td>.09</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Agg.</td>
<td>__</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Eth = Ethnic Group; Cog = Cognitive Ability; Gen = Gender; VE = Verbal Encoding; NE = Nonverbal Encoding; Att = Attributions; SS = Social Skills; Agg = Aggression.

* p < .05; ** p < .01.

Normal Distribution. To verify the assumption that each variable was normally distributed, a one-sample Kolmogorov-Smirnov test was used. All variables were normally distributed except aggression and the two measures of encoding. Estimates of skewness and kurtosis, along with the associated standard
error were examined. For Encoding 1, skewness (-0.466, \( SE = 0.279 \)) and kurtosis (-0.522, \( SE = 0.552 \)) were within acceptable limits. The distribution of scores for encoding 2 were found to have high levels of skewness (-1.171, \( SE = 0.279 \)) but the ratio of kurtosis to standard error was acceptable (1.219, \( SE = 0.552 \)) (Garson, 2008). The aggression scale had significant levels of skewness (1.771, \( SE = 0.281 \)) and kurtosis (3.043, \( SE = 0.555 \)). The aggression measure was taken from the TRF, which provides standardized scores that facilitate comparison of the behaviour of a child to his or her peers. However, the \( t \)-scores on subscales of the TRF were truncated at 50, which resulted in less variation among scores and a highly skewed distribution. The TRF manual (Achenbach & Rescorla, 2001) recommends that for the purpose of statistical analysis, raw scores should be used for subscales such as the aggression scale used in the present study. Furthermore, the authors noted that these scales are often positively skewed, as the majority of children show few of the problems listed on any one subscale, and therefore the data may require transformation. Therefore, raw scores from the TRF aggression scale were used in this analysis.

Transformations. Transformations were used in an attempt to correct the distributions of variables that did not have normal distributions. In the case of aggression, the raw scores from the TRF created a skewed and kurtotic distribution, therefore a number of transformations were attempted, and the best fit was to take the sine to obtain a distribution that approached a normal curve. The transformed aggression variable did not have significantly high levels of skewness (-0.503, \( SE = 0.281 \)) or kurtosis (-0.691, \( SE = 0.555 \)), and histograms
indicated that the distribution approached normality. For nonverbal encoding, no transformations effectively changed the distribution; therefore the original variable was used despite the limitations.

**Between Group Differences.** One-way ANOVAs were used to check for differences between groups on the dependent variables. The estimated socio-economic status of participants (based on school attendance area) did not significantly predict teacher ratings of aggression \(F(2, 70) = 1.315, p = 0.275\) or social skills \(F(2, 70) = 1.734, p = 0.184\). Gender did not predict raw scores on the aggression measure \(F(1, 71) = 0.656, p = 0.421\), and the SSRS provided separate normative data for males and females, therefore it is not surprising that gender did not predict differences in standardized scores on this measure of social skills \(F(1,71) = 0.203, p = 0.653\). Ethnic group was analyzed using two groups, Caucasian or non-Caucasian. The non-Caucasian group consisted primarily of African-Americans, although there were also 2 students of South Asian descent. Ethnicity was not a significant predictor of teacher perceptions of aggression \(F(1, 71) = 2.062, p = 0.156\). The two ethnic groups did significantly differ on teacher ratings of social skills \(F(1, 69) = 7.077, p = 0.010\). Based on these analyses, SES and gender were dropped from the planned regression analysis, but ethnicity was entered.

**Hypothesis Testing**

**Expression Recognition and Social Information Processing.** To examine the prediction that expression recognition ability is related to social information processing patterns, Pearson correlation coefficients were calculated between
children’s performance on expression recognition and social information processing tasks. Table 4 presents the relevant correlations.

Table 4

Pearson correlations among expression recognition and social information processing measures (n=73)

<table>
<thead>
<tr>
<th>Measure</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Verbal Encoding</td>
<td></td>
<td>.00</td>
<td>.02</td>
<td>.29*</td>
<td>.21</td>
<td>.41**</td>
</tr>
<tr>
<td>2. Nonverbal Encoding</td>
<td></td>
<td>.23</td>
<td>.27*</td>
<td>-.28*</td>
<td>.16</td>
<td></td>
</tr>
<tr>
<td>3. Attribution</td>
<td></td>
<td></td>
<td>.29*</td>
<td>-.40**</td>
<td>.15</td>
<td></td>
</tr>
<tr>
<td>4. ER Accuracy</td>
<td></td>
<td></td>
<td></td>
<td>-.70**</td>
<td>.67**</td>
<td></td>
</tr>
<tr>
<td>5. ER Bias</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-.66**</td>
<td></td>
</tr>
<tr>
<td>6. ER Fear/Sad</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* *p < .05; **p < .01.

Among the measures of social information processing and expression recognition, low to moderate strength correlations were expected, as stated in prediction 1. In this analysis, expression recognition accuracy showed small but significant correlations with verbal encoding and nonverbal encoding. The two measures of encoding did not correlate significantly with one another. Attribution of intent was significantly correlated with ER but did not show a relationship with either type of encoding.
Two additional variables were used to look at specific aspects of expression recognition ability. The first, ER bias, was a measure of the tendency of a child to frequently attribute hostile emotions (anger or disgust) to non-hostile expressions. On this measure, higher scores indicated stronger hostile attribution biases, therefore negative correlations were expected with the other SIP variables. ER bias showed significant negative correlations with nonverbal encoding, overall ER accuracy, attribution of intent, and ER Fear/Sad. The last expression recognition variable, ER Fear/Sad, was a score comprised only of a child’s accuracy at identifying fearful and sad emotions. ER Fear/Sad was significantly related to overall ER accuracy, and ER bias, which were to be expected because these scores were all derived from the same measures, but ER Fear/Sad also showed a significant relationship with verbal encoding, which indicated that children who were more accurate at identifying fearful and sad emotions were also more accurate at encoding social information.

*Prediction of Social Skills.* A hierarchical multiple regression equation was used to test the prediction that ER would account for a significant amount of variance in teacher ratings of social skills, over and above the variance accounted for by age, ethnicity, cognitive ability, and SIP variables. In the model, cognitive ability, age, and ethnicity were entered in the first step. Gender and SES were left out of the regression equation based on the results of the between-groups ANOVAs. In the second step, the SIP variables verbal encoding, nonverbal encoding, and attribution were entered. For the third step, expression recognition
accuracy was entered. Table 5 presents the results of the regression analysis predicting children’s social skills, as reported by teachers.

Table 5

Hierarchical multiple regression predicting teacher reports of social skills

<table>
<thead>
<tr>
<th>Variable</th>
<th>Step 1</th>
<th>Step 2</th>
<th>Step 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$B$ (SE)</td>
<td>$\beta$</td>
<td>$B$ (SE)</td>
</tr>
<tr>
<td>Cognitive</td>
<td>.095 (.143)</td>
<td>.077</td>
<td>.066 (.149)</td>
</tr>
<tr>
<td>Age</td>
<td>.403 (.200)*</td>
<td>.226</td>
<td>.410 (.204)*</td>
</tr>
<tr>
<td>Encoding – Verbal</td>
<td>-.373(1.500)</td>
<td>-.029</td>
<td>-.768 (1.556)</td>
</tr>
<tr>
<td>Encoding – Nonverbal</td>
<td>.650 (1.077)</td>
<td>.072</td>
<td>.458 (1.096)</td>
</tr>
<tr>
<td>Attribution</td>
<td>1.184 (1.554)</td>
<td>.090</td>
<td>.959 (1.573)</td>
</tr>
<tr>
<td>Expression</td>
<td>.324 (.337)</td>
<td>.145</td>
<td>.324 (.337)</td>
</tr>
</tbody>
</table>

$R^2$ Squared .168  .184  .196
$\Delta R^2$ Squared .168**  .016  .012
$F$ ($df_1$, $df_2$) 4.587 (3, 68)**  2.443 (6, 65)*  2.224 (7, 64)*

* $p < .05$; ** $p < .01$; † $p < .10$.

Ethnic group (caucasian or non-caucasian) was a significant predictor of teacher ratings of social skills at all 3 steps ($p = .005$, $p = .012$, $p = .046$). The first block of control variables, including ethnicity, age, and cognitive ability, accounted for approximately 17% of the variance in social skills. Step 2, containing three SIP variables, and step 3, containing expression recognition, did
not add significant predictive value to the model, as indicated by the change in R Squared. Beta coefficients indicated that none of the SIP variables or ER contributed significantly to the prediction of social skills.

In summary, while correlations among the three SIP variables (verbal encoding, nonverbal encoding, and attribution) were not significant, expression recognition ability was significantly related to performance on all three measures of SIP. Additionally, more specific measures of expression recognition skill, expression recognition bias, and accuracy of fearful and sad expressions, were also correlated with one or more aspects of SIP. These findings indicate that children who are more accurate at recognizing facial expressions of emotion are also likely to be more accurate at encoding and interpreting social cues.

Predicting Aggression. A second hierarchical multiple regression equation was used to test the prediction that ER would account for a significant amount of variance in teacher ratings of aggressive behaviour, over and above the variance accounted for by age, ethnicity, cognitive ability, and SIP variables. Similarly to the last model, cognitive ability, age, and ethnicity were entered in the first step. Gender and SES were again left out of the regression equation based on the results of the between-groups ANOVAs. In the second step, the SIP variables verbal encoding, nonverbal encoding, and attribution were entered. For the third step, expression recognition accuracy was entered. The results of the regression analysis used to predict teacher perceptions of aggression are summarized in Table 6.
### Table 6
Hierarchical multiple regression predicting teacher reports of aggression

<table>
<thead>
<tr>
<th>Variable</th>
<th>Step 1</th>
<th>Step 2</th>
<th>Step 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$B$ ($SE$)</td>
<td>$\beta$</td>
<td>$B$ ($SE$)</td>
</tr>
<tr>
<td>Cognitive</td>
<td>.002 (.004)</td>
<td>.042</td>
<td>.002 (.004)</td>
</tr>
<tr>
<td>Age</td>
<td>-.020 (.006)**</td>
<td>-.363</td>
<td>-.020 (.006)**</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>-.162 (.124)</td>
<td>-.154</td>
<td>-.145 (.125)</td>
</tr>
<tr>
<td>Encoding – Verbal</td>
<td>.097 (.045)*</td>
<td>.237</td>
<td>.091 (.047)†</td>
</tr>
<tr>
<td>Encoding – Nonverbal</td>
<td>.001 (.032)</td>
<td>.005</td>
<td>.002 (.033)</td>
</tr>
<tr>
<td>Attribution</td>
<td>-.078 (.046)†</td>
<td>-.188</td>
<td>-.081 (.047)†</td>
</tr>
<tr>
<td>Expression Recognition</td>
<td>.005 (.010)</td>
<td>.072</td>
<td></td>
</tr>
<tr>
<td>$R^2$</td>
<td>.172</td>
<td>.263</td>
<td>.266</td>
</tr>
<tr>
<td>$\Delta R^2$</td>
<td>.172**</td>
<td>.091†</td>
<td>.003</td>
</tr>
<tr>
<td>$F(df_1, df_2)$</td>
<td>4.721 (3,68)**</td>
<td>3.865 (6,65)**</td>
<td>3.311 (7,64)**</td>
</tr>
</tbody>
</table>

* $p < .05$; ** $p < .01$; † $p < .10$.

The results of the hierarchical regression indicate that neither cognitive ability nor ethnicity accounted for a significant amount of variance in teacher reports of aggression. However, age was a significant predictor of aggression, even after all variables were entered into the equation at step 3. Together, the three control variables accounted for approximately 17% of the variance in teacher reports of aggression. Of the three SIP variables, only verbal encoding was significant as a predictor of teacher perceptions of aggression ($p = .033$) at entry. Attribution accounted for some variance in aggression in both steps 2 and
3, but this relationship was non-significant \((p > .05)\). Expression recognition did not appear to explain a significant amount of variance in this analysis, after the effects of cognitive ability, ethnicity, and SIP variables were entered.

Summary

Children who were accurate at recognizing facial expressions were more likely to do well on SIP tasks; however, accuracy at recognizing facial expressions did not predict teacher rating of social skills or aggression in this sample. Overall, age and ethnic group were the only significant predictors of teacher ratings of social skills in this sample. Children who were Caucasian and older were more likely to be rated as having good social skills by their teachers. The best predictor of teacher ratings of aggression was the age of the child, followed by verbal encoding. Children who were younger and poorer at verbal measures of encoding were more likely to be perceived by teachers as aggressive.
CHAPTER V

Discussion

The current study was designed to investigate the role of facial expression recognition in social information processing and the prediction of two aspects of social adjustment, aggression and social skills. Results support the hypothesis that expression recognition ability is related to social information processing ability, in that children who are more accurate at processing social information are also more accurate at recognizing facial expressions of emotion.

This chapter is comprised of four sections. First, I review the predictions of the present study in light of the evidence collected, with conclusions and interpretation. Further, I discuss findings provided by the data. I consider the implications of this research for theory, methodology, and prevention and intervention efforts. Finally, I review the limitations of the present study, and make recommendations for future research in this area.

Expression Recognition and Social Information Processing

The results of the current study indicated that children who are more accurate at recognizing facial expressions were also more accurate at encoding and interpreting social cues. Social information processing theory suggests that performance on tasks relating to different steps of SIP should show a moderate relationship, therefore the current findings support the hypothesis that expression recognition may be an important component of SIP. However, it was also expected that three aspects of SIP, verbal encoding, nonverbal encoding, and attribution, would be related to each other. Past researchers (e.g., Dodge et al,
2003) have found that children who are accurate encoders will also make accurate attributions, and in the current study this did not appear to be the case. The two types of encoding and attributions did not significantly relate to one another, suggesting, for example, that ability to demonstrate encoding of social information verbally did not relate to the ability to demonstrate encoding nonverbally or to make attributions. These findings could be explained by the lack of a normal distribution on the nonverbal encoding measure, or the low reliability found with all three measures of SIP. However, despite these statistical weaknesses, all three SIP steps were related to ER.

Crick and Dodge (1994) reviewed a strong body of research demonstrating that the individual steps of SIP are related. As discussed in the limitations section, the measures of SIP used in this study have low levels of reliability, which may have negatively affected the chance of finding significant relationships among SIP variables. Furthermore, the SIP step of encoding was measured using two different tasks which do not show a significant relationship, which suggests that the two tasks are not accurately measuring the same construct. It may be that one of the two tasks is not measuring encoding, or that the two tasks measure different aspects of the encoding process. Although children’s verbal encoding skill was unrelated to nonverbal encoding skill, both encoding tasks were related to expression recognition ability. Children who demonstrated the ability to accurately encode information through either verbal or nonverbal responses were more accurate at recognizing facial expressions. This finding suggests that both ways of measuring encoding have some relevance to the understanding of facial
expressions of emotion. Perhaps the differences could be explained by individual differences in processing, such as some children encoding information verbally and others visually. It is possible that two children may have encoded the same amount of social information, but one child is more skilled at responding verbally, while the other child performs better when allowed to show his knowledge nonverbally, in this case by matching pictures. Again, the non-significant relationship between encoding measures could also be explained by the limitations of the data used in this study, such as the non-normal distribution of one encoding measure.

To better understand the role of expression recognition in social information processing and behaviour, two specific aspects of ER were examined in addition to overall accuracy. ER bias is a measure of how often children mistakenly attribute hostile emotions (anger or disgust) to non-hostile facial expressions. It is a process similar to attribution bias, which is the tendency of individuals to mistakenly attribute hostile intent in social situations. In the SIP literature, attribution bias has been widely studied (Crick & Dodge, 1994) but researchers have never specifically addressed the role of facial expressions in this process. In the current study, children who were more likely to attribute hostile emotions to facial expressions tended to be less accurate at encoding information seen in pictures and more likely to attribute hostile intent in hypothetical and ambiguous social situations. The finding that ER bias and attribution bias are related suggest that patterns of processing social information also apply specifically to the processing of facial expressions of emotion. Although it may
seem that the processing of facial expressions is an implied part of processing social information, the link between SIP and facial expressions has not been demonstrated in previous literature.

Blair and Coles (2000) have postulated that the specific ability to recognize fear and sadness may be related to aggressive behaviour; therefore the ability of children in this sample to recognize fear and sadness was measured. Findings of the present study suggest children who were more accurate at identifying fearful and sad facial expressions of emotion are also better at encoding relevant information about social situations. In fact, the accuracy of children at recognizing fearful and sad emotions showed a stronger relationship with encoding ability than overall accuracy at seven common facial expressions, lending support to Blair and Coles’ theory that the ability to recognize fearful and sad emotions has a unique role in social interactions. Blair and Coles argue that the recognition of fearful and sad expressions has a special role in triggering empathy, and therefore children who have difficulty recognizing fearful and sad expressions will be less likely to inhibit aggression through empathetic responses. However, an alternative explanation is that fear and sadness are among the most difficult of the seven basic expressions to recognize (Lenti et al., 1999), therefore it is possible that lower accuracy could be attributed to cognitive ability or developmental changes. In the present study, children with higher cognitive ability were indeed more accurate at overall recognition of facial expressions, although cognitive ability did not account for significant variance in teacher reports of children’s aggression in the present study. The results of the present
study suggest that the recognition of specific facial expressions may provide unique information about how children process social information. Further research is needed to clarify the predictive value of recognition of fear and sadness in relation to maladaptive behaviour, and to determine if recognition of specific expressions adds to the predictive power of SIP variables after the effects of cognitive ability are accounted for.

Thus, the evidence presented in the present study suggests that the ability to recognize facial expressions of emotion is related to how children process social information. Children who are accurate at ER tend to be more accurate at encoding and interpreting social information. Specific aspects of ER were examined; expression recognition bias and recognition of fearful and sad emotions, and these skills were also related to SIP patterns. The relationship between ER bias and attribution should not be surprising, as these may be different applications of a similar cognitive process. Children who were more likely to assume hostile emotions in others in ambiguous social situations appeared to show the same tendency when looking at facial expressions. Therefore, ER bias and attribution bias may actually be different ways to measure the same underlying cognitive process. That is, some children may be more likely to assume hostile emotions in others when presented with social information.

Children who were less likely to show a hostile bias when labelling facial expressions were also more likely to show accurate nonverbal encoding of social information. However, hostile bias did not appear to relate to verbal encoding skill. One possible explanation for this finding may again be the nonverbal
response format for both tasks. In the ER bias task children were only required to
give one word answers and the nonverbal encoding task required children to point
at the correct response, while the verbal encoding task required children to
explain aloud what they had encoded when shown a social scene. However,
children who were more accurate at identifying fearful and sad emotions were
more likely to show accuracy when asked to verbally demonstrate encoding skills.
In this case, performance on a verbal SIP task is related to the less verbal
expression recognition task. Improved measures of the encoding step of social
information processing may allow more insight into the relationship between
encoding and expression recognition ability. Together, the findings relating
various ER abilities to SIP patterns highlight the importance of integrating our
understanding of facial expression recognition abilities into social information
processing theory to better understand the complexities of how children process
and respond to social interactions.

*Predicting social skills.* Evidence presented in the current study indicated
that older children were more likely than younger children to be seen by their
teachers as having good social skills, which is consistent with developmental
expectations. Crick and Dodge (1994) note that, over time, development and
social experiences are expected to lead to more efficient and effective ways of
processing social information. Additionally, non-Caucasian children had lower
levels of social skills than their Caucasian peers, according to reports of their
teachers. Children with varying cognitive ability did not differ in teacher-reported
social skills. Verbal encoding, nonverbal encoding, and attribution ability did not predict teacher ratings of social skills in this sample.

Overall, ethnic group membership was the best predictor of teacher ratings of social skills in third and fourth grade children. This finding may raise more questions than it answers. Social skills in the current study were measured by teacher report, not by direct observation or parent or peer reports. Therefore, the difference in social skills may be a difference in teacher perceptions. To date, no researchers of SIP theory have specifically addressed the issue of ethnicity or culture and the role they play in SIP, therefore there is little information available to help explain this finding in relation to SIP.

The finding that children from different ethnic backgrounds were rated as having lower levels of prosocial skills by teachers could indicate actual differences in the child’s behaviour, but it may simply indicate differences in expectations or reports by their teachers. Researchers (e.g., Walthall, Konold, & Pianta, 2005) have found that teacher reporting of social skills tended to be consistent regardless of the ethnic background of the student. However, Mashburn, Hamre, Downer and Pianta (2006) found that a significant amount of variance in teacher ratings of social behaviour in preschoolers was related to characteristics of the teacher, such as feelings of self-efficacy or years of experience, rather than child factors alone. The authors of this study also note that the setting and the teacher’s own ethnicity may have an impact on how teachers rate social behaviour in their students, which may be a better explanation for the differences in teacher ratings of social skills found in this study.
Predicting aggression. In addition to having higher teacher ratings of social skills, the results of the current study indicated that older children were less likely to show aggressive behaviour, according to teachers, than younger students, which is also expected as children grow and develop. Children’s cognitive abilities were not associated with variations in aggressive behaviour, and different ethnic groups did not show differences in teacher perceptions of aggression. Children belonging to varying socio-economic groups (low, medium, high) did not differ in the amount of aggressive behaviour that was reported by teachers.

However, the present study found that one aspect of SIP predicted differences in teacher ratings of aggressive behaviour. Children who could verbally describe the relevant aspects of social situations were less likely to be rated as aggressive, but children who demonstrated attention to social situations nonverbally by matching pictures, and those who made less hostile attributions were no less likely to be seen as aggressive by their teachers. The bulk of the literature on SIP and behaviour indicates that how children process social information predicts how frequently they show aggressive behaviour; however, the present study found only one aspect of SIP, verbal encoding, accounted for a significant amount of variance in teacher reports of aggression after accounting for age, ethnicity, and cognitive ability, while none of the three indicators of SIP ability accounted for variance in social skills. Expression recognition ability did not predict teacher perceptions of aggressive behaviour.

Summary
The evidence presented in this study demonstrated a relationship between expression recognition abilities and social information processing in children. Children who are accurate in their recognition of facial expressions are also likely to be accurate in their social information processing patterns. ER accuracy, ER bias, and accuracy at recognizing fearful and sad emotions all showed relationships to one or more aspects of SIP.

The current findings indicate that verbal encoding ability was the only aspect of SIP to predict teacher reports of aggression and none of the SIP skills measured in this study predict teacher-reported social skills. However, it would be premature to say that this study shows that SIP skills are unrelated to aggression and social skills given that large number of studies in the past have found that SIP does indeed predict aggressive behaviour and social skills, and the findings of the current study could be explained, at least in part, by limitations of sample size and reliability of SIP measures.

This study failed to find that ER significantly predicted behavioural outcomes (teacher perceptions of aggression and social skills) over and above the influence of demographic variables, cognitive ability, and SIP skills. However, past research indicates that ER abilities do relate to behavioural outcomes such as social skills (e.g., Izard et al., 2001; Mostow et al., 2002) and aggression (Blair & Coles, 2000; Izard et al., 2001), and it is again possible that the limitations of the current study (discussed later in this section) reduced the chances of finding a significant predictive relationship.
If expression recognition is a distinct step of SIP, it is expected to explain a significant amount of variance in behaviour. However, the findings presented in the current study did not suggest that ER ability predicts aggression or social skills in children, as reported by their teachers. However, the finding that ER relates to all three measures of SIP suggests that ER is not irrelevant to the study of SIP. Perhaps rather than considering ER ability as a step or separate component of SIP, it is more appropriate to consider that ER is an integral part of the existing SIP steps of encoding and interpretation of cues. In this way, consideration of the role of expression recognition in studies of encoding and attribution may help to refine our understanding of social processing during these steps. Further research is needed to clarify the role of expression recognition in the processing of social information.

Original Contributions

Overall, this study makes an original contribution to the literature by clarifying the importance of expression recognition in the processing of social information. Specifically, in this work a relationship between expression recognition abilities and social information processing abilities has been demonstrated. Expression recognition was measured in three ways and all were found to relate to aspects of social information processing. An attempt was made to show that expression recognition ability could add to the power of the SIP model to predict some aspects of poor social adjustment; however, in this study ER did not account for a significant amount of variance in teacher perceptions of aggression or social skills. Furthermore, a need for better measures of encoding
abilities was identified, and an alternative measure of nonverbal encoding was developed and used in the current study.

Implications

Theory and research. Based on current SIP theory, as described by Dodge and colleagues (Crick & Dodge, 1994) ER is not believed to be a separate step of SIP, but an integral part of the first two steps of processing, encoding and interpretation of cues. A change to the theory itself is not suggested, rather a refocusing on a previously neglected area. The vast number of studies conducted to date have largely ignored the importance of understanding facial expressions, perhaps with the assumption that there is little variation in this ability.

When encoding information, the details a child encodes may be as important as how many details are attended to. To properly understand the intentions of others, it is critical that children encode information from facial expressions as well as other nonverbal signs. Evidence presented in this study indicates that understanding of facial expressions is related to encoding abilities, although ER ability did not predict teacher ratings of social skills or aggression. The finding that ER ability is related to other aspects of SIP, combined with findings from previous studies that ER predicts important aspects of behaviour, warrants consideration of researchers who are studying encoding. When providing social cues that involve facial expressions in test tasks, careful attention to the use of facial expressions is needed. When researchers use stimuli such as a video vignettes to provide social cues for children to respond to, they are usually relying on actors to portray certain emotions or intentions. However, if careful attention is
not paid to the cues provided by the actors in vignettes, children watching may be responding to inaccurate social cues. Although the findings of the present study are not conclusive, there is sufficient evidence to suggest that future studies of encoding may benefit from paying special attention to how children encode facial expressions of emotion.

Research into the interpretation of cues, or attribution, stage of SIP may also be improved by incorporating an understanding of expression recognition. In this step, individuals must interpret the cues they have encoded to make decisions about the intentions of others in a given situation. Facial expressions, along with other nonverbal signals, are a primary cue that individuals use to decide what the other person is thinking or feeling. In ambiguous social situations, such as getting bumped by a peer when standing in line, the facial expression may be most informative about whether the peer had hostile or benign intentions. An apologetic look by a peer who bumped into a child may lead the child to believe that the bump was unintentional, while a mischievous smile or angry expression may be a cue that the peer had hostile intent. When researchers attempt to simulate these everyday social interactions for study, they could eliminate possible sources of error by paying careful attention to facial expressions to ensure that unintended cues are not provided, and that the social cues that are provided are accurately portraying the intended emotions. Additionally, researchers may choose to specifically examine expression recognition bias separately from more traditional measures of attribution bias in order to better understand whether the tendency to label facial expressions as hostile and the
tendency to assume hostile intent in others are distinct processes or two expressions of the same process. Thus, close attention to the role of facial expressions is recommended in future studies of SIP.

*Implications for School Psychologists.* Although the findings of the current study do not provide strong support for the predictive value of SIP skills, past researchers have provided robust findings that indicate children’s SIP patterns are indicative of present and future maladaptive behavior. Given the number of studies that have investigated SIP and behavior, there are surprisingly few intervention or prevention programs available that specifically incorporate SIP concepts that can be used in schools or clinical settings. Rather than teaching children what behaviors to carry out in a given situation, SIP training teaches children cognitive techniques to process incoming cues and social information (van Maneun et al., 2004). In theory, interventions from an SIP perspective should generalize better because they are not situation-specific.

There are currently four programs with published efficacy studies that apply SIP concepts directly to intervention. Second Step (Committee for Children, 1991, 1992a, 1992b, 1997), Fast Track (Conduct Problems Prevention Research Group, 1999), Making Choices, (Fraser et al., 2005), and the Social Cognitive Intervention Program (Van Manuen et al., 2004). Although these four programs vary greatly, researchers have demonstrated that each has been effective in reducing aggression or other behavior problems, or increasing positive social behaviors. All of the programs reviewed target the ability of children to correctly interpret social cues, and many use materials including pictures, videos, and role
playing where children are required to decode facial expressions of emotion.

Although more research is needed in this area, the development of programs that target SIP to reduce problem behaviors are a promising alternative to traditional social skills programs, which are widely used despite small overall effect sizes (for a review see Quinn et al., 1999).

**Limitations**

This study contributes to the literature on SIP and ER in children; however, some limitations should be noted, and possible effects on the results must be considered. The first limitation of this study is sample size. Although 74 students and their teachers participated, this is a relatively small sample compared to that of other studies in this area which used more than 200 participants (e.g., Schultz & Shaw, 2003). The effects of ER are hypothesized to be small, therefore it was ambitious to expect significant results in a sample of this size. However, a larger sample could not be used due to constraints such as time, funding, and limited participation from school districts.

A second limitation is the reliability of the SIP measures. The tasks used to obtain information about children’s SIP (verbal encoding, nonverbal encoding and attribution) were brief and had only 5 items each. Measures of internal consistency, or reliability, such as Cronbach’s alpha, increase as the number of items on the scale increase. Therefore, the low number of items is likely to have led to low internal consistency (Garson, 2008). The brief measures were used due to time constraints (schools were reluctant to have students out of the classroom for extended periods of time), but the resulting sacrifice in reliability may have
reduced the possibility of finding significant relationships between SIP variables and outcome measures. This is underscored by the failure to replicate previous findings that SIP ability predicts teacher perceptions of aggression and social skills. More in-depth measures of SIP processing, along with a larger sample size, may have revealed that SIP variables predicted aggression and social skills, which would be consistent with the conclusions of a majority of past researchers in this area.

In the current study, SIP variables and ER ability were used in an attempt to predict social skills and aggression. In both cases, teacher reports were used to measure levels of these behaviours in children. Although teacher reports have acceptable validity (Achenbach & Rescorla, 2001) it is often preferable to have direct data, as teachers often do not see all aspects of child behaviour. Observational data, sociometric data, or parent reports may have been useful tools in learning more about aggression and social behaviour in children.

Future Directions

In light of the findings presented in this paper, several directions for future research are indicated. First and foremost, it is recommended that future studies of SIP, specifically those investigating encoding and interpretation of cues, include expression recognition skills in their theory and methodology.

When measuring encoding and interpretation of cues, past researchers have used stories, pictures, or video vignettes of social situations. Stories told verbally or presented in written form provide no information about the facial expressions of the characters, and therefore do not provide information about the
role of expression recognition. When pictures or videos were used, researchers have not documented specific attention to the facial expressions used by actors in these vignettes. Analysis of the video, or specific instructions to the actors, could ensure that the expressions used meet standards (e.g., Ekman & Freisen, 1974) for the emotions they are expected to convey to reduce sources of error or ambiguity.

A challenge for researchers may be differentiating between errors that stem from lack of attention to facial expressions (encoding) and those that are merely misinterpretations of facial expressions (interpretation of cues). Take the example of a child who is asked how a character felt after being shown a picture or vignette, and answers incorrectly. The child may have looked at the facial expression carefully, but misinterpreted what he or she saw, or the child may have not given the facial expression enough attention to decode the expression. Studies using eye-movement tracking may provide one solution to this problem, allowing researchers to learn exactly where the child’s gaze is directed and then determine whether facial cues were ignored or misinterpreted.

Interpretation of cues may be the area that could benefit most from the study of expression recognition. This is the step where expression recognition accuracy is most important. Based on the findings presented in this study, the widely studied phenomenon of attribution bias appears to also occur in response to facial expressions. Children who were more likely to label non-hostile expressions as hostile were also more likely to interpret ambiguous social situations as hostile, indicating that expression recognition plays an important role in the interpretation of cues, and warrants further research attention.
Another potential future direction for research involves the measures used to study SIP. Encoding, as the first step of SIP, is arguably the step that has received the least research attention (Crick & Dodge, 1994). Part of the reason may be that encoding is difficult to measure. The few studies that have addressed encoding have used a variety of methods, and no consensus has emerged on an appropriate measure. The present study offers an alternative; in the nonverbal encoding task children were asked to pick the picture that best matched the one they had last seen. This task was designed to determine if children were attending to relevant aspects of the social scene or not. However, the evidence presented in this study does not make a strong argument for the use of the nonverbal encoding task, as the results did not contribute significantly to the prediction of teacher ratings of social skills or aggression. It is recommended that researchers strive to develop practices for measurement of encoding that have higher validity as well as better predictive value. Video vignettes can be a useful tool because they are a closer approximation to real social situations; however, because videos provide so much more social information they also provide many more social cues that must be carefully controlled.

Certainly, sufficient past research exists to support the idea that the SIP ability predicts aggression and social behaviour. However, the efforts to apply SIP theory to intervention lag far behind those designed to understand the intricacies of processing and its relationship to behaviour. In the past several years, empirically supported prevention and intervention programs have emerged and are becoming more accessible to schools and other child-centered programs. With
evidence to suggest that learning adaptive SIP skills can have a significant impact on behaviour, perhaps more attention will be given to the application of SIP theory, and reliable and well-validated interventions will be made available. Knowledge of social information processing in children is useful only if the information is applied outside the laboratory. It is the hope of this researcher that significant research attention in the future will be devoted to the application of social information processing theory, including facial expression recognition, to benefit the children, schools, and families affected by poor social adjustment.
References


Izard, C. E., Fine, S., Schultz, D., Mostow, A., Ackerman, B., & Youngstrom, E. A. (2001). Emotion knowledge as a predictor of social behaviour and


Appendix A

Parental Consent Form

dear parent or guardian,

I am writing to request permission for your child to participate in a study about the abilities of children to understand social cues and facial expressions. This study will explore the relationship between social understanding and the behavior of children. This research may have important implications for future interventions for children with behavior problems. This project is conducted by Pamela August, under the supervision of Dr. Ingrid E. Sladeczek, Associate Professor at McGill University. The methods of this project have been reviewed and approved by the McGill Ethics Review Board and Springfield Public Schools.

The results of this study will be used to meet the requirements of a doctoral degree, and in the future may be published or presented at a professional conference. All identifying information that is collected will remain confidential, by the assignment of identification codes to each participant. Your child's name or identifying information will not be used, and the list of codes and associated names will be stored in a locked file separate from the data used for the study.

If you agree to participate, your child's teacher will be asked to complete a brief questionnaire about your child's behavior and social interactions. Your child will also be asked to work one on one with a researcher for approximately 20 minutes. There is no expected risk to participants. The test tasks involve pictures and drawings and are often enjoyed by children. Your child will be allowed to choose a small prize, such as a toy or pencil, for participating. Interested parents will also receive a copy of the completed research paper.

During the 20-minute session, each child will complete brief tests of vocabulary and spatial reasoning, and tasks where social situations are shown and children are asked to describe how people are feeling or what their intentions are. The results of these tests are for research purposes only, and your child’s performance will not be shared with anyone but the research team. Your child will be asked for verbal assent before participation, and will be told he/she is free to leave at any time.

I hope that you will consider allowing your child to participate in this project. If you agree to participate, please read and sign the attached consent form and return it to your child's teacher. Testing will take place in the school at a time chosen to minimize disruption to the classroom. Thank you for your time.

Sincerely,

Pamela August, M.A. Ingrid E. Sladeczek, Ph.D.
Ph.D. Student in School/Applied Child Psychology Associate Professor
McGill University, Montreal, Canada School/Applied Child
Psychology Program
pamela.august@mail.mcgill.ca McGill University, Montreal,
Canada
Statement of Consent:

This is to state that I agree to allow my child to participate in the research project entitled “Expression Recognition and Social Information Processing in Children with Poor Social Adjustment”.

I understand that this project is conducted by Pamela August, under the supervision of Dr. Ingrid Sladeczek in the Department of Educational and Counselling Psychology at McGill University.

I understand the purpose of this study and that there are no anticipated risks or inconveniences.

I understand that participation is voluntary and my child and I are free to withdraw from this study at any time without penalty or prejudice.

I understand how confidentiality will be maintained during this research project.

I understand the anticipated uses of data, especially with respect to publication, communication and dissemination of results.

I have carefully studied the above and understand my participation in this agreement. I freely consent and voluntarily agree to my child's participation in this study.

Name of child (please print)

Name of parent or guardian (please print)

Signature ___________________________ Date ___________________________
Appendix B
Child Assent Form

TO BE READ BY EXAMINER:

Before we get started I will tell you a little bit about what we are doing. This is a research project that we are doing to learn more about how kids think and act. This study is run by Pam August and other professors at McGill University.

We will put a number on your answer sheets instead of your name, and we will not tell anyone your name or how you answered these questions. What you answer here is confidential (or secret), unless for some reason we are worried about your safety.

I will ask you to tell me what some words mean and to solve some small puzzles. Then I will show you some pictures and ask you about what you think is happening. Most kids enjoy these activities. All you have to do is try your best and tell us what you think.

Your parents gave permission for you to be here today, but you don’t have to do this if you don’t want to. If you say you don’t want to do this you can go back to class at any time and you don’t have to tell me why.

Do you understand?

Do you have any questions?

Do you agree to participate?

Name of participant: _________________ Date: ______________

Name / Signature of examiner: _______________ _____________________
Appendix C

Testing protocol

ID Number: \_

Date of testing: \_

Examiner: \_

ENCODING

1. What was happening in the picture?

__________________________________________________________________
__________________________________________________________________

Relevant / Not relevant / Partially relevant

Which picture is most like the one you saw first?

A  B  C

2. What was happening in the picture?

__________________________________________________________________
__________________________________________________________________

Relevant / Not relevant / Partially relevant

Which picture is most like the one you saw first?

A  B  C

3. What was happening in the picture?

__________________________________________________________________

Relevant / Not relevant / Partially relevant

Which picture is most like the one you saw first?

A   B   C

4. What was happening in the picture?

__________________________________________________________________
__________________________________________________________________

Relevant / Not relevant / Partially relevant

Which picture is most like the one you saw first?

A   B   C

5. What was happening in the picture?

__________________________________________________________________
__________________________________________________________________

Relevant / Not relevant / Partially relevant

Which picture is most like the one you saw first?

A   B   C

ATTRIBUTIONS

1. You are getting ready for your turn on the monkey bars. You see two boys/girls playing catch with a baseball nearby. Just as you start across the bars, you get hit hard in the back with the baseball thrown by this kid.

Tell me what happened.

Why do you think he/she hit you with the ball?
2. It is lunch time and you are carrying your lunch tray to your table. The lunchroom is very crowded, and it is hard to get around the other kids to get to your table. All of a sudden, you get bumped real hard in the back, and your lunch spills all over the floor. When you turn around, you see that another boy/girl ran into you with her tray.

Tell me what happened.

Why do you think he/she bumped you?

3. You are walking on the sidewalk after school. It rained earlier in the day, and there are mud puddles in the road. You see another boy/girl riding by on his/her bike. As he/she rides by you, he/she hits a puddle and mud splashes all over you.

Tell me what happened.

Why do you think he/she splashed you with mud?

4. You are sitting at your desk and you see a boy/girl in your class write a note and begin to pass it around the room. When the other kids read the note, they laugh. The note does not get passed to you.

Tell me what happened.

Why do you think the note was not passed to you?

5. Your teacher has just told the class to divide into groups for a special activity. Two of your best friends have already joined a group and you
want to be with them. When you walk over to your friends, the kids tell you that you can’t join their group.

Tell me what happened.

Why do you think the kids said you couldn’t join their group?

Hostile / Non-Hostile / Not Scorable

FACIAL EXPRESSIONS.

Look at this pictures and tell me how you think each person is feeling. They might feel happy, sad, surprised, angry, disgusted, scared, or no feeling.

1. ________________
2. ________________
3. ________________
4. ________________
5. ________________
6. ________________
7. ________________
8. ________________
9. ________________
10. ________________ (MO2-11)

Here are some more pictures. Remember your choices are sad, disgusted, no feeling, scared, happy, surprised, or angry.

11. ________________
12. ________________
13. ________________
14. ________________
15. ________________
16. ________________
In this next section your choices are still the same. They might be scared, sad, angry, surprised, no feeling, disgusted, or happy.

Here are some more people, they might be feeling disgusted, angry, surprised, happy, sad, no feeling, or scared.
Appendix E

Encoding Task

1a.

1b.
4a.

4b.
Appendix E

Samples from Expression Recognition Task

Ekman and Friesen (1974)
Appendix F

Sample from Attribution Task

“You are getting ready for your turn on the monkey bars. You see two boys/girls playing catch with a baseball nearby. Just as you start across the bars, you get hit hard in the back with the baseball thrown by this kid.”

Social-Cognitive Ability Profile, Revised (SCAP; Hughes, Meehan, & Cavell, 2004)
Appendix G

Ethics Approval Form

McGill
Facility of Education — Ethics Review Board
McGill University
Faculty of Education
3700 McTavish; Room 230
Montreal H3A 1Y2
Tel: (514) 398-7039
Fax: (514) 398-1527
Ethics website: www.mcgill.ca/ego/ethics/human

Faculty of Education — Review Ethics Board
Certificate of Ethical Acceptability of Research Involving Humans

REB File #: 640-0308

Project Title: Expression recognition and social information processing

Applicant’s Name: Pamela August Department: ECP
Status: PhD student Supervisor’s Name: Dr. Ingrid Sladecek

Granting Agency and Title (if applicable): n/a

Type of Review: Expedited √ Full

This project was reviewed by: McAlpine/Stampel

Approved by

[Signature/Date]
Robert Bracewell, Ph.D.
Chair, Education Ethics Review Board

Approval Period: Mar 13/06 to Mar 23/06

All research involving human subjects requires review on an annual basis. An Annual Report/Request for Renewal form should be submitted at least one month before the above expiry date. If a project has been completed or terminated for any reason before the expiry date, a Final Report form must be submitted. Should any modification or other unanticipated development occur before the next required review, the REB must be informed and any modification can’t be initiated until approval is received. This project was reviewed and approved in accordance with the requirements of the McGill University Policy on the Ethical Conduct of Research Involving Human Subjects and with the Tri-Council Policy Statement on the Ethical Conduct for Research Involving Human Subjects.

3/20/06