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**Examining the Association Between Shyness, Anxiety and
Health Problems in Preschoolers**

Melissa A. Magder

**A thesis in partial fulfillment of the requirements
for the degree Master of Arts**

Department of Psychology

Carleton University

Ottawa, Ontario

September, 2001

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Abstract

Previous studies have shown an association between extreme shyness and certain symptoms of illness such as gastrointestinal symptoms, affective symptoms, and hay fever. The present study examined the association between anxiety, shyness, and health problems in 97 preschoolers to see if those health problems found to be associated with older shy children and shy adults occur at the preschool age. Parents completed inhibition, shyness, and health measures while teachers completed an anxiety measure. Gender differences were also explored. Results indicated that children with Affective symptoms were more anxious than children with no Affective symptoms. Other significant findings include a gender by anxiety interaction for Gastrointestinal symptoms, and a gender by inhibition interaction for predicting the impact of symptoms. Results are discussed in terms of the potential role of inhibition and anxiety in the development of illness.

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Introduction

Shyness, social withdrawal, and behavioural inhibition are terms used to describe individuals who exhibit fear and wariness in response to novel and/or social situations, and who continue to display this apprehension upon subsequent encounters with the same situation (Chung & Evans, 2000; Schmidt, Fox, Rubin, Sternberg, Gold, Smith, & Schulkin, 1997). These individuals are often characterized as affectively restrained, quiet, timid, emotionally subdued, and lacking in spontaneous speech and action when experiencing a state of uncertainty. The tendency to react this way in the face of uncertainty is demonstrated both behaviourally and physiologically, and is established by a low threshold for arousal in infancy, as early as four months of age (Calkins, Fox, and Marshall, 1996).

The literature highlights several factors that contribute to the course of this unpleasant form of solitude. Factors such as an approach-motivation conflict (e.g., Asendorpf, 1993), an over controlling parenting style (e.g. Rubin, Burgess & Coplan, in press), differences in physiology (e.g. Kagan, Reznik & Snidman, 1988), and temperament during infancy (e.g. Kagan, 1988), are thought to influence the emergence of behavioural inhibition/shyness (and eventually to social withdrawal). The long-term consequences of social withdrawal can seriously impact an individual from childhood through adolescence and even into adulthood, in terms of peer relationships, achievement in school, self-esteem and negative emotional outcomes such as loneliness, depression, and anxiety. Thus, early signs of social withdrawal serve as a marker for psychological and interpersonal maladjustment (Rubin et al., in press). In addition to its impact on psychological well being, shyness/social withdrawal has recently been linked with a

higher incidence of health problems among children. These health problems include allergies, headaches, and gastrointestinal upset, among other health related symptoms (e.g., Chung & Evans, 2000; Bell, Jasnoski, Kagan & King, 1990). The goal of this thesis was to examine the association between shyness and illness in young children, utilizing more optimal measures of health and shyness than have been used in the past. Social withdrawal/shyness may not only serve as a marker for later psychological and interpersonal difficulties, but it may also serve as a marker for an increased susceptibility to various health problems.

Definitions. Shyness, withdrawal, and inhibition are behavioural concepts which share many of the same characteristics. Throughout this thesis these terms may be used interchangeably because of the large overlap; however, it remains important to highlight their differences. Definitions of these terms, among other related terms, are provided to facilitate a deeper understanding of the concept most commonly referred to as shyness.

Inhibition is defined as the disposition to be wary and fearful when encountering novel situations (e.g. Kagan, 1988). Fearful shyness is inhibition in response to novel social situations (Rubin & Asendorpf, 1993). Self-conscious shyness is inhibition in response to social-evaluative concerns (Rubin & Asendorpf, 1993). Social isolation is considered to be the experience of solitude derived from peer rejection (Rubin et al., in press).

Social withdrawal is defined as the consistent display of solitary behavior when encountering familiar and/or unfamiliar peers (Rubin et al., in press). Social Reticence (conflicted shyness) is described by high approach and high avoidance; there is a desire to engage in social activity but this desire is usually met with little success (Asendorpf,

1990). Avoidant Shyness is described by low approach and high avoidance, as well as the tendency to intentionally withdraw from social activity (Asendorpf, 1993).

Children who are behaviourally inhibited exhibit long latencies to approach the unfamiliar, display a high frequency of negative affect, and stay close to their mothers when faced with novel stimuli (Kagan, Reznick, Clarke, Snidman, & Garcia-Coll, 1984; Schmidt et al., 1997). Physiologically, children who are behaviorally inhibited differ from nonshy children in ways that imply different thresholds in limbic sites, particularly the amygdala and the hypothalamus (Kagan, 1988). A more in depth discussion about the relation of physiology to shyness/behavioral inhibition will follow in a later section.

Factors Contributing to the Development of Shyness and/or Social Withdrawal

Inhibition. Kagan purports that extremely inhibited children differ qualitatively from both uninhibited children and children falling in the middle of the distribution. According to Kagan (1988) “approximately 15% of Caucasian children in the second year of life are consistently shy and emotionally subdued in unfamiliar situations, whereas another 15% are consistently sociable and affectively spontaneous.” Results from longitudinal studies indicate that the majority of children in these two extreme groups maintain these characteristics through their eighth year, supporting the notion that these children’s responses to novelty are stable over time.

Kagan et al. (1988) found that in a laboratory assessment, children 21 months old chosen according to their behaviourally inhibited response to unfamiliar people and events, tended to be quiet and socially withdrawn at 7 ½ years of age. In contrast, children 21 months old who were chosen for their uninhibited response were exposed to the same novel stimuli, and at 7 ½ years old tended to be more talkative and socially

extraverted in a new situation. These findings support the notion that children who respond to novelty in a certain way define extreme shyness and/or behavioural inhibition. Individuals in this 'category' are separated from everyone else because of the differences in how they respond to unfamiliarity. Recall that Kagan's view of inhibition suggests that inhibited and uninhibited types describe only 10 - 15% of children in normal samples. Therefore individual differences in reactions to novel situations will only have a developmental impact on those children in each of the extreme groups, and not the rest of the normal sample. The behaviors of the remaining 70 - 80% of the normal sample who do not fall into the inhibited/uninhibited categories are thought to exhibit normal variations in behavior with little long term developmental influence (Henderson & Fox, 1998).

As previously mentioned, behavioural inhibition can become established early on in infancy. Evidence to support this statement is found in numerous studies on temperament. The term temperament refers to "the early appearing, relatively stable, stylistic aspects of behaviour", of which one prominent aspect is the tendency to approach or withdraw when faced with new people, places, events, or objects (Goldsmith, Buss, Plomin, Rothbart, Thomas, Chess, Hinde, & McCall, 1987; Garcia-Coll, Kagan, & Reznick, 1984). From the first year of life, infants differ in the ways they respond to uncertainty. Some young children keenly approach and embrace the unfamiliar, exhibiting more sociable and outgoing behaviours, regardless of the social context, while others become quiet and restrained, and actively remove themselves from the novel situation (Kagan, 1988; Henderson & Fox, 1998). This predisposition to be inhibited or

uninhibited is thought to stay relatively stable across the lifespan despite the influence of cognitive, motor, and emotional developments (Henderson & Fox, 1998).

Reactivity-self-regulation. Another approach to studying behavioural responses to novelty in children is one of reactivity and self-regulation. This model conceptualizes approach and inhibition as separate systems. Reactivity refers to the arousal of behavioural and physiological systems while self-regulation refers to processes such as attention control which help temper reactivity (Henderson & Fox, 1998). Thus, behavioural responses to novelty are dependent on the extent to which the unfamiliarity causes a reaction, and the resources available to regulate the reaction. The interaction between reactions to novelty and the ability to regulate these reactions has presented four distinct temperament types (Caspi & Silva, 1995). The tendency to withdraw from the unfamiliar combined with low regulatory processes produces a profile of one who becomes very anxious and scared in unfamiliar environments. The tendency to withdraw from the unfamiliar combined with effective regulatory processes produces a profile of one who is appropriately cautious and functions comfortably in unfamiliar environments. The tendency to approach the unfamiliar combined with high regulatory processes produces a profile of one whom is bold and adventurous, and can regulate his or her behavior to meet the demands of the situation. The tendency to approach the unfamiliar combined with poor regulatory processes produces a profile of one who is impulsive or hyperactive, and who has trouble modifying his or her behaviour to be in accordance with specific environments such as school (Henderson & Fox, 1998). These temperament types identified by Caspi and Silva (1995) were predictive of distinct personality profiles nearly 15 years after the initial measure of temperament. Children categorized as

impulsive at 3 years old described themselves 15 years later as socially estranged and seeking dangerous and exciting experiences. In contrast, children categorized as anxious and scared at 3 years of age described themselves as cautious and avoidant of dangerous and exciting experiences, and expressed discomfort in assuming aggressive roles and positions of leadership.

Approach-Avoidance. Asendorpf (1990) posited that individual differences in shyness surface as a result of different motivational tendencies of approach and avoidance. These motivational tendencies distinguish different types of shyness that may have their own behavioural and physiological distinctions. The fearfully shy child very much desires to engage in social situations (high approach), but cannot seem to act successfully on that desire and comes to experience anxiety (high avoidance). Fearfully shy individuals experience an abundance of negative emotion when encountering a social situation. Rubin and others (Coplan, Rubin, Fox, Calkins, & Stewart, 1994) reported that such children frequently avoid peers, cry when exposed to unfamiliar peers during play, and attempt to escape from the playroom. Another type of shyness referred to as avoidant, results from high avoidance motivation and low approach behavior. The avoidant child, in contrast, does not desire to be socially involved and actively withdraws from social situations (Schmidt & Fox, 1999). Avoidant individuals are different from self-consciously shy individuals who, like socially reticent people, appear to experience an approach-avoidance conflict. These types of children approach the play group but encounter difficulty being accepted. Their efforts are often unsuccessful and result in anxious emotions. Lastly, there are some children who are perfectly content to play alone

and do not desire to be in the company of others. These children are low in both approach and motivation, and are referred to as unsociable.

Parenting. Parenting style is thought to influence the development of behavioural inhibition by over involvement in the child's life. Since already inhibited children lack the comfort and security to explore their social environment, a parental solution may be to take over the situation and handle the interpersonal conflict on the child's behalf.

While the actions of the parent are sincere and intended to protect, if repeated consistently, the child is never given the opportunity to develop the social skills and competencies required to deal with complex interpersonal situations. By controlling what situations their children encounter and how to handle them, parents may keep their children from participating in fundamental, self-initiated coping methods. Referring to the 'reactivity-self-regulation' approach mentioned earlier, children who have low regulatory processes may not learn to overcome their inherent vulnerabilities.

Furthermore, such parenting styles may impede the creation of a self-efficient belief system, and will likely exacerbate feelings of insecurity both inside and outside the family unit (Rubin et al., in press).

Evidence that childhood inhibition and withdrawal is intensified by parental over involvement comes from Rubin, Hastings, Stewart, Henderson, & Chen (1997) who found that mothers of inhibited young children were 'oversolicitous'. That means that the mothers were largely affectionate and protective when there was no need to be. In a follow-up study by Rubin, Burgess, & Hastings (in press), it was found that both behavioural inhibition and maternal over control at two years of age predicted socially wary behaviour during the preschool years. More specifically, for children of over

controlling mothers, inhibited behaviour in a peer context predicted later difficulties such as anxiety and withdrawal. However, for children of non-over controlling mothers, there was no significant association between child inhibition and social wariness in preschool.

Correlates and Outcomes of Shyness/Withdrawal

Social Skills. For decades theorists and researchers have investigated the intricacies of social interaction and its relation to normal development. Theorists like Mead (1934) and Piaget (1932) pioneered studies on the importance of peer relationships and how essential they are for children to progress developmentally. Peer relationships are thought to offer a unique context in which children foster various social and cognitive skills such as perspective taking and negotiating to resolve conflict. Thus, if the building of social competencies and the understanding of oneself in relation to others follow from normal peer interaction, one may ponder the developmental consequences for children who do not engage in normal peer interaction but instead refrain and intentionally avoid it (Rubin et al., in press). Will these children fail to reap the benefits attained through peer experiences?

It has been reported that four and five year old children who are socially withdrawn differ from their peers in the ways they think about resolving interpersonal differences (Rubin et al., in press). When faced with hypothetical social problems, withdrawn children were more apt to offer adult intervention as a means of resolution compared to more sociable children (Rubin, Daniels-Beirness & Brean, 1984). Additionally, Rubin et al. (1984) found that when observed, socially withdrawn preschoolers have rather poor skills when it comes to solving interpersonal problems. Compared to more sociable children, these researchers found that when assessing the

strategies used to meet social goals, withdrawn children were less assertive and less direct. Also, when compared to more sociable children, withdrawn children failed more in their pursuit to meet their social goals.

Thus, it is easy to see how the exposure of early failure may motivate an already fearful and insecure child to further withdraw from peer interaction. Rubin and Krasnor (1986) reported that extremely withdrawn children tended to blame themselves for social failure rather than surrounding circumstances or events not under their control. Thus, with continued social failure and peer rejection, children may begin to hold themselves responsible, and as a result may further distance themselves from social situations (Rubin et al., in press).

Self-perceptions and internalizing problems. It seems that early signs of social withdrawal serve as a behavioural marker for psychological disturbance and interpersonal maladjustment in later childhood and adolescence (Rubin et al., in press). Ollendick, Greene, Weist, & Oswald (1990) reported that socially withdrawn children at age ten-years were perceived by peers five years later as more withdrawn and anxious, more disliked, and more likely to have dropped out of school than their better adjusted counterparts. Results from a longitudinal study by Rubin, Chen, McDougall, Bowkers and McKinnon (1995) indicated that social withdrawal assessed at age 7 years predicted negative self-perceived social competence, low self-worth, loneliness, and feelings of peer group insecurity at age fourteen. In a seven year follow-up study by Morison and Masten (1991) children who were perceived by peers as withdrawn and isolated in middle childhood were more likely in adolescence to think of their social competencies and relationships in a negative manner.

A series of studies have examined whether behavioral inhibition may serve as an early marker for the development of more serious anxiety problems (Henderson & Fox, 1998). Results of these studies suggest that “for some children, behavioral inhibition may be a marker of underlying tendencies to be hyperreactive to novelty, causing a lower threshold for experiencing fear. This lowered threshold for fear may contribute to the development of more pervasive symptoms of anxiety during later childhood and adolescence” (Henderson & Fox, p. 496). Thus, the internal effects that shyness and withdrawal can have later on in life range from loneliness and poor self-esteem to more serious anxiety problems such as social phobia. When combining the impact that shyness and/or social withdrawal can have on the acquisition of social skills and on a positive image of the self, one can see the potentially overwhelming way an individual's life can be affected by something that may seem insignificant and be overlooked in the early years. If more attention is paid to signs of behavioural inhibition early on in life, parents will have a chance to intervene and possibly prevent the potentially serious impact this inhibition can have in later years.

Gender differences in shyness. There is a scarce amount of literature on gender differences in shyness. Does behavioural inhibition affect boys any differently than it affects girls? Typically, differences between the sexes have not been found in behaviourally inhibited young children (e.g. Simpson & Stevenson-Hinde, 1985). However, Lazarus (1982) reported that in a sample of 396 grade five children, approximately twice as many girls as boys perceived themselves as shy. A number of reasons can be speculated for the inconsistency in the literature. Factors such as the age of the participants, the source of the information (i.e. self-reports, parent ratings, peer

ratings) and different ideas about what constitutes the construct being assessed (i.e. shyness, withdrawal, inhibition), are all possible reasons for the inconsistency in the findings regarding gender differences in the prevalence of shyness (Rubin et al., in press).

Despite the inconclusive research on whether or not boys and girls differ in terms of how shy they are, there is some evidence that indicates shy boys are at greater risk for potentially adverse psychological effects than shy girls (Rubin et al., in press). Parents appear to be more accepting of shyness in girls than in boys. Shy girls are likely to have more positive interactions with their parents while shy boys are likely to have more negative ones (Simpson & Stevenson-Hinde, 1985).

There is also some research which indicates that shyness and withdrawal are linked to more negative consequences for males than for females. In preschoolers, more behavior problems are experienced by extremely shy boys than extremely shy girls (Stevenson-Hinde & Glover, 1996). Rubin, Chen & Hymel (1993) found that among middle aged children, socially withdrawn boys described themselves as having less adequate social skills and feeling more lonely than their peers. Additionally, it was reported by Morison and Masten (1991) that withdrawn adolescent boys have poorer self-esteem than adolescent girls.

Furthermore, there is some reason to suggest that there are physiological differences between shy boys and shy girls. For example, Dettling, Gunnar, and Donzella (1999) reported that among preschoolers, increased cortisol levels over the course of the day were found for extremely shy boys, but not for extremely shy girls. More research is definitely required in this area.

Conceptualizing the Biological Underpinnings of Shyness

Various parts of the central nervous system and the peripheral nervous system become activated when experiencing stress. For a behaviourally inhibited child, confronting a novel situation that they are ill equipped to deal with is most certainly considered a stressor. The study of biological mechanisms related to stress has been applied to the study of shyness (Chung & Evans, 2000). There are several studies (Bell et al., 1990; Schmidt & Fox, 1995; Schmidt et al., 1997) supporting the notion that there is a biological disposition for shyness, and that the physiology of shy individuals differs in certain respects from their more sociable counterparts.

There is a general agreement that temperament has a biological basis and that physiological differences associated with temperamental behaviours suggest a strong psycho-physiological link in early infancy (Calkins et al., 1996). In directing attention to patterns of the autonomic and central nervous system activity that may be related to different patterns of affective response, links have been found between physiological and behavioural reactivity and regulation, and their association with social and emotional development (Calkins et al., 1996). The physiological response to a threat or stressor frequently entails the stimulation of the hypothalamic-pituitary-adrenal (HPA) system (Takahashi & Kalin, 1999). The perception of a threat activates the secretion of glucocorticoids from the adrenal gland, which is the last step in a complicated set of events that leads to the release of corticotropin-releasing hormone (CRH) which reduces the adrenocorticotropin secretion from the pituitary (Takahashi & Kalin, 1999). Extrahypothalamic CRH systems appear to be involved in stress-induced behavior as well as in the regulation of stress-induced autonomic activity (Takahashi & Kalin, 1999).

Since CRH systems play a role in regulating stress-induced autonomic and behavioral responses, variation in CRH systems may bear a part in producing individual differences in behavioral inhibition (Takahashi & Kalin, 1999).

These autonomic and central nervous system activities are not the only patterns to occur in shy/inhibited children. Researchers have revealed certain physiological patterns that appear to accompany extreme shyness. These physiological correlates include greater resting right frontal EEG activity, elevated baseline heart rate, lower vagal tone, and elevated baseline cortisol readings (Schmidt & Fox, 1999; Rubin et al., in press).

Several animal and human studies point to the frontal cortex and the forebrain amygdala as a neuroanatomical path underlying different types of shyness. Fear and other emotions are in large part regulated by the frontal cortex (Schmidt & Fox, 1999). It appears the frontal region of the brain moderates limbic sites connected to the expression of emotion; one such limbic site is the amygdala. In addition to receiving input from the frontal cortex, the amygdala is associated with the hypothalamic-pituitary-adrenocortical [HPA] and the lower brainstem nuclei which is employed in the regulation of autonomic output (Schmidt & Fox, 1999). The amygdala is sensitive to glucocorticoid levels and plays a key role in the behavioural and autonomic components of conditioned fear (Nader & LeDoux, 1999). The administration of glucocorticoids in large doses was found to affect self-reported mood and frontal brain electrical activity in healthy adults (Schmidt, Fox, Goldberg, Smith & Schulkin, 1999). Compared to adults who received a placebo treatment, those who received a high dose glucocorticoid treatment for 4 consecutive days showed elevated negative emotion (self-reported) and right frontal EEG activity. Thus glucocorticoids seem to advance responses to fear such as startle responses and

freezing behaviours (Schmidt & Fox, 1999). Although information on the developmental basis of behavioral inhibition is scant, data suggests that glucocorticoid action has a powerful role in bringing about differences in the intensity of behavioral inhibition.

The experience of negative emotion may go unregulated in part because of forebrain sensitivity (Schmidt & Fox, 1999). Peripheral physiological measures such as elevated cortisol levels and elevated heart rate are thought to be a function of the individual differences in the sensitivity of the central nucleus of the amygdala (Schmidt & Fox, 1999).

When encountering stress it is thought that individuals with different types of limbic arousal respond on many levels, both behaviorally and physiologically. When experiencing social stress, shy children of the socially avoidant type will undergo an elevation in right frontal EEG activity, heart, and adrenocortical activity. When socially reticent shy children encounter stress, they experience the same elevation of heart rate but will differ with respect to cortical inhibition. These children will experience an increase in both right and left EEG activity (Schmidt & Fox, 1999).

Research on the Physiological Correlates of Shyness

Electroencephalograph studies. The physiology-behaviour link has been strengthened by research on brain lateralization and emotion. Kagan and Snidman (1991) presume that individual differences in reactivity during early infancy may very well set the stage for extreme shyness and behavioural inhibition in childhood. Studies have indicated that those infants who exhibit a large amount of negative affect and irritability during early infancy may be more likely to display behavioural inhibition, specifically in a social context, as toddlers (Calkins & Fox, 1992; Kagan & Snidman, 1991). Thus,

infants who react negatively to mild stress in the form of high motor activity and irritability may be displaying the antecedents of inhibited behaviour as well as experiencing greater right hemisphere activation. Infants who are highly motoric and exhibit negative affect in response to novel stimuli during the first six months of life display shyness and behavioural inhibition to a large extent during preschool and early school years (Kagan, 1998).

Mentioned earlier in the discussion of neural circuitry was the dense connections between the frontal cortex and limbic areas (in particular the amygdala), which are involved in the behavioural and autonomic regulation of emotion. Studies employing EEG measures have been a major source of information surrounding the role of the frontal cortex in regulating emotion processes. Several studies examining the relation between brain electrical activity pattern and emotion have given rise to the same result: There are differences in frontal EEG asymmetry which appear to be related to the experience of positive and negative emotion (Calkins et al., 1996; Kagan, 1988; Schmidt et al., 1997; Davidson & Fox, 1989). The idea that the pattern of resting frontal brain electrical activity may illustrate a predisposition to experience positive and negative affect and thus underlies individual differences in personality and affective style has been posited by several researchers (Bell et al., 1990; Schmidt & Fox, 1999; Schmidt & Fox, 1998; Schmidt & Fox, 1995; Davidson & Rickman, 1999; Calkins et al., 1996).

Resting right frontal EEG activity has consistently been associated with negative emotion, anxious behaviours, and withdrawal behaviours while resting left frontal EEG activity has been consistently linked to positive emotion, socially extraverted behaviour, and approach behaviours (Schmidt & Fox). In a number of studies conducted with

infants, infant response to stress was predicted by the pattern of resting frontal EEG activity (Davidson & Fox, 1989; Fox, Bell & Jones, 1992). Davidson and Fox (1989) reported a strong relation between whether or not an infant would cry when experiencing maternal separation and the pattern of resting frontal EEG. Infants with greater relative resting right frontal EEG activity were more apt to cry at maternal separation and approachment of a stranger than infants with greater relative left frontal EEG activity. Also Davidson and Fox (1982; 1989) found that in the presence of negative affective stimuli, infants displayed greater relative right frontal EEG activity. In contrast, in the presence of positive affective stimuli, infants displayed greater relative left frontal EEG activity.

Further evidence to suggest the pattern of resting frontal asymmetry may signify differences in temperament was reported by Davidson and Fox (1992). Infants 7 to 12 months old who regularly displayed a longer latency to cry to maternal separation exhibited greater left frontal activation across age, while infants 7 to 12 months old who across age displayed a short latency to cry exhibited right frontal activation.

Calkins et al. (1996) examined the behavioural and physiological precursors of shyness in a group of 4 month old infants. They found that infants who exhibited high negative affect when exposed to novel stimuli at 4 months showed greater relative right frontal EEG activation at 9 and 24 months in comparison to infants who displayed either high positive or both low positive and low negative affect. This group of infants also exhibited a larger degree of behavioural inhibition in response to novel stimuli at 14 months compared to the other groups.

The idea noted earlier by Kagan et al. (1987) that the roots of childhood shyness may be related to the arousal of limbic areas involved in the expression of fear and the regulation of that fear response in frontal area activity (Schmidt & Fox, 1999) are supported by the EEG results in the Calkins et al. (1996) study, as well as findings from Schmidt & Fox (1998) that high motor/high negative affect infants display greater 'fear-potentiated' startle responses than infants in the other two groups. Kagan et al. (1987) posited that infants born with elevated arousal in these subcortical areas may be predisposed to fear, and may further develop the profile of a behaviourally inhibited child. It is quite possible that the resting right frontal asymmetry of the infants displaying high motor activity and high negative affect could reflect increased limbic activity since there are well known anatomical connections between the frontal region and the amygdala, in addition to other areas of the limbic system (Calkins et al., 1996). Results from the Calkins et al. (1996) study confirm past EEG-affect studies and further supports the assertion that relative high frontal activation found in irritable and highly motoric infants may be a physiological correlate of temperament in infancy.

Studies with preschoolers have also found significant differences in shy and nonshy children in terms of baseline frontal EEG asymmetry (Fox, Schmidt, Calkins, Rubin & Coplan, 1996; Schmidt et al., 1997). During a period of peer play, those preschoolers who exhibited a high frequency of anxious/wary behaviour had greater relative right frontal EEG activity than children who exhibited a low or average frequency of anxious/wary behavior. In addition, Fox et al (1995) found that 4 year olds who showed resting right frontal asymmetry exhibited inhibited behaviours in peer play sessions.

Similar results associating negative affect with greater right frontal EEG activity have been found for older children. Finman, Davidson, Colton, Straus & Kagan (1989) found that children who displayed characteristics for behavioural inhibition such as remaining close to the mother during play, were more likely to show right frontal asymmetry. As well, Schmidt, Fox & Schulkin (in press) reported that among a group of extremely shy, average, and nonshy seven year olds, those that were extremely shy showed a larger increase in right frontal brain activation, a greater increase in heart rate, and a larger decrease in heart rate variability than those children in the average and nonshy groups

Thus, the data suggest that there are individual differences in the threshold of infants and young children to display negative affect in response to a mildly tense situation that may be related to the pattern of frontal activation, specifically with the pattern of asymmetry (Calkins et al., 1996). Evidence from the studies discussed point to a relatively strong association between right prefrontal brain activity and the inability to modulate negative affect. Thus, frontal activation asymmetry may be a physiological correlate of the predisposition to show behavioural inhibition when faced with unfamiliarity (Calkins et al., 1996).

The stability of EEG patterns may also be a factor. In most temperamentally inhibited infants the pattern of frontal EEG asymmetry is stable over the first two years of life (Schmidt & Fox, 1999). For those infants in which the right frontal EEG pattern is stable, an increase in inhibited behaviour is evident at 14 and 24 months compared to those infants with a stable pattern of left frontal EEG. Infants whose pattern of frontal EEG asymmetry switched from right to left during the first two years of life were less

likely than those with stable right frontal EEG activity across the two years to develop shyness (Schmidt & Fox, 1999). These data underlie the potential influence of environmental input on particular functions of the frontal lobe during the first two years of life, specifically those functions involved in the maintenance of fear (Schmidt & Fox, 1999).

Although measures of EEG prefrontal asymmetry remain relatively stable over the first two years of life and predict concurrent measures of behavioural inhibition, neither the measures of brain function nor the measures of behavioural inhibition are stable from ages three to ten (Davidson & Rickman, 1999). It is believed that this lack of stability is due to plastic changes which occur during early childhood (Davidson & Rickman, 1999). However, this lack of stability is not consistent among all children. Of the 64 children involved in an EEG follow-up study at ten years of age, stable patterns of prefrontal asymmetry were found in twenty-three percent of children (Davidson & Rickman, 1999). Thus stability of prefrontal asymmetry measures over several years of early childhood may be of use in identifying young individuals who may be at risk of developing psychopathology later in life (Davidson & Rickman, 1999).

Heart rate. In addition to prefrontal brain activity, heart rate and heart rate variability are thought to be physiological correlates of shyness/behavioural inhibition (Bell et al., 1990; Schmidt & Fox, 1995; Kagan, 1988; Kagan, Reznik & Snidman, 1987; Kagan et al., 1984). Both the sympathetic and parasympathetic branches of the autonomic nervous system regulate heart rate and heart rate variability (Kagan et al., 1984). Kagan et al. (1984) states that “under resting conditions, there is phasic alteration in parasympathetic (via the vagus nerve) and sympathetic influences on the heart” (p.

2213). Respiratory sinus arrhythmia is the most marked influence. Heart rate, blood pressure, and sympathetic activity normally elevate during inspiration as vagal tone is suppressed, and lessen with expiration as the vagal tone is disinhibited, resulting in a heart rate that has a regular cycle and is somewhat variable over 10-20 second intervals (Kagan et al., 1984). However, the deceleration that is usually affiliated with the expiration is silenced when the vagus is suppressed, resulting in a less variable heart rate (Bunnell, 1982, Kagan et al., 1984).

Various psychological conditions are connected to the loss of respiratory sinus arrhythmia and the elevation and stabilization of heart rate; one such condition is mental work (Kagan et al., 1984). Heart rate is often lower and more variable under resting but alert conditions than it is when asserting mental effort on cognitive tasks or dealing with potentially stressful events (Kagan et al., 1984). Grossman (1983) states that under a moderate level of stress, “vagal and sympathetic tone interact antagonistically to produce the final cardiac response pattern” (p. 293). In young children, behavioural inhibition is the probable response to the combination of increased psychological uncertainty and physiological arousal (Kagan et al., 1984).

A longitudinal study examining the relation of heart rate and heart rate variability to inhibited behaviour was conducted by Kagan et al (1984) on a set of 4 year old children who were previously selected at 21 months old because they were extremely inhibited or uninhibited. Children were observed in a variety of unfamiliar situations, and heart rate and heart rate variability was monitored in response to cognitively challenging tasks. At 21 months, inhibited children had higher and more stable heart rates than uninhibited children, especially when exerting mental effort. Behavioural inhibition at 21

months not only predicted behavioural inhibition at 4 years, but also predicted higher and more stable heart rates in response to challenging cognitive tasks (Kagan et al., 1984). Thus, at 4-years of age, inhibited children had higher and more stable heart rates than uninhibited children, however the two groups did not differ in terms of cognitive performance, suggesting that the characteristics of inhibition and lack of inhibition are independent of cognitive abilities (Kagan et al., 1984).

Salivary cortisol. Elevated cortisol levels are postulated to be another physiological correlate of shyness/behavioural inhibition. The association between elevated cortisol levels and behavioral inhibition has been made in several studies (Bell et al., 1990; Schmidt & Fox, 1995; Kagan, 1988; Kagan, Reznik & Snidman, 1987; Takahashi & Kalin, 1999).

Kagan, Reznik & Snidman (1987) reported that children who were behaviorally inhibited at 21 months of age had higher morning and laboratory levels of cortisol at 5 ½ years old, compared to their more sociable counterparts. It has also been reported that behaviorally inhibited children in insecure attachment relationships display high levels of salivary cortisol during fearful situations (Nachmias, Gunnar, Mangelsdorf, Parritz, & Buss, 1996). Although increased cortisol has been associated with fear and distress in infants (Kagan et al., 1987) and animals (Takahashi & Kalin, 1999), high cortisol levels have also been found in assertive and dominant children during the preschool and early school years (Granger, Stansbury, & Henker, 1994). Furthermore, Manoque, Leshner, & Candland (1975) found higher cortisol levels in dominant monkeys compared to subordinate monkeys.

Studies with preschoolers have also found significant differences in shy and nonshy children in terms of morning cortisol levels (Fox et al., 1996; Schmidt et al., 1997). During a period of peer play, those preschoolers who exhibited a high frequency of anxious/wary behaviour had higher morning cortisol levels than children who exhibited a low or average frequency of anxious/wary behaviour. Additionally, Dettling, Gunnar, and Donzella (1999) reported that among preschoolers, increased cortisol levels over the course of the day were found for extremely shy boys, but not for extremely shy girls.

In a longitudinal study Schmidt et al (1997) followed infants from 4 months of age to 4 years of age. Social behaviour and salivary cortisol, among other measures, were examined at 4 years of age. At 4 months old, three groups were formed. The first group was termed 'negative' and consisted of infants who were high on motor activity and negative affect and low on positive affect. This group was behaviourally inhibited at 14 months (Calkins et al., 1996). The second group was called 'positive' and was made up of infants who were high on motor activity and positive affect and low on negative affect. Group 3 was called 'low', and was comprised of infants who were low on motor activity, positive, and negative affect. At 4 years of age samples of saliva were collected on three consecutive mornings within thirty minutes of waking and before eating breakfast. This time of day was chosen because the stress of the day ahead has yet to set in. Results showed that children who were behaviourally inhibited at 14 months of age were likely to be behaviourally inhibited and have high morning salivary cortisol at age 4 years (Schmidt et al., 1997). Among the three groups of children at age four, the negative group was more likely to exhibit higher cortisol levels than the positive. To summarize,

behaviourally inhibited infants at 4 months of age predicted behavioural inhibition at 14 months. Behavioural inhibition at 14 months predicted behavioural inhibition and elevated cortisol levels at 4 years. Taken from these results, the association between cortisol and infant distress may predict subsequent shyness later in childhood (Schmidt et al., 1997). The findings of this study are also consistent with animal studies which have shown cortisol to impact behavioural inhibition in rats (Takahashi & Kalin, 1999).

Recall the earlier discussion of the role of the amygdala and CRH systems in fear related responses. The perception of a threat leads to the release of CRH which reduces the adrenocorticotripin secretion from the pituitary. It is thought that variation in CRH systems may play a role in producing individual differences in behavioural inhibition. Schmidt et al. (1997) hypothesize that high levels of cortisol in children who are behaviourally inhibited exacerbate the experience of fear by increasing CRH in the central nucleus of the amygdala.

Taken together, these data suggest that shyness and sociability are discernable on a neural and physiological level (Schmidt & Fox, 1999). Continuing research on the physiological correlates of shyness afford an index to this phenomenon that may be going undetected in behavioural measures. Most recently, the physiological profile of extremely shy individuals has led to a relatively new area of study- health problems in those that are extremely shy. Do the physiological characteristics that appear to be specific to a shy profile (i.e. high resting right frontal EEG activity, elevated morning cortisol levels, elevated heart rate) make one more susceptible to illness?

Shyness and Health Problems

In the last ten years, researchers have started to examine the general health of individuals who display extreme shyness/behavioural inhibition. With the notion of a biological predisposition to shyness and the ever growing research on its physiological correlates, the following question begs to be asked: Does the biological make up of extremely shy individuals lend itself to an increased susceptibility to illness?

Regarding the health of shy individuals, there is evidence to support a higher prevalence of health problems in those who are extremely shy (Chung & Evans, 2000; Bell et al., 1990; Schmidt & Fox, 1995; Reznik, Hegerman, Kaufman, Woods & Jacobs, 1992; Bell, Martino, Meredith, Schwartz, Siani, & Morrow, 1993). Reznik et al (1992) found that adults who were behaviourally inhibited as children and perceived themselves to be presently shy reported an increased number of mental health problems compared to nonshy adults. Even older adults (aged 55-88) who are extremely shy have reported both affective problems and health problems such as insomnia, constipation, and hay fever (Bell et al., 1993). These health problems are not likely just a function of age, as such problems were not reported by adults of the same age range who are not shy.

Inhibited children (as compared to sociable children) experience higher frequencies of irritability, sleeplessness, constipation, and infant allergies (Kagan et al., 1988). Kagan et al. (1984) reported a positive relation among 4 year old children between frequency of fears, constipation, sleeplessness, and nightmares. Kagan interpreted these symptoms as a sign of sympathetic arousal because “high sympathetic tone constricts the colon and leads to constipation, while sleepiness and nightmares can be accompanied by sympathetic discharge” (Kagan et al., 1984, p. 2220). This particular

finding supports the notion that the physiological differences experienced by extremely shy individuals may lend itself to a vulnerability to problems of health.

Bell et al. (1990) examined the prevalence of allergies, depression, and fearfulness in a large sample of undergraduate students with varying degrees of shyness (all data were self-reported). Those individuals high in shyness rated themselves significantly higher on existing depression, fearfulness, and feelings of tiredness (Bell et al., 1990). Additionally significant was the finding that extremely shy young adults reported a higher frequency of hay fever than the more sociable/outgoing individuals (Bell et al., 1990). These findings taken together with the previously discussed information on the central nervous system and the neural circuitry of the brain, suggest that extremely shy individuals experience a higher frequency of affective/emotional problems and various health problems ranging from constipation and insomnia to hay fever. This supports the possibility that there are important differences in the physiology of shy and outgoing individuals within the immune and central nervous system (Kagan et al., 1988). Another interpretation as to why hay fever appears to be related to shyness is because “the nose has a more direct anatomical and perhaps neurochemical relationship to the brain than do other allergic organs such as lungs or skin” (Bell et al., 1990, p.523).

Chung and Evans (2000) examined several health problems in shy and nonshy children and found significant differences between shy and nonshy children for fatigue, emotional upset (including sadness, lack of appetite, irritability, and insomnia), and gastrointestinal upset (including nausea, vomiting, diarrhea, constipation, and cramps). Headaches were the one category in the Chung and Evans (2000) study in which nonshy children were significantly higher than shy children.

There are several possible causal explanations to the link between shyness and illness. Shyness may cause individuals to develop a weakened immune system, the result of which is getting sick more often. A second possible explanation is that some third variable may be related to both shyness and illness. For example, the physiological patterns previously discussed may contribute towards shyness and a weakened immune system (causing more frequent illnesses). As well, an overprotective style of parenting may contribute to increased shyness as well as lead to an over-reporting of children's illnesses by parents. A third possible explanation is that being sick causes an individual to become more shy. It is possible that all explanations may contribute to the relationship between shyness and illness.

The Current Study.

The intent of this study was to replicate and extend research by Chung and Evans (2000) on the associations between shyness and illness in young children. Through the collection of daily diary reports completed by parents, Chung and Evans (2000) compared 16 shy children (mean age 7 years, 4 months) and 16 nonshy children (mean age 7 years, 3 months) on a variety of illness symptoms. Shyness was measured by teacher rankings of verbal participation in class. The amount that children speak has been shown by numerous studies to be a major index of inhibition (Kagan et al., 1988) and shyness (Asendorpf & Meier, 1993; Evans, 1993, as cited in Chung and Evans, 2000). The Behavior Rating Scale {modified (Behar & Stringfield, 1974; Evans, 1989)} which reflects internalizing and externalizing behavior, was completed by teachers at the end of the study (after diary completion) to confirm the assignment of shy and nonshy children to their respective groups. All parents completed the Recent Life Changes/Stressors

Questionnaire to control for any aberrations in immune responses credited to the experience of major life stressors. Note however, the lack of a parental measure of shyness. In addition to spending more time with their children, parents have the opportunity to observe their child in a wider variety of situations than do teachers. The Chung and Evans study would have been strengthened by using a parental measure of shyness since different behaviors may be more salient to parents than to teachers. By utilizing both teacher and parental measures of shyness, one is more likely to capture how a child responds across all types of situations. Symptoms of illness were measured through a daily health complaint diary, completed by parents each day for a 4-week duration. The diary included room to indicate a child's health related complaints, parental observations of child's health, parental conclusions, and any actions taken in response to the child's health complaint (Chung & Evans, 2000). Content analysis revealed eight categories of children's health complaints, six categories for parental observations of illness, and six categories for parental conclusions, all which separated shy children from nonshy children.

Results of the study revealed that shy children encountered twice the number of ill days as nonshy children (4.69 versus 2.31 days out of 28 days). This finding was statistically significant. Shy children made more affective complaints than nonshy children, consisting of lack of appetite, irritability, and insomnia. Fatigue and gastrointestinal upset, including nausea, vomiting, diarrhea, constipation, and cramps, were significantly observed by more parents of shy children than the parents of nonshy children.

Increased attention should be paid to examining the relation between shyness and illness symptoms in young children. Previous reports of more health problems in shy children (Chung & Evans, 2000) and the conceptualization of shy children having a decreased threshold of arousal leading to recurrent states of physiologic hyperreactivity and a more jeopardized immune system than nonshy children, are reasons to further examine the relation between health and inhibition. The current study looks at parent ratings of shyness and inhibition, as well as teacher ratings of anxiety. These three measures were combined to yield a solid, well-rounded measure of behavioural inhibition across multiple contexts (i.e. home and school environment). The rationale behind the anxiety measure is that anxious/wary behaviours are sometimes characteristic of extreme inhibition and shyness (Asendorpf, 1990).

The current study chose to examine preschoolers for two reasons. The first reason was to see if those health problems associated with older shy/anxious children and shy/anxious adults occur at the preschool age. Kagan (1988) and others (Calkins & Fox, 1992; Kagan & Snidman, 1991) have noted that extreme shyness develops as early as infancy, so it is expected that extreme shyness will already be developed for this sample. Perhaps there is some mitigating factor that affects the occurrence of health problems at such a young age. Prevention is the second reason for selecting a preschool sample. If a relationship was found between shyness and health problems, the importance of social activity at a young age could be emphasized, offering possible benefits to health. Additionally, the current study intends to explore gender differences in shyness and their relation to health problems, as this is an area of research that requires further investigation. Some evidence (e.g. Rubin et al., in press) indicates that shy boys are at

greater risk for potential negative psychological effects than shy girls. Perhaps shy boys are also at greater risk of developing more health problems than shy girls. Thus, the aim of the present study is to replicate and extend that of Chung and Evans (2000) in a younger sample (i.e. preschoolers), utilizing more optimal measures of shyness and health, and by examining gender differences in shyness and health problems.

Measuring Health Behaviors

Previous studies examining the association between health and shyness have employed a variety of techniques to yield a measure of health. Methods such as retrospective questionnaires, surveys, open-ended questions of a general nature, and daily diaries have been used as an indicator of individual health status. Some measures are general; others are more involved; all however, are self-report. In studies where individuals attend school, number of days missed is a more quantifiable measure of health that often accompanies the self-report measures. An additional (and somewhat quantifiable) measure sometimes used is number of visits made to a physician.

Some interesting results have been found in evaluations of children's health. In 1988 the National Center for Health Statistics in the United States distributed a nationwide survey (NHIS) to collect information on the health status and use of health care by the US population (Newachek & Taylor, 1992). One or more chronic conditions were reported to be experienced by twenty million children nationwide (31%). The most commonly reported conditions were respiratory allergies (including hay fever) and repeated ear infections (Newachek & Taylor, 1992). Other conditions frequently experienced were asthma, eczema and skin allergies, headaches, and speech impediments. In assessing the impact of chronic illness on children, 66% of children were never or

occasionally bothered by their medical problem, and were not limited in their regular activities (Newachek & Taylor, 1992). Only 5% of children with chronic medical conditions felt bothered some or all of the time, and were limited in their regular activities. School absences and physician visits were made by approximately 10% of children with chronic medical conditions (Newachek & Taylor, 1992).

In a survey of Connecticut school nurses, headaches were found to be a complaint in 52% to 69% of children aged 7 to 14. Headaches ranked fourth following minor trauma, gastrointestinal upset, and upper respiratory problems (Dimario Jr., 1992).

The measure of health used in the present study is a retrospective questionnaire that consists of two parts. The first part is a symptom checklist which includes both health problems commonly reported by parents of shy children (e.g. insomnia, irritability, hay fever), and health problems commonly experienced by children in general (e.g. headaches, cough, minor accidents). The second part consists of six questions that are to be answered for each symptom checked on the list.

This measure of health is more optimal than the daily diary employed by Chung and Evans (2000) because it requires much less work on the part of the parent. The daily health complaint diary was quite laborious and time consuming as it consisted of four sections that were to be completed on a daily basis for a four week duration. The four sections were: child's health related complaints; parental observations of child's health; parental conclusions; and any action taken in response to the child's health complaint.

The checklist used in the present study extracts the same information in a very condensed format. This health measure is much more user friendly and requires less work and time to complete, thus making it a more effective health measure than the daily

diary used by Chung and Evans (2000). For these reasons, a relatively large sample should be obtained. Additionally, since health problems are normally sporadic and not experienced on a regular basis, the time frame of two months being examined in the present study is a more suitable amount of time than the one month period examined by Chung and Evans (2000).

Hypotheses

It was hypothesized that the measures of shyness, inhibition, and anxiety would be highly correlated with one another. High scores on these scales should correspond with an increased number of symptoms checked off the health measure. Thus, a significant correlation was hypothesized between the measures of shyness and the number of symptoms checked off on the health measure. Based on previous research, significant differences were expected to be found between shy and nonshy preschoolers, specifically in the frequency of gastrointestinal problems (including nausea, vomiting, diarrhea, constipation, cramps), insomnia, hay fever, irritability, fatigue, and lack of appetite. Also, shy preschoolers were expected to differ from nonshy preschoolers in terms of means on each of the six health variables.

Because of the lack of research in this area, the analyses concerning gender differences are predominantly speculative in nature. However, given the results of past research suggesting that shyness may be more of a risk factor for boys (e.g. Rubin et al., 1993; Rubin et al., in press; Morison & Masten, 1994; Stevenson-Hinde & Glover, 1996) and that shyness may be more physiologically based for boys (e.g. Dettling et al., 1999), it was speculated that shyness may produce greater health problems for boys than girls.

Method

Participants. Participants in this study were 97 preschool-aged children (51 males, 46 females), ranging in age from 36 to 74 months ($M = 52$ months, $SD = 10.59$). The children were attending 10 child care centres in the Ottawa-Carleton area. Over 500 packages of questionnaires were distributed, resulting in less than a 20% consent rate. Demographic information collected indicated that 2.1% of mothers had elementary school as their highest level of education; 12.4% of mothers and 13.4% of fathers had a high school diploma or equivalent; 18.6% of mothers and 13.4% of fathers had a community college degree or equivalent; 39.2% of mothers and 41.2% of fathers had a university degree; 27.8% of mothers and 24.7% of fathers had a graduate school degree. The average level of parent education was a university degree ($M = 3.75$, $SD = 0.98$).

Measures. A multi-source approach was employed in the present study. Data were collected from parents and teachers in the form of questionnaires.

Child shyness. Parents completed the Colorado Child Temperament Inventory (CCTI, Buss & Plomin, 1984; Rowe & Plomin, 1977). The CCTI assesses various temperamental characteristics and has been used extensively in studies of shyness (Coplan & Rubin, 1998; Coplan et al., 1994; Fox et al., 1995). Parents rated a series of descriptive items on a five point Likert-type scale in terms of how much these characteristics are 'like their child'. The scale is made up of six subscales: emotionality, activity, attention span, soothability, shyness, and sociability. Rowe and Plomin (1977) reported moderate to high internal consistency estimates and one-week test-retest reliability coefficients for these sub-scales. Only items pertaining to the shyness subscale were used. The items for the shyness scale are: "Child tends to be shy"; "Child makes

friends easily" (reversed); "Child is very sociable" (reversed); "Child takes a long time to warm up to strangers"; "Child is very friendly with strangers" (reversed). The complete shyness measure can be found in Appendix A. Alpha reliability for the current study was .85. Unfortunately due to an administrative error, CCTI ratings were only available for 67 of the 97 subjects.

Child inhibition. Parents also completed the Inhibition Toward Strangers Scale (Asendorpf, 1993). The scale consists of 8 items rated on a 7 point scale of 'never' to 'always'. The complete inhibition measure can be found in Appendix B. The 8 items are split into 2 subscales of four items each. The items on the first subscale are: "When my child meets unknown adults s/he needs a long time to warm up"; "My child is shy toward unknown adults"; "My child is somewhat inhibited toward unknown adults"; "My child easily approaches unknown adults" (reversed). The items on the second subscale are exactly the same, only "adults" is replaced by "children". Over a five year assessment the two subscales showed little discriminant validity (intercorrelations between .64 and .76 in all five years) and the eight item scale showed high internal consistency ($\alpha > .84$ each year). Alpha reliability for the current study was .93.

In the current sample the CCTI measure was strongly related with the Parental Inhibition Scale ($r = .79$, $p < .001$). Since the PIS was collected for 96 of the 97 participants and the correlation between the two measures was so high, the PIS was used as the parent measure of shyness in the current study. The data of one participant were eliminated on the PIS because substantial portions of the questionnaires were left incomplete.

Unfortunately extreme groups of inhibited and uninhibited children were not created as had been intended. With the current sample of 97 participants, 15% of the sample resulted in extreme groups that were too small to carry out the intended analyses.

Child anxiety. Teachers completed the Child Behavior Scale (CBS, Ladd & Profilet, 1996). The CBS is a 59-item rating scale used to assess different forms of adjustment (prosocial behavior) and maladjustment (anxiety, aggression, and hyperactivity) in preschool. Of interest for the present study was the anxiety scale. Items on the scale are: “Is worried. Worries about many things”; “Appears miserable, unhappy, tearful, or distressed”; “Tends to be fearful or afraid of new things or new situations”; “Cries easily”. Alpha reliability for the anxiety scale in the current sample was .71. The data of three participants were eliminated on the CBS because substantial portions of the questionnaires were left incomplete. The complete anxiety measure can be found in Appendix C.

Health measure. Parents completed a brief questionnaire consisting of two parts. The first part was a list of 30 health symptoms frequently experienced by young children. Parents checked off those symptoms experienced by their child in the previous two months. There was a section for chronic/longstanding illnesses and blank spaces were provided for any symptom that had not been mentioned. The checklist consisted of symptoms belonging to four different groups, (1) gastro-intestinal symptoms, (2) affective symptoms, (3) allergy symptoms, and (4) infection symptoms. The symptoms are displayed in Table 1.

The second part of the questionnaire consisted of six questions to be answered for each health symptom that was checked from the first section. The questions were (1)

Table 1

Symptom Categories

Gastro-Intestinal	Affective	Allergies	Infections
Nausea	Irritability	Food Allergies	Cold/flu
Cramps	Fatigue	Hay Fever	Cough
Diarrhea	Migraines	Asthma	Fever
Constipation	Headaches	Eczema	Ear Infection
Vomiting	Lack of Appetite	Hives	Eye Infection
	Difficulty Sleeping	Skin Allergies	Throat Infection
		Respiratory Allergies	Urinary Infection
		Breathing Difficulties	

"How many times has your child experienced this symptom during the last 2 months?"

(2) "How would you describe the severity of your child's symptom (e.g. how bothersome or painful)?" (3) "How many times have you visited a physician or health practitioner in the last two months?" (4) "How much has your child's regular activities been limited by this particular symptom in the last two months?" (5) "What is the current status of the health problem?" (6) "Has your child received medication for the particular symptom?"

Answers were recorded on a 4 point likert scale (3 point scale for question 6). The complete health measure can be found in Appendix D.

The health measure was piloted on parents of 3 - 5 year old children prior to administration in the current study. Some minor changes were made in response to parent feedback. These changes included adding symptoms such as breathing difficulties and dizziness, changing the symptom 'insomnia' to 'sleeping difficulties', the division of symptoms into chronic and non chronic, as well as the inclusion of a general question at the bottom of the first page. The question reads "Overall, how would you rate your child's health?" There is a scale from 1 to 7, 1 being unhealthy and 7 being healthy. The data pertaining to this question were not analyzed due to equivalent ratings by parents of children's health. Approximately 90% of parents checked off a 6 or 7, indicating that their child was very healthy, despite the number and impact of health symptoms checked on the list. This inconsistency between 'overall' health and 'current' health could reflect a bias on the part of the parent and how they view their child's health. The inconsistency could also reflect a bias in accuracy, lending support to the argument that there is difficulty with self-report ratings.

Responses to each of the two sections of the health measure were coded using

different coding schemes. In the first section the total number of symptoms experienced in the previous two months was tallied within each category (G.I., affective, allergies, and infections). Due to the relatively poor distribution within each symptom category (i.e., over 50% of subjects checked no symptoms), several groups were created consisting of participants who experienced 'none' versus 'any' symptoms. For Gastro-Intestinal (G.I.) symptoms, n = 45 children experienced no symptoms and n = 52 experienced one or more G.I. symptom. For Affective symptoms, n = 56 children experienced no symptoms and n = 41 experienced one or more affective symptom. For Allergy symptoms, n = 60 children experienced no symptoms and n = 37 experienced one or more allergy symptom. For Infection symptoms, n = 11 children experienced no symptoms and n = 86 experienced one or more infection. Creating the 'none' and 'some' groups for each symptom category provided a different analysis to the study than what was originally intended. The sample was too small to form extremely inhibited and uninhibited groups, and the distribution of health data within each symptom category was so poor that it did not allow for its examination as a continuous variable. The grouping had to be done in terms of 'none' versus 'some' as opposed to 'none' versus '1 to 2 symptoms' versus '3 to 4 symptoms' and so on, since over two thirds of the sample comprised zero and one symptom combined (with the exception of the Infection group). For both GI and Affective groups, 78 of the 97 subjects combined to account for zero and one symptoms. For the Allergy group 87 of the 97 participants combined to account for zero and one symptoms. The exception was the Infection group for which 41 subjects combined to account for zero and one symptoms.

Responses for the questions assessing the frequency of symptoms, severity of symptoms, physician visits, effect of symptoms on regular activity, current status of problem, and medication use were coded on a 4 point likert scale. A total global health impact score was computed for each participant. The purpose of this score was to reflect the overall impact of symptoms experienced by the child (in terms of frequency, severity, etc.). This total global health impact score is a new way of assessing health, as it collects detailed information that goes beyond simply examining whether or not a given symptom is experienced. First, an average score was calculated for each of the six health variables within each symptom category. Thus for each of the G.I., Affective, Allergy, and Infection symptoms, there was an average score created for frequency, severity, physician visits, effect on activity, current status, and medication. These average scores were then added together to yield a total symptom impact score per category, such that a higher total score represented greater symptom frequency and severity, more physician visits, a greater impact on activity, symptom not improved, and a greater use of medication. Thus there was a total G.I. impact score, a total Affective impact score, a total Allergy impact score, and a total Infection impact score. Finally, these symptom impact scores were summed together to produce a total global impact score, taking into account all symptom categories. ¹

1. One subject was identified as an outlier. Their impact score was five standard deviations above the mean. This subject was hence dropped from further analyses.

Procedure. Following approval from the ten preschools and daycares, children were sent home in March/April with a package including an information letter and consent form. Enclosed in the package was two parental measures of shyness (the CCTI and the Inhibition Toward Strangers questionnaires), the health measure, and a short demographics questionnaire. This was done to maximize parental participation in the study. Parents not wishing to participate in the study were asked to recycle their package. Upon return of parental consent; teachers received a copy of the CBS questionnaire.

Results

Overview. A variety of analyses were carried out in the current study. The first set of analyses presented are Preliminary Analyses, which were carried out to explore relations between demographic variables and related variables of interest. The second set of analyses presented in the current study are Analyses of Symptoms. This set of analyses includes a series of MANOVAs carried out for each category of health symptoms (GI, Affective, Allergy, Infections). Following presentation of the symptom analyses are Analyses of Symptom Impact, which include a series of regression analyses performed to assess the overall impact of health symptoms.

Preliminary Analyses. The goal of these analyses was to explore relations between demographic variables and related variables of interest. Results from a series of correlations indicated that child's age and parental education were not significantly related to inhibition, anxiety, or the total global health impact (see Table 2). Table 3 shows the correlations among inhibition, anxiety, and health variables. The only significant correlations were those between the affective symptom group and anxiety, and between total global health impact and inhibition. The relation between anxiety and the affective symptom group is not surprising since symptoms in the affective category are characteristic of anxiety. As would be expected, each health group was correlated with total number of health problems. Any other correlations between health groups, anxiety, and inhibition, were non significant. This finding however, should be interpreted with caution as it is likely due to the fact that approximately half of the sample checked off zero health symptoms. As well, results from a series of t-tests indicated no significant differences between the various health groups (GI, Affective, Allergy, Infections) with

Table 2

**Correlations Between Demographic Variables and Inhibition, Anxiety, and
Total Global Health Impact**

Variables	Inhibition	Anxiety	Total Global Impact
	(<u>n</u> = 96)	(<u>n</u> = 94)	(<u>n</u> = 97)
Age (mths)	-.05	-.15	-.15
Parent Education	.08	-.15	.12

Table 3

Correlations Between Inhibition, Anxiety, and Health Variables

Variables	Anxiety	Total # of Health Problems	Total Global Health Impact	G.I. Symptoms	Affective Symptoms	Allergy Symptoms	Infection Symptoms
Inhibition	.18*	.02	0.29***	.021	.17	-.01	-.08
Anxiety		.09	.04	-.12	.20**	.08	.05
Total # of Health Problems			.04	.47***	.58***	.33***	.43***
G.I. Symptoms					.29***	-.08	.12
Affective Symptoms						.101	.109
Allergy Symptoms							.080

* p<.10

** p<.05

*** p<.01

regard to age and education (see Table 4).

Analyses of Symptoms. A series of MANOVAs were carried out for each category of symptoms (GI, Affective, Allergy, Infections) to examine differences between the children showing 'none' versus 'some' symptoms. Both inhibition and anxiety served as dependent variables; the correlation between inhibition and anxiety was $r = .18$, $p < .10$.

Gastrointestinal Symptoms. For this group, results indicated no significant effect of health group ($F(2, 88) = .40$, ns) or gender ($F(2, 88) = 1.55$, ns). However, the gender by group interaction approached significance ($F(2, 88) = 2.46$, $p < .10$). Results from subsequent univariate analyses indicated a significant gender by group interaction for anxiety ($F(1, 89) = 4.15$, $p < .05$). Results from follow up simple effect analyses indicated that among children in the 'no GI' group, females were more anxious than males. Among the children who displayed GI symptoms, males were more anxious than females. No significant interaction was observed for inhibition ($F(1, 89) = .52$, ns). Relevant means are displayed in Table 5.

Affective Symptoms. For this group, results indicated a significant main effect of group ($F(2, 88) = 3.54$, $p < .05$). There was no significant effect of gender ($F(2, 88) = 2.34$, ns) or gender by group interaction ($F(2, 88) = 1.87$, ns). Results from subsequent univariate analyses indicated a significant main effect of group for anxiety ($F(1, 89) = 5.36$, $p < .05$). Results from follow up simple effect analyses indicated that children with affective symptoms were more anxious than children with no affective symptoms. The main effect of group was in the right direction for inhibition, but was not significant ($F(1, 89) = 2.59$, $p < .10$). (See Table 6 for Means).

Table 4

Means for Groups in Age and Education

Demographic Variables	<u>No Symptoms</u>			<u>Symptoms</u>		
	<u>M</u>	<u>SD</u>	<u>N</u>	<u>M</u>	<u>SD</u>	<u>n</u>
Gastro-Intestinal Group						
Age (mths)	52.22	10.92	45	51.75	10.39	52
Parent Education	3.78	.93	45	3.73	1.03	52
Affective Group						
Age (mths)	53.41	10.49	56	50.00	10.52	41
Parent Education	3.85	.91	56	3.62	1.05	41
Allergy Group						
Age (mths)	53.33	10.45	60	49.76	10.58	37
Parent Education	3.80	.98	60	3.66	.99	37
Infection Group						
Age (mths)	57.45	12.93	11	51.27	10.13	86
Parent Education	3.73	1.19	11	3.76	.95	86

Table 5

Means for G.I. Group Effect and Gender by Group Interaction

Group	<u>No Symptoms</u>			<u>Symptoms</u>		
	<u>M</u>	<u>SD</u>	<u>n</u>	<u>M</u>	<u>SD</u>	<u>N</u>
Gastro-Intestinal Group						
Inhibition	3.40	1.47	42	3.44	1.38	51
Anxiety	1.42	.45	42	1.35	.43	51
Inhibition						
Males	3.40	1.47	42	3.44	1.38	51
Females	3.40	1.49	24	3.60	1.37	21
*Anxiety						
Males	1.25	.31	18	1.36	.43	30
Females	1.59	.49	24	1.33	.43	21

* $p < .05$

Table 6

Means for Affective, Allergy, and Infections Group Effect

Group	<u>No Symptoms</u>			<u>Symptoms</u>		
	<u>M</u>	<u>SD</u>	<u>n</u>	<u>M</u>	<u>SD</u>	<u>N</u>
Affective Group						
Inhibition	3.22	1.40	53	3.67	1.41	40
*Anxiety	1.31	.41	53	1.52	.46	40
Allergy Group						
Inhibition	3.42	1.44	58	3.43	1.39	35
Anxiety	1.33	.46	58	1.45	.41	35
Infection Group						
Inhibition	3.67	1.82	10	3.37	1.37	83
Anxiety	1.32	.39	10	1.40	.45	83

* p<.05

Allergy Symptoms. For this group, results indicated no significant effect of group ($F(2, 88) = .43, ns$) or gender ($F(2, 88) = 1.45, ns$), and no significant gender by group interaction ($F(2, 88) = .75, ns$). (See Table 6 for Means).

Infection Symptoms. For this group, results indicated no significant effect of group ($F(2, 88) = .41, ns$) or gender ($F(2, 88) = .90, ns$), and no significant gender by group interaction ($F(2, 88) = .42, ns$). (See Table 6 for Means).

Analyses of Symptom Impact

Regression Analyses. In order to explore the relations between inhibition, anxiety, and total global impact of health symptoms, a series of regression analyses was performed. The goal of these analyses was to assess any main effects or interactions with gender. Standardized scores were computed for gender, inhibition and anxiety. These variables were then regressed on the variable total global health impact. Two separate equations were computed for anxiety and inhibition. For the inhibition equation, variables entered in the first block were standardized gender and inhibition, followed by the standardized gender by inhibition interaction in the second block. These variables were then regressed on the total global health impact variable. For the anxiety equation, standardized gender and anxiety were the variables entered in the first block, followed by the standardized gender by anxiety interaction in the second block. These variables were then regressed on the total global health impact variable.

Inhibition. Results from the first analysis revealed no significant main effect of inhibition ($\beta = .13, t = 1.23, ns$) or gender ($\beta = -.14, t = -1.36, ns$) on total global health impact. A significant interaction was found between gender and inhibition in the

prediction of total global impact ($\Delta R^2 = .04$, $F(1, 91) = 3.86$, $p < .05$). The interaction was explained by re-computing the equations separately for males and females. Results indicated that inhibition was significantly related to total global impact for females ($\beta = .35$, $t = 2.42$, $p < .05$), but not for males ($\beta = -.06$, $t = -.41$, ns). Results are summarized in Table 7.

Anxiety. Results from the first analysis revealed no significant main effect of anxiety ($\beta = -.13$, $t = -1.25$, ns), no significant main effect of gender ($\beta = -.10$, $t = -.99$, ns), and no significant interaction between gender and inhibition in the prediction of total global impact ($\Delta R^2 = .00$, $F(1, 89) = .03$, ns). Results are summarized in Table 8.

Table 7

Summary of Regression Analysis for Inhibition and Gender Predicting Total GlobalHealth Impact (N=92)

Variable	<u>B</u>	<u>SE B</u>	<u>β</u>
Gender	-.83	.59	-.14
Inhibition	.74	.59	.13
Gender by inhibition interaction	1.16	.59	.20*
Inhibition			
Males	-.35	.85	-.06
Females	1.97	.82	.35*

Table 8

Summary of Regression Analysis for Anxiety and Gender Predicting Total Global HealthImpact (N=92)

Variable	<u>B</u>	<u>SE B</u>	<u>β</u>
Gender	-.61	.63	-.10
Anxiety	-.80	.64	-.13
Gender by anxiety interaction	.11	.63	.02

Discussion

The goal of the current study was to examine health problems in shy/anxious preschoolers. The primary intent of the study was to see if those health problems associated with older shy children and shy/anxious adults occur at the preschool age. The second intent of the study was to explore any gender differences in shyness and anxiety and their relation to health problems, as this is an area of research that requires further investigation. Analyses had to be modified from what was originally intended since the creation of extreme groups was not practical, and since there was little variability in the health data for each group (GI, Affective, Allergy, Infection). Results from the analyses of health groups indicated significant differences in anxiety in both the Gastrointestinal and Affective groups. Significant gender differences in anxiety were found for the Gastrointestinal category, while a main effect of group was found for the Affective category. Results from regression analyses, which assessed the overall impact of symptoms experienced, indicated that inhibited girls experienced a greater impact of symptoms than inhibited boys. Included in the following section is a summary of the current study's findings and how these findings relate to both previous research, and to what was originally hypothesized. A variety of explanations are offered in an effort to interpret what was found. The section concludes with limitations to the current study and suggestions for future research.

Summary of Findings and Relation to Previous Research

Contrary to what was originally hypothesized, the anxiety measure (CBS) was only moderately correlated with the measure of inhibition (PIS). Additionally, no significant correlations (other than that between anxiety and the Affective category) were

found among inhibition, anxiety, and health variables. This finding however, should be interpreted with caution since it is likely due to the fact that approximately half of the participants in the current sample checked off no symptoms on the health measure. One reason for the less than strong relation between the anxiety measure (CBS) and the inhibition measure (PIS) measure may be that anxiety and inhibition are actually two separate constructs, tapping different characteristics. Previous research however, has shown anxiety and inhibition to be related to one another (e.g. Bell et al., 1990; Henderson & Fox, 1998; Schmidt & Fox, 1995). Henderson and Fox (1998) stated that for some children, behavioural inhibition may cause a lower threshold for fear, thereby contributing to the development of more pervasive symptoms of anxiety in later life. Kagan (1988) actually names anxious/wary behaviour as a marker for behavioural inhibition and extreme shyness. Note that not all inhibited children go on to develop social anxiety. Anxiety may, however, develop as a result of other factors related to inhibition. Closer examination of some previous research (e.g. Bell et al., 1990; Schmidt & Fox, 1995) showed that anxiety was treated as an affective symptom, rather than a predictor of symptoms like extreme shyness or inhibition. Schmidt and Fox (1995) found that extreme shyness was a consistent predictor of emotional and psychosomatic problems. Extremely shy young adults reported more social anxiety, fearfulness, and neuroticism than nonshy young adults. The extremely shy individuals also reported significantly more Gastrointestinal problems and allergies than nonshy individuals.

The current study examined both inhibition and anxiety as predictors of health symptoms. This may account for why different patterns were found for inhibition and anxiety. Perhaps anxiety should have been grouped with the other Affective symptoms.

Viewing anxiety as an affective symptom explains the correlation between anxiety and the Affective symptom category in the current study. It also explains the finding that children with affective symptoms were more anxious than children with no affective symptoms. This finding was somewhat commensurate with the predicted hypothesis that shy children would differ significantly from nonshy children on affective symptoms. Although not statistically significant, some findings were in the right direction for inhibition.

The association found in the current study between anxiety and affective health symptoms is supported by previous researchers who have noted an association between extreme shyness and affective health problems. Bell et al (1990), Kagan et al (1988), and Chung and Evans (2000) have found extremely shy individuals to report affective complaints such as irritability, insomnia, nightmares, sadness/depression, fatigue, and lack of appetite. These findings were supported by the current study which revealed a significant relationship between anxiety and affective health problems. These affective health problems included irritability, fatigue, lack of appetite, sleeping difficulties, headaches, and migraines.

Previous researchers have also noted an association between extreme shyness and gastrointestinal health symptoms. Bell et al (1990) and Kagan et al (1988) found constipation to be consistently reported by extremely shy individuals. Chung and Evans (2000) reported a significant relationship between extreme shyness and 'gastrointestinal upset' which included symptoms of nausea, vomiting, diarrhea, constipation, and cramps. These findings were partially supported by the current study which found a significant gender by gastrointestinal group interaction for anxiety. Among males, those without GI

symptoms were less anxious than those with GI symptoms. Among females, those without GI symptoms were actually more anxious than those with GI symptoms. This latter finding could be a spurious result as sample size was relatively small; perhaps a few females with high scores on the anxiety measure swayed the results. Among children who experienced no gastrointestinal symptoms, females were more anxious than males. Among children who did experience gastrointestinal symptoms, males were more anxious than females. Gastrointestinal symptoms such as nausea and vomiting are characteristics that often accompany anxiety, thus perhaps accounting for the relation between anxiety and G.I. symptoms in males. This is the one finding that is in the predicted direction of the study's speculative hypothesis that shy boys may report more health problems than shy girls. The hypothesis stems from previous research (e.g. Stevenson-Hinde & Glover, 1996) which notes that shyness in girls is more acceptable than shyness in boys, and that extremely shy boys exhibit more 'problem behaviour' than extremely shy girls. The gender by group interaction in the current study should be interpreted with caution since no other gender by health group interactions were found for either anxiety or inhibition.

Schmidt and Fox (1995) found a significant relation between extreme shyness and self reported allergies. Bell et al. (1990) also reported a significant relationship between extreme shyness and hay fever. Unfortunately the current study was not able to analyze hay fever alone as an individual symptom and its relation to inhibition and anxiety, as not enough people checked off hay fever as a symptom experienced in the previous two months. As a result, hay fever was grouped with the other allergy symptoms. No significant associations were found among allergy symptoms, inhibition, and anxiety. However, examination of the means for the gender by allergy group interaction (see

Table 6) appear to be in the direction of an interaction such that for those with no allergy symptoms males were more inhibited than females, and for those with allergy symptoms, females were more inhibited than males. Note that there were only 19 males and 16 females. Perhaps with a larger sample size the interaction would have been significant. Note that if this were the case it goes against the prediction that boys will have more health complaints than girls. It may also be the case that allergies of any sort have yet to develop at the preschool age.

The only significant finding for inhibition was that between total global impact and inhibition for girls, but not boys. This means that compared to inhibited boys, inhibited girls were more affected by the health symptoms they experienced, regardless of how many symptoms were experienced. Recall that the total global impact score is made up of an impact score for each health category, such that a high total global impact score represents a greater frequency of symptom, greater severity of symptom, greater effect on activity, more physician visits, a greater need for medication, and a greater likelihood the symptom still persists. Thus inhibited girls were significantly more 'impacted' than inhibited boys. One reason for this finding may be that girls at the preschool age are more verbal than boys, and are thus better able to communicate symptoms of illness. Another possible reason why girls as opposed to boys were more affected in terms of total global impact is socialization and upbringing. The idea that females are more cognizant of their health than males and are more likely than males to address health concerns, has been supported by various researchers (e.g. Munley, McLaughlin, and Foster, 1999; Suris, Parera, and Puig, 1997). Stevenson-Hinde and Glover (1996) purport that shyness is more acceptable for girls than it is for boys. Perhaps sickness is also more

acceptable for girls than it is for boys. Perhaps parents are more reinforcing of the sick role when it comes to girls, but not boys.

While hypotheses surrounding gender were speculative and exploratory in nature, all findings but one were not in the direction predicted. As mentioned earlier, the single finding that was in the predicted direction with respect to gender was that of males being more anxious than females for those who experienced gastrointestinal symptoms. Not in line with gender predictions was the finding that total global impact was significantly related to inhibition for girls, but not for boys. Although findings were not statistically significant, the means were higher for inhibited girls than inhibited boys among those who experienced gastrointestinal, allergy and infection symptoms. Means were in the same direction for anxious girls and boys who experienced allergy and infection symptoms.

Perhaps the lack of significant findings for inhibition support the notion that health problems, as defined by number of symptoms and impact of symptoms, are only an issue for extremely inhibited children. Perhaps Kagan's (e.g. Kagan, 1988) view of inhibition also applies to health. Recall that Kagan suggests that inhibited and uninhibited types describe only 10-15% of the children in normal samples. The behaviours of the remaining 70-80% of the normal sample who do not fall into these categories are thought to exhibit normal variations in inhibited behaviour. The possibility exists that symptoms of illness are only problematic for the extremely inhibited group while the remainder of normal samples exhibit normal variations in health problems.

Limitations and Suggestions for Future Research

Although it is possible that some of the relations not found in the current

study actually indicate no relations between the actual constructs, it is certainly possible that limitations with the study influenced the results. Several factors are noted that could have limited the findings in the current study. The first of those factors is related to small sample size. The nonsignificant gender by allergy group interaction for inhibition that was just touched on may very well have been affected by the small sample size of 19 males and 16 females.

The study's inability to create extremely shy/inhibited groups (e.g. Kagan) was also likely a function of small sample size. Note that Kagan and colleagues purport it is the extreme shy and unshy groups, approximately 10-15% of the population, that differ from everyone else. The remaining 70-80% of individuals exhibit normal variations of inhibited behaviour. Kagan et al (1988) screened approximately 400 children to get extreme groups of 26 inhibited and 23 uninhibited children. Bell et al (1990) had a sample of 375 to get extreme groups of 18 shy and 19 nonshy children. Schmidt and Fox (1995) had an original sample size of 282 to get extreme groups of 20 shy and 20 nonshy. For the current study, a sample of 97 children would have produced extreme groups of less than 10 subjects. Thus the inability to perform extreme groups analyses potentially limited the current study since the extremities are where significant findings are expected to take place. Not having extreme groups could explain the lack of significant findings for inhibition in the current study. The lack of findings, in turn, may suggest that health problems are only an issue for the extremely inhibited group but not for everyone else.

Another limitation to the current study could have been the chosen method of data collection, as all measures were self-report. With respect to the health questionnaire, what one considers bothersome someone else may not. The retrospective nature of the

health measure may also have been problematic. Perhaps there was a problem with memory accuracy for health symptoms experienced over the previous two months. One possible way to overcome this limitation would be to give parents several copies of the health questionnaire and have one copy completed at the end of each week for a period of 3 to 4 months. This method would still be less laborious than the daily diaries used by Chung and Evans (2000), and there would be less room for retrospective error. Despite the limitation of retrospective error, the health measure used in the current study definitely has its strengths. The Total Global Health Impact Score affords a new way of assessing health, collecting detailed information that goes beyond simply examining whether or not a given symptom is experienced. Its purpose was to reflect the overall impact of symptoms experienced by the child, incorporating information about the frequency of symptom, severity of symptom, limitation of symptom on activity, etc.

Also unaccounted for was any influence that style or characteristics of parenting may have had on completing the shyness and health measures. For example, an over controlling parenting style may not permit a parent to see the magnitude of a child's inhibited behavior. Similarly, whether or not the parent is shy or anxious him or herself may have an influence on how the parent responds to the questions asked. With respect to the health measure, perhaps parents who are more 'sensitive' to illness or who are more reinforcing of the sick role are apt to check off more health symptoms than those who are not.

Finally, it is possible that the age of the participants was a limitation to the current study. Perhaps 3 to 5 years of age is too young to adequately verbalize and express health complaints. Perhaps 3 to 5 years of age is too young for health problems associated with

shyness and inhibition (i.e. allergies) to emerge. In other words, perhaps shyness/inhibition has not developed to the point it needs to in order to affect one's health. Perhaps another reason why there weren't more significant findings in the current study is a physiological one. There may very well be physiological differences between shy and nonshy individuals within the immune system that are just not yet apparent at the preschool age. Perhaps there is something going on at a physiological level that is suppressing the emergence of health problems or making potential health problems latent until further physiological development.

The inclusion of a physiological measure, i.e. cortisol readings, is necessary for future research. Additionally, a more quantitative measure of health (e.g. tracking number of school absences or physician visits), alongside the health questionnaire, would strongly enhance subsequent research. The addition of such measures would strengthen the qualitative self-report measures. Other suggestions for future research include a sample size that can afford analyses of extremely inhibited/shy groups, a measure that could partial out unwanted influence due to parenting style, and a slightly different way of collecting health information (e.g. completing health measure on a weekly basis, inclusion of a physiological measure, etc.).

Furthermore, gender differences in health problems should continue to be examined since findings surrounding this matter are inconclusive. With regards to age, it would be interesting to conduct this same type of research on preschoolers and follow them longitudinally to see if expression/manifestation of health problems increase with age.

Conclusion

In conclusion, there is still much research to be done in the area of shyness/inhibition and its relation to health problems for individuals both young and old. Does being shy cause individuals to develop a weakened immune system, the result of which is getting sick more often? Do certain physiological patterns cause an individual to be both more shy and to have a weaker immune system, the result of which is getting sick more often? Does being sick cause an individual to become shy? With more research in this area, the closer one will get to revealing the underlying relationship, if indeed there is a relationship, between shyness and illness.

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Appendix A

COLORADO CHILD TEMPERAMENT INVENTORY

For _____
(Child's NAME)

Please answer the items on these pages about the behavior of this child by circling one of the numbers following each item. We know that no item will apply to the child in every situation, but try to consider his/her usual or general behavior. Please answer honestly— there are no right or wrong answers.

	How much is the child like that?				
	Not at all (Strongly DISAGREE)			A lot (Strongly AGREE)	
1. Child persists at a task until successful.	1	2	3	4	5
2. Child gives up easily when difficulties are encountered.	1	2	3	4	5
3. Child tends to be shy.	1	2	3	4	5
4. Child cries easily.	1	2	3	4	5
5. When upset by an unexpected situation, child quickly calms down.	1	2	3	4	5
6. Child goes from toy to toy quickly.	1	2	3	4	5
7. Child likes to be with people.	1	2	3	4	5
8. Child is always on the go.	1	2	3	4	5
9. Whenever child starts crying, he/she can be easily distracted.	1	2	3	4	5
10. Child prefers playing with others than alone.	1	2	3	4	5
11. Child tends to be somewhat emotional.	1	2	3	4	5
11. When child moves about, he/she usually moves slowly.	1	2	3	4	5
13. If talked to, child stops crying.	1	2	3	4	5
14. Child makes friends easily.	1	2	3	4	5
15. Child is off and running as soon as he/she wakes up in the morning.	1	2	3	4	5

	How much is the child like that?				
	Not at all (Strongly DISAGREE)		A lot (Strongly AGREE)		
16. Child finds people more stimulating than anything else.	1	2	3	4	5
17. Child often fusses and cries.	1	2	3	4	5
18. With a difficult toy, child gives up easily.	1	2	3	4	5
19. Child is very sociable.	1	2	3	4	5
20. Child is very energetic.	1	2	3	4	5
21. Child takes a long time to warm up to strangers.	1	2	3	4	5
22. Child plays with a single toy for long periods of time.	1	2	3	4	5
23. Child gets upset easily.	1	2	3	4	5
24. Child is something of a loner.	1	2	3	4	5
25. Child prefers quiet, inactive games to more active ones.	1	2	3	4	5
26. When alone, child feels isolated.	1	2	3	4	5
27. Child tolerates frustration well.	1	2	3	4	5
28. Child reacts intensely when upset.	1	2	3	4	5
29. Child stops fussing whenever someone talks to him/her or picks him/her up.	1	2	3	4	5
30. Child is very friendly with strangers.	1	2	3	4	5

Appendix B

Parental Inhibition Scale

1. When my child meets unknown adults he/she needs a long time to warm up.

1	2	3	4	5	6	7
Never						Always

2. My child is shy toward unknown adults.

1	2	3	4	5	6	7
Never						Always

3. My child is somewhat inhibited toward unknown adults.

1	2	3	4	5	6	7
Never						Always

4. My child easily approaches unknown adults

1	2	3	4	5	6	7
Never						Always

5. When my child meets unknown children he/she needs a long time to warm up.

1	2	3	4	5	6	7
Never						Always

6. My child is shy toward unknown children.

1	2	3	4	5	6	7
Never						Always

7. My child is somewhat inhibited toward unknown children

1	2	3	4	5	6	7
Never						Always

8. My child easily approaches unknown children

1	2	3	4	5	6	7
Never						Always

Appendix C

Child's name or ID _____ Date _____

Rated by (teacher) _____ School _____

Child Behavior Scale

Please consider the descriptions contained in each of the following items below and rate the extent to which each of these descriptions applies to this child, particularly in the context of his/her behavior with peers. For example, circle 3- "Certainly applies" if the child often displays the behavior described in the statement, circle 2- "Applies sometimes" if the child occasionally displays the behavior, and circle 1- "Doesn't apply" if the child seldom displays the behavior. Please circle only one response per item.

1=Doesn't apply 2=Applies sometimes 3=Certainly applies

1 2 3 1. Restless. Runs about or jumps up and down. Doesn't keep still

1 2 3 2. Squirmy, fidgety child

1 2 3 3. Destroys own or others' belongings

1 2 3 4. Fights with other children

1 2 3 5. Not much liked by children

1 2 3 6. Is worried. Worries about many things

1 2 3 7. Irritable; "quick to fly off the handle"

1 2 3 8. Appears miserable, unhappy, tearful, or distressed

1 2 3 9. Has twitches, mannerisms, or tics of the face and body

1 2 3 10. Is disobedient

1 2 3 11. Has poor concentration or short attention span

1 2 3 12. Tends to be fearful or afraid of new things or new situations

1 2 3 13. Fussy or over-particular

1 2 3 14. Tells lies

1 2 3 15. Has speech difficulty

<u>1=Doesn't apply</u>	<u>2=Applies sometimes</u>	<u>3=Certainly applies</u>
-
- 1 2 3 16. Bullies other children

 - 1 2 3 17. Inattentive

 - 1 2 3 18. Doesn't share toys

 - 1 2 3 19. Cries easily

 - 1 2 3 20. Blames others

 - 1 2 3 21. Gives up easily

 - 1 2 3 22. Inconsiderate of others

 - 1 2 3 23. Kicks, bites or hits other children

 - 1 2 3 24. Stares into space

 - 1 2 3 25. Prefers to play alone

 - 1 2 3 26. Helps other children

 - 1 2 3 27. Peers refuse to let this child play with them

 - 1 2 3 28. Shows a recognition of the feelings of others; is empathetic

 - 1 2 3 29. Tend to react to other children's distress by teasing them or making things worse

 - 1 2 3 30. Not chosen as playmate by peers

 - 1 2 3 31. Likes to be alone

 - 1 2 3 32. Keeps peers at a distance

 - 1 2 3 33. Peers avoid this child

 - 1 2 3 34. Seems concerned when other children are distressed

 - 1 2 3 35. Aggressive child

 - 1 2 3 36. Taunts and teases other children

 - 1 2 3 37. Often unoccupied

1=Doesn't apply	2=Applies sometimes	3=Certainly applies
- 1 2 3 38. Threatens other children
 - 1 2 3 39. Takes turns with play material
 - 1 2 3 40. Kind toward peers
 - 1 2 3 41. Can be trusted, is dependable
 - 1 2 3 42. Listens to classmates
 - 1 2 3 43. Excluded from peers' activities
 - 1 2 3 44. Compromises in conflict with peers
 - 1 2 3 45. Is ignored by peers
 - 1 2 3 46. Cooperative with peers
 - 1 2 3 47. Loses temper easily in conflicts with peers
 - 1 2 3 48. Argues with peers
 - 1 2 3 49. Friendly toward other children
 - 1 2 3 50. Annoys or irritates other children
 - 1 2 3 51. Solitary child
 - 1 2 3 52. Disrupts peers' activities
 - 1 2 3 53. Shows concern for moral issues (e.g., fairness, welfare or others)
 - 1 2 3 54. Ridiculed by peers
 - 1 2 3 55. Avoids peers
 - 1 2 3 56. Offers help or comfort when other children are upset
 - 1 2 3 57. Withdraws from peer activities
 - 1 2 3 58. Will continue to bother or hurt other children even when they are clearly
upset
 - 1 2 3 59. Bossy toward peers

Appendix D

Health Measure

The following are chronic/longstanding health problems that are sometimes experienced by young children. Please check off any of these that apply to your child.

Food Allergies	_____	Skin Allergies	_____
Hay Fever (refer to the	_____	Respiratory Allergies	_____
most recent allergy season)	_____	Eczema	_____
Asthma	_____	Other Skin Allergies	_____

Three OTHER spaces have been added to the list. Please name any other chronic or longstanding health problems (e.g. anemia, diabetes) that are not listed above.

OTHER _____
 OTHER _____
 OTHER _____

The following are health problems that are sometimes experienced by young children. Please think carefully about the previous **2 months prior to completing this questionnaire**, and check off any symptoms your child may have experienced during that time.

Cold/flu	_____	Hives	_____	Vomiting	_____
Cough	_____	Fever (of	_____	Overeating	_____
Nausea	_____	unknown origin)	_____	Lack of Appetite	_____
Cramps	_____	Breathing Difficulties	_____	Ear Infection	_____
(stomach)	_____	Irritability	_____	Eye Infection	_____
Diarrhea	_____	Migraines	_____	Throat Infection	_____
Constipation	_____	Headaches	_____	Urinary Infection	_____
Fatigue	_____	Dizziness	_____	Nose Bleeds	_____

_____ Difficulty sleeping _____

Three OTHER spaces have been added to the list. Please name any health related symptoms experienced by your child that are not listed above.

OTHER _____
 OTHER _____
 OTHER _____

Overall, how would you rate your child's health: Please circle.

1	2	3	4	5	6	7
unhealthy						healthy

Note: If none of these health problems or symptoms can be applied to your child, please write 'N/A' at the top of this page, and still include it in the return of all forms.

FOR ANY SYMPTOMS YOU HAVE CHECKED ABOVE (INCLUDING CHRONIC/LONGSTANDING HEALTH PROBLEMS), PLEASE ANSWER THE FOLLOWING 6 QUESTIONS FOR EACH SYMPTOM. SHOULD YOU NEED ADDITIONAL ROOM, PLEASE WRITE ON THE BACK OF THE PAPER.

HEALTH PROBLEM I.

1. Name of symptom: _____
2. How many times has your child experienced this symptom **during the last 2 months:**
 - (a) none
 - (b) once or twice
 - (c) 3 to 5 times
 - (d) more than 5 times
3. How would you describe the severity of your child's symptom (how bothersome or painful was the symptom)?
 - (a) not at all bothersome
 - (b) somewhat bothersome
 - (c) moderately bothersome
 - (d) very bothersome
4. How many times have you visited a physician or health practitioner **in the last 2 months:**
 - (a) never
 - (b) once or twice
 - (c) 3 to 5 times
 - (d) more than 5 times
5. How much has your child's regular activities been limited by this particular symptom **in the last 2 months:**
 - (a) activity not at all affected by symptom
 - (b) activity slightly affected by symptom
 - (c) activity moderately affected by symptom
 - (d) activity severely affected by symptom
6. What is the current status of the health problem?
 - (a) problem has been resolved
 - (b) problem is still being experienced
 - (c) problem has gotten better but is not completely resolved
 - (e) problem has gotten worse
7. **In the last 2 months**, your child has received medication for this particular symptom:
 - (a) never
 - (b) as needed: please state frequency

 - (c) regularly: please state frequency

ADDITIONAL COMMENTS about this health problem/symptom can be written on the back of this page.

HEALTH PROBLEM II.

1. Name of symptom: _____
2. How many times has your child experienced this symptom **during the last 2 months:**
 - (a) none
 - (b) once or twice
 - (c) 3 to 5 times
 - (d) more than 5 times
3. How would you describe the severity of your child's symptom (how bothersome or painful was the symptom)?
 - (a) not at all bothersome
 - (b) somewhat bothersome
 - (c) moderately bothersome
 - (d) very bothersome
4. How many times have you visited a physician or health practitioner **in the last 2 months:**
 - (a) never
 - (b) once or twice
 - (c) 3 to 5 times
 - (d) more than 5 times
5. How much has your child's regular activities been limited by this particular symptom **in the last 2 months:**
 - (a) activity not at all affected by symptom
 - (b) activity slightly affected by symptom
 - (c) activity moderately affected by symptom
 - (d) activity severely affected by symptom
6. What is the current status of the health problem?
 - (a) problem has been resolved
 - (b) problem is still being experienced
 - (c) problem has gotten better but is not completely resolved
 - (d) problem has gotten worse
7. **In the last 2 months**, your child has received medication for this particular symptom:
 - (a) never
 - (b) as needed: please state frequency

 - (c) regularly: please state frequency

ADDITIONAL COMMENTS about this health problem/symptom can be written on the back of this page.

HEALTH PROBLEM III.

1. Name of symptom: _____
2. How many times has your child experienced this symptom **during the last 2 months:**
 - (a) none
 - (b) once or twice
 - (c) 3 to 5 times
 - (d) more than 5 times
3. How would you describe the severity of your child's symptom (how bothersome or painful was the symptom)?
 - (a) not at all bothersome
 - (b) somewhat bothersome
 - (c) moderately bothersome
 - (d) very bothersome
4. How many times have you visited a physician or health practitioner **in the last 2 months:**
 - (a) never
 - (b) once or twice
 - (c) 3 to 5 times
 - (d) more than 5 times
5. How much has your child's regular activities been limited by this particular symptom **in the last 2 months:**
 - (a) activity not at all affected by symptom
 - (b) activity slightly affected by symptom
 - (c) activity moderately affected by symptom
 - (d) activity severely affected by symptom
6. What is the current status of the health problem?
 - (a) problem has been resolved
 - (b) problem is still being experienced
 - (c) problem has gotten better but is not completely resolved
 - (d) problem has gotten worse
7. **In the last 2 months**, your child has received medication for this particular symptom:
 - (a) never
 - (b) as needed: please state frequency

 - (c) regularly: please state frequency

ADDITIONAL COMMENTS about this health problem/symptom can be written on the back of this page.

HEALTH PROBLEM IV.

1. Name of symptom: _____
2. How many times has your child experienced this symptom **during the last 2 months:**
 - (a) none
 - (b) once or twice
 - (c) 3 to 5 times
 - (d) more than 5 times
3. How would you describe the severity of your child's symptom (how bothersome or painful was the symptom)?
 - (a) not at all bothersome
 - (b) somewhat bothersome
 - (c) moderately bothersome
 - (d) very bothersome
4. How many times have you visited a physician or health practitioner **in the last 2 months:**
 - (a) never
 - (b) once or twice
 - (c) 3 to 5 times
 - (d) more than 5 times
5. How much has your child's regular activities been limited by this particular symptom **in the last 2 months:**
 - (a) activity not at all affected by symptom
 - (b) activity slightly affected by symptom
 - (c) activity moderately affected by symptom
 - (d) activity severely affected by symptom
6. What is the current status of the health problem?
 - (a) problem has been resolved
 - (b) problem is still being experienced
 - (c) problem has gotten better but is not completely resolved
 - (d) problem has gotten worse
7. **In the last 2 months**, your child has received medication for this particular symptom:
 - (a) never
 - (b) as needed: please state frequency

 - (c) regularly: please state frequency

ADDITIONAL COMMENTS about this health problem/symptom can be written on the back of this page.

HEALTH PROBLEM V.

1. Name of symptom: _____
2. How many times has your child experienced this symptom **during the last 2 months:**
 - (a) none
 - (b) once or twice
 - (c) 3 to 5 times
 - (d) more than 5 times
3. How would you describe the severity of your child's symptom (how bothersome or painful was the symptom)?
 - (a) not at all bothersome
 - (b) somewhat bothersome
 - (c) moderately bothersome
 - (d) very bothersome
4. How many times have you visited a physician or health practitioner **in the last 2 months:**
 - (a) never
 - (b) once or twice
 - (c) 3 to 5 times
 - (d) more than 5 times
5. How much has your child's regular activities been limited by this particular symptom **in the last 2 months:**
 - (a) activity not at all affected by symptom
 - (b) activity slightly affected by symptom
 - (c) activity moderately affected by symptom
 - (d) activity severely affected by symptom
6. What is the current status of the health problem?
 - (a) problem has been resolved
 - (b) problem is still being experienced
 - (c) problem has gotten better but is not completely resolved
 - (d) problem has gotten worse
7. **In the last 2 months**, your child has received medication for this particular symptom:
 - (a) never
 - (b) as needed: please state frequency

 - (c) regularly: please state frequency

ADDITIONAL COMMENTS about this health problem/symptom can be written on the back of this page.