Theory of Mind Decoding and Reasoning Abilities in Depression, Social Phobia, and Comorbid Conditions

By

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Abstract

Vulnerability to major depressive disorder (MDD) is characterized by extensive interpersonal dysfunction. A framework that has been used to understand this impairment is theory of mind, or the ability to decode and reason about others’ mental states. Previous research has identified a mental state decoding advantage in individuals with a past history of MDD, which has been explained in terms of an enhanced social orientation in those with depression vulnerability. Although social phobia is highly comorbid with MDD, there is no research investigating theory of mind abilities in individuals with social phobia, nor has there been research examining how social anxiety may better account for the relation of depression to heightened theory of mind ability. Furthermore, there is a paucity of research investigating whether evidence of such a relation extends to the more complex task of reasoning about others’ mental states. Thus, the goals of the current investigation were to examine whether heightened ToM accuracy in those with a history of MDD is better accounted for by social phobia, and whether superior ToM skills in those with past MDD are seen across tasks that tap the domains of decoding and reasoning. Participants (N = 109) were assigned to one of four groups based on a structured diagnostic interview: (a) past MDD only (n = 36); (b) social anxiety disorder only (n = 9); (c) comorbid past MDD and social anxiety disorder (n = 23); and (d) no psychiatric history (n = 41).

Results show that having a history of MDD is associated with heightened mental state reasoning abilities only in the presence of current social phobia. However, theory of mind decoding was not elevated in this condition. This suggests that social phobia differentially influences the relation of past MDD and theory of mind ability for decoding and reasoning abilities. Furthermore, social phobia without a history of depression was associated with poor
theory of mind decoding and reasoning. This reduced ability in individuals with social phobia may be the result of self-focused attention or avoidance of potential negative evaluation, but future research is required to specifically address these possibilities.
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Chapter 1

Introduction

With an overall lifetime prevalence rate of 12 percent in Canada (Patten et al., 2006), Major Depressive Disorder (MDD) is one of the most common psychological disorders and leads to a wide range of difficulties. Individuals with both the full clinical syndrome of MDD, as well as those with subthreshold depression symptoms (i.e., dysphoria) exhibit significant distress and a wide array of impairments, including lower educational and occupational attainment, as well as poorer physical health (Canadian Psychiatric Association, 2002; Fossati, Ergis, & Allilaire, 2002; Taconnat et al., 2010).

An impairment that is particularly salient in both MDD and dysphoria is interpersonal dysfunction. Individuals with MDD display less competence in social interactions (Cole, Martin, Powers, & Truglio, 1996) and interact maladaptively with others in ways that contribute to stressful interpersonal events (Davila, Hammen, Burge, Daley, & Paley, 1995). Also, they report that interactions are less enjoyable and rewarding than non-depressed individuals (Nezlek, Hampton, & Shean, 2000) and socially withdrawal from others, which may in turn perpetuate depressive symptoms (Beekman, Deeg, van Tilberg, Smit, Hooijer, & van Tilberg, 1995). Even upon remission of MDD, individuals with a depression history continue to exhibit significant impairment in key areas of psychosocial functioning (Coryell, Scheltner, Keller, Endicott, Maser, & Klerman, 1993; Rao et al., 1995; Tweed, 1993). Hammen & Brennan (2002) found that, compared to never-depressed women, formerly depressed women had more problematic relationships with their children, friends, and extended family. They also reported more stressful life events, specifically with conflict in interpersonal interactions. Similarly, dysphoria is associated with social skills deficits that lead to social impairment (Segrin, 2000). Compared to
non-depressed individuals, they have fewer social contacts (Billings & Moos, 1984), greater conflict with romantic partners (Daley, & Hammen, 2002), and they report decreased satisfaction in interpersonal interactions (Locke, 1994). Also, their negative interpersonal behaviours can lead to rejection by others (Joiner & Metalsky, 1995).

The substantial interpersonal difficulties exhibited by individuals across the spectrum of depression severity highlight the importance of understanding the mechanisms that underlie social dysfunction in depression (Johnson, Andersson-Lundman, Aberg-Wistedt, & Mathe, 2000). The foundation of social functioning is theory of mind (ToM), which refers to the ability to decode and reason about others’ mental states (e.g., beliefs, intentions, emotions, and desires) in an effort to understand and predict their social behaviour (Wellman, 1990). Over the past 10 years, the theory of mind framework has been applied to depression in an effort to understand these individuals’ profound interpersonal dysfunction. This research has revealed an intriguing paradox. Although both individuals with a diagnosis of current MDD and those who are vulnerable to depression, either due to the expression of subthreshold symptoms or due to a past depression history, experience social impairment, there is a clear divergence in their theory of mind ability: On the one hand, those in a current episode of MDD show impairment in their theory of mind performance compared with healthy controls (Lee, Harkness, Sabbagh, & Jacobson, 2005; Kettle, O’Brien-Simpson & Allen, 2008; Wang, Wang, Chen, Zhu, Wang, 2008). On the other hand, depression vulnerable individuals display enhanced theory of mind ability relative to healthy controls (Harkness, Jacobson, Duong, & Sabbagh, 2010; Harkness, Sabbagh, Jacobson, Chowdrey, & Chen, 2005; Harkness, Washburn, Theriault, Lee, & Sabbagh, 2011). The findings related to MDD are easy to reconcile with other literature examining theory of mind deficits in other clinical conditions (e.g., schizophrenia, bipolar disorder, autism...
spectrum disorders; Baron-Cohen, 2000; Bora et al., 2005; Brüne, 2005). However, the enhanced theory of mind performance seen in those with dysphoria or a past history of depression poses something of a paradox. Why would these individuals, who show severe interpersonal dysfunction, also show enhanced abilities in this basic social cognitive skill?

The purpose of the current study was to further our understanding of theory of mind functioning as it relates to depression, and, specifically, to address the paradox relating depression vulnerability with enhanced theory of mind. Several researchers have suggested that anxiety, and in particular social anxiety, might help in understanding this paradox. Social anxiety is characterized by interpersonal dysfunction as a primary impairment, and is highly comorbid with depression (Chavira, Stein, Bailey, & Stein, 2004; Davidson, Hughes, George, & Blazer, 1993; Essau, Conradt, & Petermann, 1999; Sanderson, DiNardo, Rapee, & Barlow, 1990; Schneier et al., 1994). It is plausible that the theory of mind advantage exhibited by depression vulnerable individuals is better attributed to social anxiety that is so frequently comorbid with depression vulnerability.

Therefore, the primary goal of the current study was to examine differences in theory of mind ability among those with a ‘pure’ depression vulnerability, not comorbid with social phobia, those with a ‘pure’ social phobia, those with both a depression vulnerability and social phobia, as compared to healthy controls. The specific depression vulnerable group used in this study was comprised of those with a past history of MDD who were currently in remission.

**Theory of Mind**

Theory of mind is a framework that has been fruitful in understanding social cognitive deficits in other disorders characterized by social impairment such as schizophrenia, autism, and sociopathy (e.g., Baron-Cohen, Leslie, & Frith, 1985; Blair & Cipolotti, 2000; Frith & Corcoran,
Two components of theory of mind have been identified (Sabbagh, 2004). First, theory of mind **decoding** involves using information that is immediate and observable in the social environment (e.g., tone of voice, body posture, facial expression) to accurately label another’s mental state. An example of decoding would be determining that one’s conversational partner is angry based on his or her facial expression. Second, theory of mind **reasoning** involves using mental states to explain or predict others’ actions. Theory of mind reasoning requires an integration of personal knowledge about others within the contextual circumstances. An example of this would be reasoning that one’s conversational partner is angry *because* there are dirty dishes in the sink, one knows that this individual dislikes dirty dishes in the sink and, despite an agreement not to do so, it has happened several times. These abilities work in concert to accurately identify and interpret messages fluidly in social interactions.

The relation of depression and other clinical conditions to theory of mind decoding has been assessed using the “Reading the Mind in the Eyes” (Eyes) task (Baron-Cohen, Wheelwright, Hill, Raste, & Plumb, 2001). This task involves participants viewing a pair of eyes and having to choose one out four adjectives that best describes the thought, emotion, or intention that is being conveyed. It is a difficult task and has several design features that maximize its ability to detect subtle individual differences in performance. For example, it includes complex mental states such as ‘contemplative’, ‘cautious’, and ‘playful’ as opposed to basic emotions (e.g., happy, sad), and the mental state distractor terms are matched closely in emotional valence to the target word. As such, healthy adults perform at approximately 70 percent accuracy (Baron-Cohen et al., 2001). This high ceiling allows for the detection of superior patterns of performance in particular groups.
Theory of mind reasoning has traditionally been assessed using first- and second-order false belief tasks (e.g., Stone, Baron-Cohen, & Knight, 1998; Wimmer & Perner, 1983). False belief tasks assess an individual’s ability to recognize that others have beliefs and knowledge about the world that is different than their own. A first-order false belief is indicated when Person 1 *incorrectly* believes that object A exists in location B. A second-order false belief occurs when Person 2 *incorrectly* believes that Person 1 thinks that object A exists in location B.

Another type of mental state reasoning task is the Faux Pas task. In these tasks, participants read stories, some of which contain something that is socially inappropriate. At the end of each story, participants are asked two Faux Pas questions (e.g., “Did anyone say something they should not have said or something awkward?”). An important problem with both of these types of tasks is that they are very easy and have low ceilings in healthy control groups (Corcoran & Frith, 2003). As such, they are not useful in assessing individual differences in non-clinical groups or in groups that would be expected to show enhanced performance relative to healthy controls.

Recently, an advanced test of mental state reasoning utilizing video has been developed to increase test sensitivity and to more closely approximate the social cognitive skills used in more common life situations. The ‘Movie for the Assessment of Social Cognition’ (MASC) task (Dziobek et al., 2006) involves watching a short (15 minutes) film of four people interacting at a dinner party that is paused at 45 time points and requires participants to answer multiple choice questions probing their understanding of the characters’ feelings, thoughts, and intentions at the point where the film was stopped. This task has the advantages of being a sensitive evaluation of subtle ToM reasoning ability and it incorporates several aspects of social cognition (i.e., first- and second- order false beliefs, deception, faux pas, persuasion, metaphor, sarcasm, and irony) into one task. Furthermore, the replication of common social situations lends the task strong
ecological validity. Although the items vary in difficulty, the test was designed to be challenging so as to detect even subtle difficulties in social understanding.

A more recently developed task is the Director task (Keysar, Barr, Balin, & Brauner, 2000). This task was originally developed to assess perspective taking, but has also been used in studies of theory of mind reasoning. In this task, a participant and a confederate are seated on the opposite side of a grid. The grid contains objects, some of which are occluded from the confederate so they are only visible by the participant. The confederate gives instructions on how to move objects around, and some of the trials require the participant to use the perspective of the confederate when moving the required object. An advantage of this task is that it is both verbally communicative (as opposed to reading stories and answering questions) and interactive, lending it more ecological validity than some tasks used in the previous research. As well, this task is based on a paradigm that results in a high number of errors in healthy adults (Keysar, Lin, & Barr, 2003), indicating that it has a high ceiling.

In the current study it is important to utilize tasks that are sensitive and exhibit a large range of response accuracy given that the hypothesized individual differences are subtle and in the direction of enhanced performance in the clinical groups. For these reasons, the current study employed the Eyes task to assess theory of mind decoding and the MASC and Director tasks to assess theory of mind reasoning. Previous research examining theory of mind functioning in depression and social anxiety using these tasks is reviewed below.

**Theory of Mind and Depression**

**Current MDD and Theory of Mind.** A number of studies have investigated differences in theory of mind ability between individuals with MDD and healthy controls. MDD is a clinical condition defined by the Diagnostic and Statistical Manual for Mental Disorders (DSM-IV-TR:
American Psychiatric Association, 2000) as comprising a constellation of five of nine symptoms that persist for at least two weeks, one of which must be depressed mood or the loss of interest or pleasure in most activities. Other symptoms of MDD include changes in appetite or weight, sleep, and psychomotor activity; decreased energy; feelings of worthlessness or excessive guilt; difficulty thinking, concentrating, or making decisions; or recurrent thoughts of death or suicidal ideation, plans, or attempts.

Studies investigating differences in theory of mind decoding between outpatients with clinically diagnosed MDD and healthy controls have been mixed. On the one hand, studies by Lee et al. (2005), Wang et al. (2007), and Kettle et al. (2008) all reported that the MDD patient groups performed significantly worse than controls on tasks of mental state decoding, including the Eyes task. Further, Lee et al. (2005) found that symptoms of hopelessness depression most strongly mediated their effects, suggesting that individuals with MDD may not have a motivation to attend to others’ mental states. On the other hand, a more recent study employing the Eyes task failed to find a significant difference between individuals with an MDD diagnosis and nondepressed individuals (Wolkenstein, Schonenberg, Schirm, & Hautzinger, 2011). This discordant finding may be accounted for by the fact that the Wolkenstein and colleagues’ (2011) sample included individuals with dysthymia, which is a much less severe form of depression than MDD.

A further four studies have investigated theory of mind reasoning in MDD, and results are also somewhat mixed. Specifically, Wang et al. (2007) found deficits in inpatients in their first episode of MDD compared to healthy controls on the Faux Pas task. Further, Zobel and his colleagues (2010) also found that theory of mind reasoning abilities in individuals with major depression were impaired in a subgroup of individuals with chronic depression, who have been
shown to have deficits in a broad range of cognitive functions (Levin, Heller, Mohanty, Herrington, & Miller, 2007; Tavares, Drevets, & Sahakian, 2003). Reasoning ability was measured using two tasks. In the first, participants were asked to logically sequence four pictures of cartoon picture stories involving either deception, cooperation of two characters, or cooperation of two characters at the cost of a third character. They also completed a ToM questionnaire with first- and second-order questions based on the stories. The second task involved sequencing six cartoon pictures and then narrating the story. The narration was recorded and coded for statements describing affective states, intentions, and cognitions. Participants demonstrated impaired reasoning on all measures compared to controls. Interestingly however, after controlling for logical memory and working memory, the differences between groups on all tasks were reduced to nonsignificance, suggesting that these deficits may be associated with general cognitive impairments (Zobel et al., 2010). Finally, Wolkenstein and her colleagues (2011) found deficits between outpatients with MDD and matched healthy controls on the MASC task.

In contrast, Wilbertz, Brakemeier, Zobel, Härter, & Schramm (2010) also used the MASC task in a sample of early onset chronically depressed individuals and found no differences in performance relative to controls. The difference in their findings may lie in the performance of the control group rather than the abilities of the depressed group. Wilbertz et al. (2010) reported that they did not assess psychopathology in their control group; thus, it is possible that unidentified psychopathology in the control group may explain this group’s lower task accuracy. Indeed, the control group in the Wilbertz et al. (2010) study performed much worse on the MASC than the control group of the Wolkenstein et al. (2011) study, or than the healthy groups used in other studies using the MASC (Dziobek et al., 2006; Montag et al., 2010).
To sum the research on theory of mind ability in individuals with current MDD, the balance of the literature suggests that both mental state decoding and mental state reasoning are impaired.

**Depression Vulnerability and Theory of Mind.** In direct contrast to the studies reviewed above, individuals with a vulnerability to developing major depression have a *heightened* theory of mind ability compared to their healthy counterparts. These studies have examined three specific groups who show a depression vulnerability: (1) those with subthreshold depression (dyshporia); (2) those with a past history of MDD currently in remission, and (3) those with identified risk factors for depression (e.g., a maternal history of depression).

First, in two independent samples, dysphoric university students were found to have enhanced mental state decoding ability relative to controls, as measured using the Eyes task (Harkness et al., 2005). Second, Harkness and colleagues (2010) compared performance on the Eyes task between university students with a past history of MDD currently in remission, with never-depressed individuals. Again, the past depressed group was significantly more accurate in decoding mental states than those with no history of depression. Third, in a sample of female outpatients versus healthy controls, Harkness and colleagues (2011) found that those with a maternal history of depression, whether or not they were currently depressed, demonstrated superior mental state decoding ability, as assessed by the Eyes task, relative to women without this history.

Only one study has examined reasoning ability in remitted depression. Inoue, Tanooka, Yamada, & Kanba (2004) compared a group of individuals with a history of unipolar or bipolar disorder, currently in remission, to healthy controls on a cartoon picture story assessing first- and second-order false belief tasks. Inoue and her colleagues (2004) found that the clinical group was
significantly less accurate than controls on the second-order false belief task, and concluded that theory of mind reasoning is impaired in depressive patients in symptomatic remission. These results, however, must be interpreted with caution. Their sample included both individuals with diagnoses of unipolar depression and bipolar depression, which is an important consideration. There is evidence that individuals with bipolar disorder show greater impairment than those with unipolar depression on a number of cognitive abilities (Sweeney, Kmiec, & Kupfer, 2000; Wolfe, Granholm, Butters, Sanders, & Janowsky, 1987), including pattern and spatial recognition memory (Murphey et al., 1999) and recognizing similarities and differences among visual stimuli (Savard, Rey, & Post, 1980). These basic cognitive functions were not controlled for in the above study. Therefore, at present we are unable to make a conclusion regarding the theory of mind reasoning abilities in those with a depression vulnerability. This is an important gap in the literature that was addressed in the current study.

In summary, the depression and theory of mind decoding literature reviewed above outlines a clear dissociation in performance between those with clinical levels of MDD and those who are vulnerable to MDD, but are not currently depressed. This dissociation is intriguing and may reflect differences in the motivational tendencies of these two groups. In particular, it has been suggested that individuals vulnerable to depression may have a hypersensitivity to subtle social information as an adaptive design, whereby these individuals gain an advantage in their ability to minimize risk of damage to interpersonal relationships (Allen & Badcock, 2003). As a complementary mechanism, these individuals’ hypersensitivity to others’ mental states may be motivated by a desire for satisfying interpersonal relationships (Harkness, Jacobson, Sinclair, Chan, & Sabbagh, 2012). As a test of the motivation hypothesis, Harkness et al. (2012) assigned dysphoric and non-dysphoric undergraduate university students to one of three motivation
conditions before beginning the Eyes task: (1) a social motivation, in which participants read a passage stating that those who do better on the Eyes task tend to have rewarding and long-lasting relationships with others. They were also told that those who do poorly are more likely to be alone later in life; (2) a monetary motivation, in which they received a chance to win a monetary draw with every correct answer; or (3) no motivation, in which participants did not receive any additional instructions prior to beginning the Eyes task. The results showed that, among the dysphoric participants, the social motivation was associated with greater mental state decoding ability than the monetary or no motivation conditions, whereas the non-dysphoric group performed best when prompted with monetary reward. These results suggest that dysphoric individuals may be especially motivated to understand the mental states of others.

A further possible explanation for the above pattern of enhanced performance in individuals vulnerable to MDD is anxiety, and, in particular, social anxiety. People high in social anxiety are extremely distressed in social situations. We might expect that, in an effort to reduce their distress by gaining a greater sense of control, these individuals may put more effort into understanding these situations by being more vigilant to social cues. Harkness and colleagues (2005) were interested in whether anxiety that co-occurs with a vulnerability dysphoria mediated their enhanced decoding ability. They found no relation between mental state decoding and anxiety. Moreover, the dysphoric group’s heightened decoding ability remained after statistically controlling for anxiety. However, the anxious symptoms assessed were most specific to panic disorder (e.g., “was trembling or shaking”, “was afraid I was going to die”). Thus, the precise relation of theory of mind ability to the combined presentation of social phobia and depression vulnerability is still undetermined. Therefore, the enhanced theory of mind ability observed in depression vulnerable individuals may be better explained by the hypervigilance displayed as a
result of co-occurring social anxiety. The following section describes social phobia as a disorder, and reviews the literature on facial emotion recognition in individuals with social phobia and how it relates to theory of mind ability.

**Theory of Mind and Social Phobia**

The most pronounced characteristic of social anxiety disorder, or ‘Social Phobia’, is pronounced social impairment. The DSM-IV-TR defines social phobia as “A marked and persistent fear of one or more social or performance situations in which the person is exposed to unfamiliar people or to possible scrutiny by others. The individual fears that he or she will act in a way (or show anxiety symptoms) that will be humiliating or embarrassing” (American Psychiatric Association, 2000, p. 456). The individual will avoid these situations or will endure them with intense anxiety to the point that it causes impairment.

The social functioning deficits in socially phobic individuals are similar to those with MDD and depression vulnerability. Socially anxious individuals behave in ways that lead to negative social outcomes (Clark, 2001), and individuals with social phobia reported being at least moderately impaired in relationships with family, romantic partners, and friends (Schneier et al., 1994). As a result of having weak social networks and fewer friends, they experience a high degree of social isolation and report having low perceived social support (Davidson et al., 1993; Sanderson et al., 1990). These interpersonal difficulties are often maintained because socially phobic individuals are unlikely to pursue help, with only four percent seeking professional treatment (Magee, Eaton, Wittchen, McGonagle, & Kessler, 1996).

Despite social impairment being a definitional feature of Social Phobia, there are currently no studies examining theory of mind abilities in the disorder. Nevertheless, an area of research that may provide our first clues of theory of mind ability in individuals with social
phobia is facial emotion recognition research. There are studies that have found no difference in facial emotion labeling between individuals with social phobia and non-anxious controls. In a study by Philippot and Douilliez (2005), out-patients with social phobia were compared to individuals with another anxiety as well as healthy controls on a task that required evaluating emotional facial expressions with the emotional intensity manipulated to different levels. These researchers found no group differences between the socially phobic and healthy controls (Philippot & Douilliez, 2005). Similarly, Douilliez and Philippot (2003) found no difference in socially anxious and non-anxious students in evaluating the threatening value of angry-threatening, joyful, and neutral faces.

In contrast, three studies have revealed that socially phobic individuals are more accurate in identifying facial emotions, in particular, negative facial emotions. Gilboa-Schechtman, Presburger, Marom, and Hermesh (2005) presented multiple faces simultaneously to individuals with social phobia and non-anxious controls, and found that the socially phobic individuals were significantly better at recognizing when a group of faces included slightly more negative faces than neutral or positive faces. As well, Hunter, Buckner, and Schmidt (2009) found that socially anxious individuals were overall more accurate at labelling facial expressions (happy, sad, angry, or fearful), regardless of facial emotion valence. Further, de Souza and colleagues (2006) compared facial emotion recognition in socially phobic patients to healthy controls in a task that morphed facial emotion intensity from 0% (neutral face) to 100% (full emotion) on six emotions (happiness, fear, sadness, surprise, anger, and disgust). Although socially phobic patients labeled emotions with the same accuracy as controls, they required less emotional intensity for judgment.
These contradictory findings make it difficult to draw conclusions regarding socially phobia individuals’ accuracy in detecting facial emotions. Differences in the tasks used in these studies may account for the different patterns of performance. For example, some studies exposed participants to very brief subliminally presented facial expressions, whereas others did not limit the stimulus presentation. In general, it appears as though brief stimulus presentations may be most strongly associated with an enhanced pattern of performance (see also Winton, Clark, & Edelmann, 1995). In the Eyes task used in the current study, participants are instructed to make their judgements as quickly as possible.

Given that mental state decoding relies heavily on thoughts, beliefs, and emotions portrayed in the face, the research relating social anxiety and facial emotion recognition may provide clues in understanding mental state decoding. However, it must be noted that, although there are similar features, facial emotion recognition and theory of mind are not one in the same. The studies described above involve choosing emotional labels for faces that are well rehearsed daily throughout life. For example, although there can be a certain degree of difficulty distinguishing disgust and anger, most of the basic emotions are heavily internalized. Theory of mind, however, not only involves understanding emotions portrayed on the face, but also thoughts, intentions, and beliefs. Therefore, whereas facial emotion recognition tasks require recognizing features of the face in order to distinguish types of emotion, they fall short of evaluating the complex interpretations of the thoughts, beliefs, and intentions portrayed in the stimuli that characterize theory of mind ability. Nonetheless, facial emotion recognition research may be useful in formulating preliminary predictions in performance on a task of mental state decoding.
In summary, there has been no research on theory of mind ability in individuals with social phobia. However, research on basic facial emotion recognition suggests that these individuals display greater accuracy in detecting emotions. Therefore, similar to individuals vulnerable to depression, we might expect this hypervigilance to be associated with an enhanced motivation to attend to others’ mental states. The primary goal of the current study is to determine whether enhanced theory of mind performance is seen particularly in those who have a depression vulnerability in the context of social phobia.

**Correlation Among Theory of Mind Decoding and Reasoning Tasks**

Theory of mind decoding and reasoning each rely fundamentally on different kinds of social-information processing skills (Sabbagh, 2004) and invoke distinct neurobiological substrates (Frith & Frith, 2001; Siegal & Varley, 2002; Tager-Flusberg & Sullivan, 2000). As is clear from the research reviewed above, there has been far greater examination of theory of mind decoding in depression, and in tasks similar to theory of mind decoding in social phobia, than theory of mind reasoning. An extensive review of the neuroimaging literature by Carrington and Bailey (2009) outlines that different regions of the brain are engaged in theory of mind decoding and reasoning tasks, respectively. On the one hand, this may suggest that we would expect a dissociation in mental state decoding and reasoning abilities. Consistent with this, some studies of pathologies involving theory of mind deficits that have employed both decoding and reasoning tasks have found no significant correlation between decoding and reasoning abilities. In a study of bipolar (BP) patients, the Eyes and Hinting tasks were employed to measure decoding and reasoning abilities, respectively. Results showed no significant correlation between these tasks (Bora et al., 2005). Further, Njomboro, Deb, and Humphreys (2008) conducted a study on patients with lesions affecting the left temporo-parietal junction (TPJ), the superior
temporal cortex (STS), and inferior parietal (IP) regions of the brain, areas indicated in theory of mind functioning (Apperly, Samson, Chiavarino, & Humphreys, 2004; Samson, Apperly, Chiavarino, & Humphreys, 2004). They found that a mental state reasoning deficit could coexist with a relatively intact ability to decode mental states (Njomboro et al., 2008).

On the other hand, although mental state decoding and reasoning are dependent on different cognitive skills, it is believed that these processes work in concert to enable people to make judgments about others’ mental states (Sabbagh, 2004). As such, we may expect that an association between these processes. Only one study in depression research has reported on the correlation between theory of mind decoding and theory of mind reasoning. In their depressed sample, Wang et al. (2007) reported that the Eyes task and the Faux Pas task had a significant positive correlation. This suggests that, despite various disparities in brain regions that are activated during mental state decoding and reasoning, there may be overlap for individuals with major depression.

One difficulty in using individuals with pathologies to examine the correlation between theory of mind decoding and reasoning abilities is that they often exhibit a range of impairments not isolated to theory of mind. For example, in some cases associated language impairment may weaken their ability to perform reasoning tasks that involve greater language ability, whereas decoding mental states from faces may not be as affected.

Research focusing on brain regions related to theory of mind provides theoretical context for predicting limited correlation between mental state decoding and reasoning tasks. However, the precise nature of brain networks for complex cognition is not well established. The current study will further contribute by clarifying the relation among theory of mind decoding and two novel reasoning tasks.
Objectives and Hypotheses

The over-arching goal of the current study was to examine differences in theory of mind decoding and reasoning ability among four groups: (1) individuals with current social phobia and no depression history (‘Social Phobia’ group); (2) individuals with current social phobia and a past history of MDD, currently in remission (‘Comorbid’ group); (3) individuals with a past history of MDD, currently in remission, and no past or current social phobia (‘Past MDD’ group); and (4) healthy controls (‘Control’ group).

Given the extremely intertwined presentation of MDD and social phobia and the documented hypervigilance seen in socially phobic individuals, I propose that the theory of mind advantage displayed in those with a past history of major depression seen in previous studies may be better attributed to comorbid social phobia. Specific hypotheses for each subgoal of the current study are presented below.

**Goal 1: Group Differences on ToM Decoding.** I hypothesized that the Social Phobia and Comorbid groups would display significantly higher accuracy on the Eyes task than the Past MDD group, which would display significantly higher accuracy than the Control group.

**Goal 2: Group Differences on Theory of Mind Reasoning.** I hypothesized that the Social Phobia and Comorbid groups would display significantly higher accuracy on the MASC and Director tasks than the Past MDD group, which would display significantly higher accuracy than the Control group.

**Goal 3: Correlations Among Theory of Mind Tasks.** I hypothesized that the Eyes, MASC, and Director tasks would be significantly inter-correlated, such that enhanced performance on one would be associated with enhanced performance on the other two.
Chapter 2
Method

Participants

Participants were 109 individuals (75 females; age range 17-36, $M = 19.18$, $SD = 2.62$) who were assigned to one of four groups based on their diagnostic status: (a) The *Past MDD* group ($n = 36$) included those meeting Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR; American Psychiatric Association, 2000) criteria for a past episode of Major Depressive Disorder (MDD) and did not meet criteria for current MDD; (b) the *Social Phobia* group ($n = 9$) included those meeting DSM-IV-TR criteria for social phobia; (c) the *Comorbid* group ($n = 23$) included those meeting criteria for a past episode of MDD and current social phobia; or (d) the *Control* group ($n = 41$), including those who did not have any current or past psychiatric diagnosis. Exclusion criteria were a co-occurring diagnosis of a psychotic disorder (e.g., schizophrenia), bipolar disorder, drug/alcohol dependence, developmental disability (e.g., autism), or an active medical disorder that could have caused their depression (e.g., hypothyroidism). Exclusionary diagnoses were assessed during an initial telephone screen. During the phone screen, potential participants were asked if they had a history of substance abuse or psychiatric illness. If they were still eligible, they were administered a brief structured interview based on the MDD and social phobia sections of the Structured Clinical Interview for DSM-IV Axis I Disorders (SCID; First, Spitzer, Gibbon, & Williams, 2002) to determine their potential inclusion in one of the four study groups. If deemed eligible, they were scheduled with an appointment to participate.

Participants were recruited from the Queen’s University PSYC100 subject pool, advertisements posted around the Queen’s university campus and on various online websites, and from ongoing studies.
in the Mood Research Lab. Participants referred from ongoing projects provided consent to be contacted for further studies. Participants recruited from the PSYC100 subject pool were selected based on their scores on self-report measures of social anxiety and depression administered during the pre-screening session conducted at the start of the academic year. Participants with scores above 10 on the Beck Depression Inventory (BDI-II; Beck, 1996) or above 170 on the Social Anxiety and Avoidance Scale for Adolescents (SAASA; Cunha, Pinto-Gouveia, & Salvador, 2008) were contacted for potential inclusion in one of the three diagnostic groups; participants with BDI-II and SAASA scores below those cut-offs were screened as candidates for the Control group. All potential participants were administered the telephone screen described above to confirm their eligibility.

An initial 116 individuals participated in the full study. Of these, seven met criteria for a current episode of MDD at the time of the study based on the full diagnostic interview (see below). Therefore, the final analyses included 109 participants.

**Materials**

**Diagnostic.** Participants were administered the Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I/P; First et al, 2002). The SCID-I/P is a semi-structured interview used to determine present and past DSM-IV diagnoses, and has demonstrated excellent reliability and validity (Williams et al., 1992). The mood and social phobia modules were administered by one graduate student in clinical psychology or one of four undergraduate students in psychology who were trained to “gold standard” reliability status by Dr Kate Harkness. In order to achieve this status, interviewers sat in on diagnostic interviews being conducted by gold standard interviewers, conducted these interviews while being observed by gold standard interviewers, and matched diagnoses on at least three consecutive interviews. Interrater reliability was
performed between pairs of interviewers, and kappa coefficients ranged from .71 ($p = .035$) to 1.00 ($p < .001$).

**Beck Depression Inventory-II (BDI-II; Beck, 1996).** This 21-item self-report questionnaire is designed to measure the type and severity of depression symptoms, and its strong psychometric properties have been well documented (Beck, Steer, & Garbin, 1988; Rehm and O’Hara, 1985). It is very widely used in the study of depression and takes approximately five minutes to complete. The internal consistency estimate was high in this sample (*Cronbach’s alpha* = .94).

**Social Anxiety and Avoidance Scale for Adolescents (SAASA; Cunha et al., 2008).** The SAASA is a 34-item self-report questionnaire that presents social situations and assesses the level of anxiety and avoidance they elicit. The SAASA is comprised of two subscales, Distress/Anxiety and Avoidance, and separate scores for each subscale can be obtained, as well as a total score. Participants’ responses are on a likert-type scale ranging from 1 (*not anxious/never avoid*) to 5 (*very anxious/almost always avoid*). Its ability to discriminate participants with social phobia from those with any other anxiety disorder or those with no diagnosis makes it particularly relevant to this present study. The internal consistency estimates of the Distress/Anxiety and Avoidance subscales were high in this sample (*Cronbach’s alpha* = .95 and .93, respectively).

**Reading the Mind in the Eyes task (revised version: Baron-Cohen et al., 2001).** Participants’ ToM decoding abilities were assessed using the “Reading the Mind in the Eyes” task. The task consists of 36 black-and-white photographs of the eye region of faces, from just above the eyebrows to midpoint along the bridge of the nose. Each pair of eyes was standardized to the same size (15 x 6 cm). Each photograph was presented in the middle of a computer screen.
centered between four descriptive adjectives placed in the corners, each equally spaced from the centre of the screen. The adjectives describe various mental states that the person in the photograph might be thinking or feeling, and the participant was required to choose the standardized correct one (see Figure 1a for a sample item). The task was presented on a desktop computer and participants responded by pressing one of four keys on the keyboard (S, X, K, M) identified by coloured stickers. These keys were chosen because they are spatially analogous to the location of the adjective at the corners of the picture. Participants’ responses and response times in milliseconds (ms) were digitally recorded.

The stimuli that were used in this study have been adapted from the originals in two ways. First, the original pencil-and-paper items were computerized to allow us to digitally record response times. The original eye stimuli were digitized using a flatbed scanner with a pixel resolution of 72 dots per inch (dpi). They were then resized to a screen size of approximately 14.5 cm × 5.5 cm. Second, we ensured that the location of the correct answer was counterbalanced across items (see Harkness et al., 2005). The stimuli used in the Eyes task were also classified into three emotional valence categories: positive (e.g., “Friendly”), neutral (e.g., “Reflective”), and negative (e.g., “Upset”) (Harkness et al., 2005). The adjectives are listed in Table 1 with their associated valence. The primary dependent variable used in this task was accuracy (percent correct), calculated as the number of items on which participants endorsed the ‘correct’ adjective, divided by the total number of items (n = 36). Separate accuracy scores were also calculated for the positive, neutral, and negative eyes. Response time was also used as a dependent variable to assess the trade-off between response accuracy and speed.
Table 1
*Adjectives Used in the Eyes Task with their Associated Valence*

<table>
<thead>
<tr>
<th>Valence</th>
<th>Item No.</th>
<th>Adjective</th>
<th>Item No.</th>
<th>Adjective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative</td>
<td>2</td>
<td>Upset</td>
<td>23</td>
<td>Defiant</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Worried</td>
<td>26</td>
<td>Hostile</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>Regretful</td>
<td>27</td>
<td>Cautious</td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>Accusing</td>
<td>34</td>
<td>Distrustful</td>
</tr>
<tr>
<td></td>
<td>17</td>
<td>Doubtful</td>
<td>35</td>
<td>Nervous</td>
</tr>
<tr>
<td></td>
<td>22</td>
<td>Preoccupied</td>
<td>36</td>
<td>Suspicious</td>
</tr>
<tr>
<td>Positive</td>
<td>1</td>
<td>Playful</td>
<td>21</td>
<td>Fantasising</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>Fantasising</td>
<td>25</td>
<td>Interested</td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>Thoughtful</td>
<td>30</td>
<td>Flirtatious</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>Friendly</td>
<td>31</td>
<td>Confident</td>
</tr>
<tr>
<td>Neutral</td>
<td>3</td>
<td>Desire</td>
<td>15</td>
<td>Contemplative</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Insisting</td>
<td>18</td>
<td>Decisive</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>Uneasy</td>
<td>19</td>
<td>Tentative</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>Despondent</td>
<td>24</td>
<td>Pensive</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>Preoccupied</td>
<td>28</td>
<td>Interested</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>Cautious</td>
<td>29</td>
<td>Reflective</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>Skeptical</td>
<td>32</td>
<td>Serious</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>Anticipating</td>
<td>33</td>
<td>Concerned</td>
</tr>
</tbody>
</table>

**Animals task.** A control task was created by Harkness et al. (2005) to ensure that the differences among groups on the Eyes task could be attributed to differences in mental state decoding rather than task demands or low-level perceptual processing. The stimuli created for the Animals task are similar those in the Eyes task, but consist of 12 black-and-white photographs of animals. In this task, participants were required to choose the correct adjective describing a trait of the animal from four choices presented in the same format as the adjectives in the Eyes task (see Figure 1b for a sample item). Accuracy on the Animals task was defined as percent correct in a manner similar to above. As in the Eyes task, responses and response times in milliseconds (ms) were digitally recorded.
The Movie for the Assessment of Social Cognition (MASC; Dziobek et al., 2006) is a sensitive video-based task measuring subtle theory of mind reasoning ability. Participants watched a 15-min video of two male and two female actors interacting at a dinner party and were instructed to try to understand the characters’ feelings, thoughts, and intentions. The MASC integrates various aspects of social cognition, including first- and second-order false beliefs, deception, faux pas, persuasion, metaphor, sarcasm, and irony.
Before the film began, participants watched slides introducing the characters. As the film played, it was stopped at 45 time points and participants were required to answer multiple choice questions probing their understanding of the characters’ feelings, thoughts, and intentions at the point where the film was stopped.

For each of the 45 questions, participants chose from one of four possible answers in multiple-choice format. In each item, answer choices reflected either (1) appropriate ToM reasoning (i.e., the ‘correct’ answer), (2) over-mentalizing, representing over-interpretative mental state reasoning, (3) ‘insufficient’, or reduced, mental state reasoning, and (4) no ToM ability, or non-mental state reasoning (i.e., physical causation). Thus, total scores can be obtained for ‘correct’ ToM, no ToM, insufficient ToM, and overmentalizing. Six of the questions were control items requiring non-social inferencing (e.g., “How did Cliff likely shave when he was in Sweden?”). For the purposes of my primary analyses, the dependent variable for this task was percent correct on the task, calculated as the number of items on which participants endorsed the ‘correct’ (appropriate ToM reasoning) answer divided by the total number of ToM questions (n=39). Secondary descriptive analyses were also performed to examine participants’ types of errors (i.e., over-mentalizing, insufficient, or no ToM ability) and the distribution of errors across groups. Types of errors were similarly calculated as the number of items on which participants endorsed each error divided by the total number of ToM questions.

**Director task (Keysar et al., 2000).** The Director task is a referential communication task used as a measure of theory of mind reasoning ability. In this task the ‘director’ (a confederate) and the participant were seated on opposite sides of a two-sided vertical 4x4 grid, in the slots of which several objects were placed. The director received a picture from the experimenter displaying the objects in a different arrangement and instructed the participant to
move the objects so as to replicate the positions of the objects in the picture. Each person was able to see straight through the slots and, thus, was able to see exactly what the other saw, with the exception of a few slots that were occluded from the director’s view. These occlusions created the critical difference in their visual perspective and served to identify egocentric tendencies, which are defined as considering objects that are not in common view but rather are only visible by the participant (Keysar et al., 2000). For example, in Figure 2 (Epley, Morewedge, & Keysar, 2004, p.762) the participant can see three trucks, but because one truck is in a slot that is occluded from the director, he or she knows the director can only see two. When instructed to move the small truck, although there is ambiguity regarding “small”, the participant may assume the director is referring to the medium-sized truck from the participant’s view (Figure 2, participant’s view, second row, far left). The extent to which the participant considers the occluded truck (Figure 2, participant’s view, third row, far right) as the referent is a measure of egocentric tendency. The present study used the level of egocentric tendency as our measure of ToM reasoning. Thus, ToM reasoning ability was measured by the percentage of correct ambiguous object moves.

The generalizability of our results was increased by having three different forms of ambiguity contained in the critical instructions: size ambiguity (e.g., “Move the small car” when the smallest of three cars was occluded); spatial ambiguity (e.g., “Move the bottom blue book”, which could refer to a mutually observable blue book stacked under a red book or an occluded blue book alone on the bottom row); semantic ambiguity (e.g., “Move the apple”, which could refer to a real apple or an occluded fake apple).
The Director task began with two practice grids, one with the confederate as the director and, so the participant fully understood the role of the director, one with the participant as the director. The experimenter explained that the director would be given a photograph of the grid with objects in different positions and the director would guide the participant in repositioning them to match the photograph. To convince the participant that the assistant was not involved with the study, several cues were used during the practice grids. For example, when practicing as the director, he or she committed some errors (e.g., occasional left-right errors) and appear to be unfamiliar with some objects (e.g., “What is this thing called?”). After the practice grids, the participant was led to believe that the roles were assigned randomly.
A trial began with a new arrangement of objects. There were 12 trials each with four instructions, one of which included a critical instruction (i.e., moving an ambiguous object). The position of the critical instruction within the trial occurred in a predetermined random order. Before the beginning of each array, a black sheet was dropped over the director’s side of the grid to block his or her view while the objects were placed, and the participant was positioned out of the grid’s sight to ensure he or she did not have exposure to the objects before beginning a trial. After the sheet was lifted and the participant was seated in front of the grid, the director was given the photograph, and the trial began. As stated above, the dependent variable for this task was accuracy on the task, calculated as the number of items on which participants chose the correct ambiguous object to move, divided by the total number of items ($n = 12$).

**Procedure**

All testing took place in the Mood Research Lab at Queen’s University. Upon arrival, participants were asked to read the consent form. After the experimenter briefly described the procedure, the participant was asked to provide signed consent.

After giving consent, participants completed the MASC, Eyes, and Director tasks in counter-balanced order. For the MASC, the experimenter directed the participant to a room with a computer equipped with the installed software. The participant was told to follow the instructions that appeared on the screen and to open the door when the task was completed.

For the Eyes task, participants completed a practice trial followed by the Eyes and Animals task trials randomly combined in a single block of 48 trials (36 trials for the Eyes and 12 Animals tasks, respectively). Participants were instructed to respond as quickly and accurately as possible, and their responses and reaction time in milliseconds (ms) were digitally recorded. They were again told to open the door when the task was completed.
For the Director task, participants completed two practice trials, one with them as the director and one with them as the addressee. They were then asked to choose from one of two pieces of folded paper (each reading “addressee”) to “randomly” determine their role for the remainder of the task. Once roles were assigned, participants completed the 12 test trials as described above.

Following completion of the tasks, participants were directed to complete electronic versions of the SAASA and BDI questionnaires. The questionnaires were always filled out after the tasks because of possible mood priming effects related to the questionnaires. When the questionnaires were fully completed, the experimenter administered the SCID-I/P interview. Following the interview, participants were debriefed and remunerated with PSYC100 research credit or $20 for their participation. We also provided a list of treatment referrals for participants in the three clinical groups.

**Data Analysis**

All analyses were conducted using the Statistical Program for the Social Sciences (SPSS) Software, Version 17.0. The independent variable (IV) in all analyses was group assignment. Preliminary univariate analyses were first conducted to examine differences across groups with respect to gender, age, ethnicity, education, and BDI and SAASA scores.

The dependent variables (DV) included participants’ accuracy on the three experimental tasks (the Eyes, MASC, and Director), which we defined as the percentage of trials on which the participant chose the correct answer. Preliminary univariate analyses were conducted to examine the relation of the DVs to gender, age, ethnicity, education, and BDI and SAASA scores. I also examined the univariate relations of the Eyes and MASC task DVs to accuracy on Animal task and MASC control questions, respectively. The univariate relation between Eyes task reaction
time and accuracy was examined to assess whether any group differences on the Eyes task occurred as a result of increased time taken to make their responses. Demographic and control task variables found to be significantly related to the task outcome variables were included as covariates in the main models below.

The primary study goal of examining group differences on ToM tasks was assessed using a series of three one-way Analyses of Covariance (ANCOVA) models, with group (Past MDD, Social Phobia, Comorbid, and Control) as the IV, and relevant variables identified above entered as covariates. Each model examined the effect of group on the relevant DVs described above. A priori contrasts were constructed to investigate specific differences among groups as per the study hypotheses. The first comparison examined whether the Social Phobia group differed significantly from the Past MDD; the second compared the Comorbid group to the Past MDD; and the third compared Past MDD and Control groups.

The ANCOVA procedure used Type III sum of squares to account for intercorrelations between the independent variable and covariates, as well as unequal cell sizes. Partial $\eta^2$ was used as the index of effect size, with .04, .25, and .64 corresponding to small, medium, and large effects, respectively, according to guidelines proposed by Ferguson (2009). Estimated marginal means are reported in all figures and tables.

To determine whether a relation of group and Eyes task accuracy was specific to stimulus valence, we conducted a 3 (valence) x 4 (group) mixed model ANOVA with valence as the within-group factor and depression group as between-group factor. To follow up analyses with the MASC task, we conducted a 3 (type of ToM error: over-mentalizing, insufficient ToM, no ToM) x 4 (group) mixed model ANOVA to examine whether groups differed in the types of theory of mind errors made.
The secondary study goal of examining the relations among the three ToM tasks was performed using Pearson’s $r$ correlation analyses.
Chapter 3

Results

Preliminary Analyses

Two participants were identified as outliers. One participant on the MASC task had a mean accuracy score of 3.40 SDs below the group mean, and one participant on the Director task had a mean accuracy score of 2.85 SDs below the group mean. Each participant was listwise deleted from all MASC and Director task analyses, respectively. Therefore, for analyses including the MASC and Director tasks, the sample sizes were 108.

Group differences on demographic variables, BDI, and SAASA scores were examined for descriptive purposes. Table 2 presents descriptive data separated for each group. Groups did not significantly differ on age, sex, ethnicity, or education, all $p$s > .13. As expected given the composition of the groups, the groups were significantly different in BDI scores, $F(3,105) = 11.93, p < .001$, partial $\eta^2 = .25$, with the past MDD, Social Phobia, and Comorbid groups having significantly higher BDI scores than controls. Further, the groups were significantly different in SAASA scores, $F(3, 105) = 20.72, p < .001$, partial $\eta^2 = .37$, such that the Social Phobia and Comorbid groups had significantly higher SAASA scores than the past MDD group, whose SAASA scores were significantly higher than controls.
Table 2  
*Descriptive Statistics of Demographic Variables, BDI, and SAASA Scores Stratified by Group*  
| Group               | Past MDD  
<table>
<thead>
<tr>
<th></th>
<th></th>
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<tbody>
<tr>
<td></td>
<td>(n = 36)</td>
</tr>
<tr>
<td>Age</td>
<td>19.86</td>
</tr>
<tr>
<td>Sex (n/%)</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>12/33.33</td>
</tr>
<tr>
<td>Female</td>
<td>24/66.67</td>
</tr>
<tr>
<td>Ethnicity (n/%)</td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>24/66.67</td>
</tr>
<tr>
<td>Asian</td>
<td>11/30.56</td>
</tr>
<tr>
<td>Other</td>
<td>1/2.78</td>
</tr>
<tr>
<td>Education (years)</td>
<td>13.83</td>
</tr>
<tr>
<td>BDI score (M/SD)</td>
<td>14.39&lt;sup&gt;a&lt;/sup&gt;/7.91</td>
</tr>
<tr>
<td>SAASA score (M/SD)</td>
<td>182.86&lt;sup&gt;b&lt;/sup&gt;/43.11</td>
</tr>
</tbody>
</table>
|                     | Social Phobia  
|                     | (n = 9) |
| Age                 | 18.33    |
| Sex (n/%)           |          |
| Male                | 3/33.33  |
| Female              | 6/66.67  |
| Ethnicity (n/%)     |          |
| White               | 5/55.56  |
| Asian               | 4/44.44  |
| Other               | 0/0.00   |
| Education (years)   | 13.22    |
| BDI score (M/SD)    | 16.78<sup>a</sup>/13.03 |
| SAASA score (M/SD)  | 230.67<sup>a</sup>/37.65 |
|                     | Comorbid  
|                     | (n = 23) |
| Age                 | 19.48    |
| Sex (n/%)           |          |
| Male                | 5/21.74  |
| Female              | 18/78.26 |
| Ethnicity (n/%)     |          |
| White               | 13/56.52 |
| Asian               | 9/39.10  |
| Other               | 1/4.35   |
| Education (years)   | 13.87    |
| BDI score (M/SD)    | 19.65<sup>a</sup>/11.15 |
| SAASA score (M/SD)  | 219.04<sup>a</sup>/36.33 |
|                     | Control   
|                     | (n = 41) |
| Age                 | 18.61    |
| Sex (n/%)           |          |
| Male                | 14/34.10 |
| Female              | 27/65.90 |
| Ethnicity (n/%)     |          |
| White               | 27/65.90 |
| Asian               | 11/26.80 |
| Other               | 3/7.30   |
| Education (years)   | 13.42    |
| BDI score (M/SD)    | 6.88<sup>b</sup>/6.68 |
| SAASA score (M/SD)  | 152.20<sup>c</sup>/33.67 |

*Notes.* BDI = Beck Depression Inventory; SAASA = Social Anxiety and Avoidance Scale for Adolescents; <sup>abc</sup> Group differences were significant at *p* < .05 and *p* < .01 on BDI and SAASA scores, respectively.

**Task Item Analysis and Relation to Sample Characteristics.** Internal consistency was evaluated for each task. The Eyes, MASC, and Director tasks had Cronbach’s alpha values of .58, .70, and .84, respectively, and were not substantially improved by deleting any items. Also, a preliminary item analysis was performed on all items of the Eyes and MASC tasks to assess whether participants performed better than chance. Participants did not perform significantly better than chance on two items (items 35 and 37) in the MASC, *ts*(107) < 1.05, *ps* > .30. Therefore, the analyses involving the MASC task below were conducted excluding these two items.
Univariate analyses revealed no significant relations of age, ethnicity, or education to any of the task outcomes, all \( ps > .17 \). Accuracy on the Director task was related to sex at a trend, \( F(1, 103) = 3.35, \ p = .070 \), partial \( \eta^2 = .03 \), such that males (\( M = 80.04, SD = 21.45 \)) performed better than females (\( M = 71.59, SD = 22.46 \)). Accuracy on the Eyes task was significantly positively correlated with accuracy on the Animals task, \( r(107) = .40, \ p < .001 \). Therefore, Animals task accuracy was entered as a covariate in the analyses investigating group differences in Eyes task accuracy. MASC task accuracy was not significantly correlated with accuracy on the MASC control questions, \( r(106) = .16, \ p = .10 \).

**Goal 1: Group Differences on Theory of Mind Decoding Task**

BDI and SAASA scores were not significantly related with any task outcomes, all \( ps > .179 \). The estimated group means and standard errors for the Eyes, MASC, and Director tasks are shown in Table 3.

<table>
<thead>
<tr>
<th>Group</th>
<th>Past MDD</th>
<th>Social Phobia</th>
<th>Comorbid</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eyes task ([Estimated Mean(SE)])</td>
<td>72.78(1.71)</td>
<td>63.00(3.44)</td>
<td>70.51(2.14)</td>
<td>70.65(1.60)</td>
</tr>
<tr>
<td>MASC task ([Estimated Mean(SE)])</td>
<td>77.91(1.86)</td>
<td>73.64(3.71)</td>
<td>78.01(2.37)</td>
<td>78.16(1.74)</td>
</tr>
<tr>
<td>Director task ([Estimated Mean(SE)])</td>
<td>70.70(3.78)</td>
<td>64.19(7.38)</td>
<td>84.60(5.04)</td>
<td>74.03(3.80)</td>
</tr>
</tbody>
</table>

**Eyes Task.** A preliminary analysis evaluating homogeneity of slopes showed no significant relation between the covariate (Animals task accuracy) and the DV (Eyes task
accuracy) as a function of the IV (group), $F(3, 101) = 1.58$, $MSE = 163.02$, $p = .200$, partial $\eta^2 = .05$. With an $F_{\text{max}}$ value of 4.39 and a ratio of largest:smallest cell sizes 4.6:1, the assumption of homogeneity of variance was satisfied, according to the guidelines stated by Tabachnick & Fidell (2007). The one-way ANCOVA revealed a trend for groups to differ on the Eyes task, $F(3, 104) = 2.16$, $p = .10$, partial $\eta^2 = .06$. While the omnibus model was not significant, a priori specified contrasts revealed that, in direct contrast to hypotheses, the Social Phobia group performed significantly more poorly on the Eyes task than the Past MDD group, $F(1, 104) = 6.47$, $p = .01$. The remaining two contrasts comparing the Comorbid group to the Past MDD group, $F(1, 104) = 0.69$, $p = .41$, and comparing the Past MDD and Control groups, $F(1, 107) = 0.83$, $p = .37$, were not significant.

Further follow-up tests revealed that, in the Social Phobia group only, SAASA scores were negatively correlated with Eyes task accuracy, $r(8) = -.48$, $p = .19$. That is, greater severity of social phobia symptoms in those with a diagnosis of social phobia was associated with poorer task performance. While this correlation was not statistically significant, likely due to the very small size of this group, the strength of the relation is in the moderate to large range (Cohen, 1988). Correlations between SAASA scores and Eyes task accuracy in the remaining three groups were negligible ($rs < -.22$, $ps > .20$) When we looked at the subscales of the SAASA, we found the correlation was much stronger for the Avoidance subscale, $r(8) = -.61$, $p = .08$, than for the Anxiety subscale, $r(8) = -.32$, $p = .41$.

Finally, the mixed model ANOVA examining the relation of group to accuracy on eyes of a positive, neutral, or negative valence revealed no evidence of a significant main effect of valence, $F(2, 208) = .56$, $p = .56$, partial $\eta^2 = .01$, or group, $F(3, 104) = 2.32$, $p = .08$, partial $\eta^2 = .0
.06, nor was there a significant valence by group interaction, $F(6, 208) = .85, p = .53$, partial $\eta^2 = .02$.

**Goal 2: Group Differences on Theory of Mind Reasoning Tasks**

**MASC Task.** Using the same criteria for the assumption of homogeneity of error variance between groups as stated above, this assumption was satisfied, $F_{\text{max}} = 5.75$. The omnibus one-way ANOVA was not significant, $F(3, 107) = .43, p = .73$, partial $\eta^2 = .01$. The same three *a priori* specified contrasts examining group differences on the Eyes task were performed on the MASC task. All contrasts were not significant, $Fs(1, 104) < 1.27, ps > .25$.

Further, a mixed model ANOVA examined whether groups differed in the types of theory of mind errors made. Mauchly’s test of sphericity was violated, $p < .001$. Therefore, the Greenhouse-Geisser test was used to adjust for this violation, and it revealed a significant main within-subject effect of type of error, $F(4.06, 208) = 103.71, p < .001$, partial $\eta^2 = .5$.

Specifically, across groups, participants over-mentalized ($M = 12.53, SD = 6.32$) significantly more than responding with low ToM ($M = 5.84, SD = 4.42$), $t(115) = 10.00, p < .001$. Further, participants responded with low ToM significantly more than with no ToM ($M = 2.33, SD = 3.77$), $t(115) = 10.92, p < .001$. The main effect of group, $F(3, 104) = .47, p = .70$, partial $\eta^2 = .01$, and the type of ToM error by group interaction, $F(4.06, 208) = .35, p = .85$, partial $\eta^2 = .01$, were not significant.

**Director Task.** A preliminary analysis evaluating homogeneity of slopes showed no significant relation between the covariate (Sex) and the DV (Director task accuracy) as a function of the IV (group), $F(3, 97) = 0.32, MSE = 155.11, p = .81$, partial $\eta^2 = .010$. The assumption of homogeneity of error variance between groups was satisfied, $F_{\text{max}} = 4.43$. The omnibus ANCOVA model revealed a trend effect of group, $F(3, 100) = 2.54, p = .06$, partial $\eta^2 = .06$, ns.
.07. Despite the pattern of means showing again the lowest level of performance in the Social Phobia group, the *a priori* contrast comparing the Social Phobia group to the Past MDD group was not significant, $F(1, 100) = 1.28, p = .39$. However, the contrast comparing the Comorbid group to the Past MDD was significant, $F(1, 100) = 4.85, p = .03$, indicating a significantly *higher* level of performance in the Comorbid group relative to the Past MDD group. Finally, the contrast comparing the Past MDD group to the Control group was not significant, $F(1, 100) = 1.33, p = .25$.

**Goal 3: Relation Among Theory of Mind Tasks**

The relation among theory of mind tasks was examined using Pearson correlations, partialling out the effects of Animals task accuracy in Eyes task correlations. The Eyes and Director tasks were significantly positively correlated in the overall sample, $r(102) = .31, p = .001$. Neither the Eyes and MASC tasks were significantly correlated, $r(105) = .17, p = .07$, nor were the MASC and Director tasks, $r(102) = .01, p = .91$. 
Chapter 4

Discussion

The purpose of this investigation was to examine the differential theory of mind decoding and reasoning abilities in individuals with a history of major depression, social phobia, and these conditions combined. I posited that the theory of mind advantage seen in individuals vulnerable to major depression may be better accounted for by symptoms of social anxiety that so often co-exist with depression. Specifically, I hypothesized that participants with a depression vulnerability would demonstrate greater theory of mind accuracy than those without, but only in the context of comorbid social phobia. The findings from the Director task support this hypothesis, with the comorbid group showing significantly greater accuracy than the past depression group, which was not significantly different from healthy controls. Interestingly, in contrast to hypotheses, the pure socially phobic participants consistently demonstrated theory of mind deficits across tasks in relation to all other groups. I will discuss results pertaining to theory of mind decoding and theory of mind reasoning separately below.

Theory of Mind Decoding Ability

Contrary to my hypotheses, individuals with social phobia, either comorbid with depression or on its own, did not perform significantly better on the Eyes task than those with a pure depression vulnerability or healthy controls. These results suggest that the heightened theory of mind decoding ability seen in previous studies may be specific to having a history of MDD, and is not better accounted for by high levels of social anxiety. Indeed, in direct contrast, those with pure social phobia demonstrated significantly lower accuracy on the Eyes task compared to those with pure past depression, which did not differ from healthy controls. There was no evidence that this lower accuracy was preferentially expressed across mental states of a
positive, neutral, or negative valence. This null finding for valence is consistent with all previous studies of theory of mind and depression vulnerability that have used the Eyes task (Harkness et al., 2010; Harkness et al., 2012; Harkness et al., 2005; Harkness et al., 2011), and provides even further evidence that individual differences in theory of mind decoding accuracy seen in clinical groups is not biased by the valence of the mental state being decoded.

The reason for the poor level of theory of mind decoding performance in the social phobia group is unclear at present and requires further investigation. Also, this result should be interpreted with caution given the small size of the social phobia group. Nevertheless, some possible mechanisms are presented to stimulate future research. For example, socially phobic participants’ impairment in decoding mental states may be attributed to lowered perception of observable facial mental state cues, lowered processing of this information, or a combination of these two factors. Research suggests that social anxiety is associated with reduced processing of external social cues in favour of internal cues (Chen, Ehlers, Clark, and Mansell, 2000; Mansell, Clark, Ehlers, and Chen, 1999).

Successful social interactions with others rely on carefully attending to and reading social situations which, to a large extent, involves processing nonverbal cues. However, there is strong evidence contending that socially phobic individuals display self-focused attention (Woody & Rodriguez, 2000; Saboonchi, Lundh, & Öst, 1999). According to the Clark and Wells (1995) cognitive model of social phobia, when socially phobic individuals are in situations they perceive as evaluative, their attention shifts away from the environment and toward detailed monitoring of themselves. This includes increased processing of somatic symptoms of anxiety (Mansell & Clark, 1999), how they believe others perceive their somatic symptoms (Johansson & Öst, 1982; Mellings & Alden, 2000), and a negative evaluation of themselves in relation to their perceived
expectations of others (Hackmann, Surawy, & Clark, 1998). The model follows that this increased self-awareness interferes with processing the social situation and others’ behaviour (Clark & Wells, 1995).

In the present study, it is possible that this inward focus, at least in part, resulted in poor mental state decoding. Perhaps being in the lab and performing tasks provided the evaluative context to cue distress. In fact, Rapee and Heimberg (1997) define a social-evaluative situation as any situation in which there is an audience, and an ‘audience’ as any one, or group, of people who may potentially perceive an individual’s behaviour. Thus, an actual interpersonal interaction is not necessary to provoke anxiety. Therefore, although participants sat alone in the room while completing the Eyes task, it can be considered (at least by the socially phobic person) a social situation in that the potential for interaction or observation exists, and hence the potential for negative evaluation. We did not obtain a measure of state anxiety or measures of internal awareness in the present study. Thus, we can only speculate that self-focused attention interfered with their ability to decode mental states. No studies have yet examined the association between current levels of anxiety and mental state decoding. An important future direction is to clarify how state anxiety interacts with trait social phobia symptoms to affect mental state decoding ability. Furthermore, future research is needed to clarify the relation between the socially phobic individual’s self-focus on thoughts about internal states (such as physiological symptoms of distress) and theory of mind decoding ability.

An alternative and possibly complementary explanation for the impaired decoding of mental state cues in participants with social phobia centres on avoidance. Within the Social Phobia group only, Eyes task accuracy had a strong negative correlation with the Avoidance subscale of the SAASA, indicating that those with the highest levels of social avoidance
displayed the lowest mental state decoding ability. Socially anxious individuals not only strategically avoid situations that they perceive to be social or evaluative in nature, but when they are in the midst of these situations, they are likely to engage in a number of subtle ‘safety behaviours’ aimed at avoiding potential negative evaluation (Rapee, 1995; Wells, Clark, Salkovskis, Ludgate, Hackmann, & Gelder, 1995). One such common safety behaviour that may affect decoding of mental state is their avoidance of eye contact. Visual scanpath studies show that, of all salient features of the face, healthy individuals pay the greatest attention to the eyes, as they are the most revealing source for emotional expression in social interactions (Lundqvist, Esteves, & Öhman, 1999). In most interpersonal exchanges there are few cues that provide unambiguous social information, making eye contact a valuable method of clarifying messages. However, eyes are also considered to be the most fear-inducing feature in situations of social appraisal by others (Öhman, 1986). It is no surprise, then, that socially anxious individuals have been shown to avoid eye-to-eye contact (Greist, 1995; Horley, Williams, Gonsalvez, Gordon, 2003; Horley, Williams, Gonsalvez, Gordon, 2004). In a study by Eves and Marks (1991), anxious people looked at an audience less often while giving a speech (Eves & Marks, 1991); and Farabee, Holcom, Ramsey, and Cole (1993) found a negative correlation between social anxiety and eye contact during social interactions. Therefore, in the current study, socially phobic participants with the highest levels of avoidance on the SAASA may also be the ones most likely to find the eyes stimuli of the Eyes task aversive. As mentioned earlier, the Eyes task is very difficult and requires detailed scanning of the subtle social features of the eyes in order to allow for an accurate judgement. An inability, or at least a reluctance, to fully attend to the eyes stimuli may, therefore, have interfered with this group’s opportunity to get sufficient data from the eyes to make accurate judgements.
It is noteworthy that the impairment in theory of mind decoding displayed by the socially phobic individuals is inconsistent with research that found either no difference or enhanced facial emotion recognition ability in individuals with social phobia compared to healthy controls (de Souza et al., 2006; Douilliez & Philippot, 2003; Gilboa-Schechtman et al., 2005; Hunter et al., 2009; Mullins & Duke, 2004; Philippot & Douilliez, 2005; Winton et al., 1995) There are many possible reasons for this discrepancy. As previously stated, correctly decoding the sorts of complex mental states portrayed in the Eyes task is a more difficult task than labeling stereotyped basic emotions. Further, emotion recognition tasks generally do not require participants to focus their attention on large photographs of eyes, which socially phobic individuals may find very aversive, but instead place those eyes in the context of the whole face. Therefore, in emotion recognition tasks, individuals with social phobia may be able to use other, less anxiety-provoking facial features to make their judgments.

Contrary to the previous literature reporting enhanced theory of mind decoding ability in individuals with a vulnerability to MDD, I found no difference between individuals with a history of MDD and healthy controls on the Eyes task. Differences in sample composition, and particularly in levels of current depression in the past depressed group, may help to explain this discrepancy. For example, if participants in the past depressed group in the current study were suffering from high levels of current depression, this may have interfered with their theory of mind advantage. However, the average BDI-II score for the past MDD group in the current study ($M = 14.39$) was very similar to that of the past depressed group in Harkness et al.’s (2010) sample ($M = 13.51$). A separate possibility relates to differences in methodology. In particular, all participants in the Harkness et al. (2010) study underwent a happy or sad mood induction procedure, whereas participants’ current mood was not manipulated in the present study.
We are very early in our understanding of how depression vulnerability relates to theory of mind decoding ability, and what the limits are in terms of identifying which vulnerabilities show this pattern of enhanced social cognition. Future replication studies that are adequately powered to detect group differences and that focus on a range of theory of mind decoding tasks are needed.

**Theory of Mind Reasoning Ability**

Consistent with my hypotheses, and specific to the Director task, individuals with a past history of depression performed significantly better than all other groups, but only in the context of current social phobia. That is, the Comorbid group outperformed the pure past depression group, which did not differ from healthy controls. This finding suggests that enhanced performance on the Director task was only associated with these conditions combined and *not* with ‘pure’ past major depression, which indicates that social phobia is a necessary component in eliciting the heightened theory of mind ability seen in individuals with a history of major depression. This supports the contention that heightened theory of mind ability demonstrated by those with a history of major depression may be attributed, at least in part, to the presence of comorbid social phobia.

Only one previous study has investigated the relation of mental state reasoning to remitted depression (Inoue et al., 2004), and it reported a deficit compared to controls. The inconsistency between my findings and those of this previous investigation may be explained by differences in the study samples. First, it is difficult to compare the results across studies because Inoue and colleague’s (2004) sample included patients with bipolar disorder. There is evidence that individuals with bipolar disorder, compared to those with unipolar depression, show greater negative cognitions (Ashworth, Blackburn, & McPherson, 1985) and information-processing
biases (Lex, 2000) during remission. Similarly, it is possible that, unlike in unipolar depression, individuals with remitted bipolar depression continue to exhibit deficits in theory of mind abilities that are similar to their impaired abilities during a major depressive episode (Kerr, Dunbar, & Bentall, 2003).

Whereas individuals with past depression and social phobia scored highest on the Director task, those with ‘pure’ social phobia scored lowest on the Director task relative to the other groups, although the difference was not significant. That is, consistent with their theory of mind decoding performance, those with pure social phobia showed deficits in their theory of mind reasoning. This suggests that individuals with pure social phobia have deficits in their theory of mind performance that extend across both decoding and reasoning about others’ mental states. Thus, a paradox has emerged: ‘Pure’ socially phobic participants with no history of major depression displayed lower mental state reasoning ability than controls; whereas, the combination of these two conditions results in heightened mental state reasoning compared to controls.

This paradox may be explained by differing schemas between individuals with social phobia and depression. A schema is a cognitive structure that refers to rules based on experience which “orient the individual to a situation and help him [or her] to select relevant details from the environment and to recall relevant data” (Beck & Emery, 1985, p.54). Individuals with social phobia have schemas related to others’ beliefs – they have the view that others perceive their performance negatively (Leary, Kowalski, & Campbell, 1988), which gives rise to their view that social interactions are threatening (Lucock & Salkovskis, 1988; Poulton & Andrews, 1996). This belief, in turn, facilitates the processing of social-evaluative cues (Hope, Rapee, Heimberg, & Dombeck, 1990), which is portrayed as an initial hypervigilance to social information. This
initial hypervigilance toward detection of negative social-evaluative information, however, is only useful insofar as it allows these individuals to avoid feared outcomes (Spokas, Rodebaugh, & Heimberg, 2007). In fact, three studies on individuals with a high fear of negative evaluation (FNE) found that, after initially looking at emotional faces longer than participants low in FNE, they avoided these faces in the consecutive time intervals (Garner, Mogg, & Bradley, 2006; Mühlberger, Wieser, & Pauli, 2008; Wieser, Pauli, Weyers, Alpers, & Mühlberger, 2009). Thus, it appears that socially phobic individuals possess an automatic tendency to be hypervigilant to social information, but subsequent avoidance behaviours in response to their fear of negative evaluation likely diminish this ability.

Whereas the maladaptive schemas of socially phobic individuals are focused on the beliefs of others (e.g., “Others think I’m not good enough”), depressed individuals have negative schemas about themselves (e.g., “I’m not good enough”) (Beck, 1967; Bradley & Mathews, 1983), which remain stable even after depressive symptoms have remitted (Beck, Rush, Shaw, & Emery, 1979; Miranda, Persons, & Byers, 1990; Persons & Miranda, 1992). As a result of their schemas, these individuals actively seek out information in the form of reassurance (Davila, 2001; Haefelf, Voelz, & Joiner, 2007) that disconfirms their negative views of themselves.

Thus, the schemas in individuals with social phobia lead to hypervigilance for social information, but their excessive fear of evaluation leads to avoidance, thereby eliminating their advantage; and individuals with a history of depression actively seek out reassurance from others. However, when an individual espouses both the schemas of the depressive and the socially phobic individual, there is a potential conflict between the need to disconfirm their negative self-view with the need to avoid negative evaluation. In the present study, the heightened accuracy on mental state reasoning in the comorbid group compared to each
condition alone may suggest that when an individual has current social phobia and a past history of major depression, the need to find information that disconfirms his or her negative self-view that arises from the depressive person’s schema outweighs the need to avoid negative evaluation that arises from the schema of a socially phobic person. This suggestion is completely speculative, and the underlying mechanisms involved in comorbid social phobia and depression are unclear. However, further research comparing these groups on a wider variety of tasks may unpack the specific interrelated processes that are at work.

In contrast to results for the Director task, no group differences were found in performance on the MASC task. Studies using the MASC task have identified significant deficits in theory of mind reasoning in individuals with schizophrenia (Montag et al., 2011; Pinkham, Sasson, Beaton, Abdi, Kohler, & Penn, 2012), Asperger syndrome (Adenauer, Kessler, Brand, Dziobek, Fleck, & Kalbe, 2007; Dziobek et al., 2006), and autism (Pinkham et al., 2012). Therefore, the fact that I failed to find even trends for significant group differences in this study may suggest that this task does not capture individual differences that are specific to depression vulnerability or social anxiety. Perhaps an understanding of the different pattern of performance in the MASC task versus the Director task lies in a more thorough analysis of what each task demands. Both tasks require the participant to take the perspective of another in order to answer questions or respond to instructions. However, there is a difference in the extent to which this need to take another’s perspective is explicit. In the MASC task participants are explicitly instructed to “try to imagine what the characters are feeling or thinking at the very moment the film is stopped” before answering each mental state reasoning question. That is, before beginning the MASC task participants’ mental state reasoning abilities are explicitly cued by being told to engage their theory of mind reasoning. In the Director task, in contrast, although
participants are shown both the addressee’s and director’s perspectives when being introduced to
the task, they are not explicitly told they must consider the director’s perspective in making their
response. That is, to correctly respond to critical trials participants must first recognize that there
is a discrepancy between their visual perspective and the director’s and, hence, must discover the
need to consider the others’ perspective.

Perhaps, then, that the variation in results between the two tasks indicate that the MASC
and Director tasks are measuring different constructs. After recognizing the need to consider the
others’ point of view, the specific skill measured in the Director task is the ability to use
another’s visual perspective, that is, participants are required to infer which objects someone
with a different perspective can or cannot see (Flavell, Everett, Croft, & Flavell, 1981). It has
been suggested that perspective taking tasks require participants to make visuo-spatial inferences
rather than inferences about someone’s mental state (Dumontheil, Kuster, Apperly, &
Blakemore, 2010). The MASC task, on the other hand, purports to measure a number of skills
(first- and second- order false beliefs, deception, faux pas, persuasion, metaphor, sarcasm, and
irony) that are considered central to theory of mind reasoning ability. Therefore, the results on
the Director task may suggest that participants with both social phobia and a history of major
depression have a heightened visual perspective taking ability relative to past depressed
individuals and healthy controls; but these groups are equal in their ability to reason about
others’ mental states. Furthermore, it would follow that individuals with social phobia have a
reduced ability both in reasoning about others’ mental states and in using their visual
perspective. Future studies using a more comprehensive battery of theory of mind reasoning
tasks are required before firm conclusions are made regarding the abilities of those with a
depression vulnerability with or without social phobia.
An additional explanation for the different results between the MASC and Director tasks relates to the social context in which the tasks were completed. Participants completed the MASC task by themselves in a room and completed the Director task in the presence of two others. There is evidence suggesting that socially phobic individuals process social information differently depending on the presence of an impending evaluation. DePaulo, Epstei, and LeMay (1990) found that socially anxious individuals displayed more maladaptive social behaviours when they anticipated an interpersonal evaluation compared to no anticipation of evaluation. Juth, Lundqvist, Karlsson, and Öhman (2005) found that socially anxious individuals exhibited a bias toward negative facial expressions that was enhanced after they were overtly monitored and evaluated. In the present, although the participants could potentially perceive they were being evaluated on the MASC task, during the Director task the presence of the experimenter with a clipboard and another person in the room would most likely be a more salient evaluative component. The discrepancy in mental state reasoning accuracy between the socially phobic participants and the other groups was much greater for the Director task than the MASC task, and perhaps it is a result of increased distress.

Correlations Among Theory of Mind Decoding and Reasoning Tasks

There is conflicting evidence in the research literature on theory of mind ability with regard to how mental state decoding and reasoning relate. The results of the current study show a significant correlation between mental state decoding and reasoning as measured by the Eyes and the Director tasks, respectively. This appears to confirm the finding of Wang and colleagues (2007), who found a significant correlation between the Eyes task and a faux pas task in a sample of participants with current MDD and healthy controls.
The Director task has been used by various researchers to assess different skills, with some explicitly using it as a measure of theory of mind (Keysar et al., 2003; Wu & Keysar, 2007; Converse, Lin, Keysar, & Epley, 2008), whereas others use it for measuring perspective taking (Keysar et al., 2000; Vogeley, May, Ritzl, Falkai, Zilles, & Fink, 2004). Perhaps perspective taking involves skills that overlap with theory of mind; however, the term “perspective” has a very broad meaning (Aichhorn, Perner, Kronbichler, Staffen, Ladurner, 2006), which makes it difficult to compare tasks. In contrast to classic ToM tasks, the Director task requires participants to make visuo-spatial inferences rather than inferences about someone’s mental state (Dumontheil et al., 2010). Indeed, there is evidence that brain regions are differentially activated during theory of mind and perspective taking tasks (Dumontheil et al., 2010). Thus, a significant correlation between the Eyes task and the Director task may indicate an association between theory of mind decoding and reasoning abilities, but it may more accurately represent an association between theory of mind decoding and perspective taking. Further research on the distinction between mental state reasoning and perspective taking, as well as the specific processes being tapped by the Director task, is needed to assist interpretation of the present study’s finding.

There was no correlation between the MASC task and either the Eyes or the Director task. Although the MASC task has been described as a reliable and highly sensitive instrument for the evaluation of complex mental state reasoning (Dziobek et al., 2006; Golan, Baron-Cohen, Hill, & Golan, 2006; Heavey, Phillips, Baron-Cohen, & Rutter, 2000), the present study neither found group differences on this task nor a correlation with the other tasks. These findings bring into question the utility of this task in samples of individuals with social phobia and a history of major depression.
Conclusions and Future Directions

The central focus of this study was to determine if the enhanced theory of mind ability seen in individuals with a past history of major depression is better accounted for by comorbid social phobia. This study provides evidence to suggest that social phobia influences mental state decoding and reasoning abilities differentially. Mental state reasoning ability in individuals with a history of depression was greater than those without when the history of depression was comorbid with current social phobia. This finding has led me to speculate that, when reasoning about others’ mental states, characteristics of individuals with both social phobia and past depression that are driven by their schemas may combine to confer an advantage. Interestingly, the heightened ability in this group of individuals is not present when they decode mental states. Given that this advantage was seen in a task that involved direct social interaction with others and was absent in tasks that were performed when alone may indicate that the social context is a critical consideration when measuring theory of mind ability in these samples. Future research is needed to examine the dissociation between theory of mind decoding and reasoning abilities, and to further specify the factors associated with social phobia and depression vulnerability to influence theory of mind ability.

Mental state decoding ability was impaired in socially phobic individuals. I speculated that this finding may be the result of these individuals focusing their attention on internal physical symptoms of anxiety and negative self-thoughts. However, it is theorized that self-focused attention arises in evaluative situations, and it is not certain whether participants perceived the present study’s context as evaluative. Thus, the contribution of self-focused attention on mental state decoding impairment cannot be substantiated at this point. One future direction that could strengthen this finding is to examine theory of mind in the context of an
experimental protocol with an explicit evaluative component. Perhaps a more feasible alternative to creating an evaluative situation would be to administer the Eyes task with the inclusion of a valence category of stimuli that are ‘evaluative’. Combining this protocol with validated measures of self-focused attention and current levels of state anxiety would greatly enhance our understanding of the effect of self-focused attention on theory of mind decoding ability in socially phobic individuals.

I also speculated that mental state decoding impairment in individuals with social phobia may be associated with a general avoidance strategy. In the present study the measure of avoidance included a wide variety of social situations. It would be interesting to see if theory of mind impairment is associated with an avoidance behaviour that may be more specific to decoding mental states, for example, avoidance of eye contact. This is another direction for future research that would lead the literature toward a more complete understanding of mental state decoding ability in socially phobic individuals.

Finally, the end goal of examining theory of mind ability in individuals with social phobia or a vulnerability to developing depression is to better understand factors that create and maintain interpersonal dysfunction. Despite heightened reasoning ability in individuals with both social phobia and a depression vulnerability, their social functioning is marked with significant impairment. This study extends our understanding of their social cognitive functioning within the theory of mind literature. An important next step is to clarify the relation between these theory of mind abilities to specific social functioning factors.

To conclude, these preliminary findings allow further clarification of the relation between mental state decoding ability in past depressed individuals, and extend the research toward a better understanding of their ability to reason about others’ mental states. Furthermore, the
present study was the first to examine theory of mind ability in individuals with social phobia. Future research is required to confirm these results in a larger sample with additional measures to identify various underlying mechanisms that contribute to interpersonal dysfunction.
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Appendix A

General Research Ethics Board (GREB) Approval Letter
August 10, 2010

Mr. Dustin Washburn  
Master's Student  
Department of Psychology  
Humphrey Hall  
Queen's University

GREB Ref #: GPSYC-490-10  
Title: "Theory of Mind Decoding and Reasoning Abilities in Depression, Social Phobia, and Comorbid Conditions"

Dear Mr. Washburn:

The General Research Ethics Board (GREB), by means of a delegated board review, has cleared your proposal entitled "Theory of Mind Decoding and Reasoning Abilities in Depression, Social Phobia, and Comorbid Conditions" for ethical compliance with the Tri-Council Guidelines (TCPS) and Queen's ethics policies. In accordance with the Tri-Council Guidelines (article D.1.6) and Senate Terms of Reference (article G), your project has been cleared for one year. At the end of each year, the GREB will ask if your project has been completed and if not, what changes have occurred or will occur in the next year.

You are reminded of your obligation to advise the GREB, with a copy to your unit REB; of any adverse event(s) that occur during this one year period (details available on webpage http://www.queensu.ca/ors/researchethics/GeneralREB/forms.html – Adverse Event Report Form). An adverse event includes, but is not limited to, a complaint, a change or unexpected event that alters the level of risk for the researcher or participants or situation that requires a substantial change in approach to a participant(s). You are also advised that all adverse events must be reported to the GREB within 48 hours.

You are also reminded that all changes that might affect human participants must be cleared by the GREB. For example you must report changes in study procedures or implementations of new aspects into the study procedures on the Ethics Change Form that can be found at http://www.queensu.ca/ors/researchethics/GeneralREB/forms.html - Research Ethics Change Form. These changes must be sent to the Ethics Coordinator, Gail Irving, at the Office of Research Services or irvingg@queensu.ca prior to implementation. Mrs. Irving will forward your request for protocol changes to the appropriate GREB reviewers and / or the GREB Chair.

On behalf of the General Research Ethics Board, I wish you continued success in your research.

Yours sincerely,

Joan Stevenson, PhD  
Professor and Chair  
General Research Ethics Board

c.c.:  Dr. Kate Harkness, Faculty Supervisor  
Dr. Kate Harkness and Dr. Mark Sabbagh, Co-Applicants  
Dr. Lee Fabrigar, Chair, Unit REB  
Marg Lawson, Dept. Admin.

think Research  
think Queen’s
Appendix B

Advertisements
Understanding what other people are thinking and feeling is important to getting along with others. Dustin Washburn and Dr. Kate Harkness from the Department of Psychology at Queen’s University are conducting a study looking at the effect of mood on understanding others’ minds.

Your participation in our study would include filling out questionnaires and completing 3 tasks that involve: (1) looking at pictures of a person’s eyes and guessing what that person is feeling; (2) watching a 15-min movie and answering some questions about it; and (3) moving some objects around in a grid. The whole study will take approximately 2 hours.

In return for your time and effort, you will receive $20. Your participation is completely confidential and totally voluntary.

If you have any questions about this project, please contact Dustin Washburn (613-533-6003 or tomdepstudy@gmail.com).
Are you anxious in social situations?

Do you go out of your way to avoid social situations?
Do you worry about how others perceive you?

Participate in a study looking at how mood and social anxiety affects people’s understanding of others’ thoughts and feelings!

The study involves completing tasks where you make judgments about images of people’s faces and a video of people interacting. In another task you would work with another person to move objects around in a 3-D grid. You would also do questionnaires and interviews that will ask about your mood and how comfortable you feel in social situations. All information that is collected is completely confidential.

The study takes approximately 2.5 - 3 hours
Compensation is $30 or 3 credits for Psyc100

The Mood Research Lab
Department of Psychology, Queen’s University
T: 613-533-6003

kroendel@queensu.ca
kroendel@queensu.ca
kroendel@queensu.ca
kroendel@queensu.ca
kroendel@queensu.ca
kroendel@queensu.ca
kroendel@queensu.ca
kroendel@queensu.ca
**Subject line:** Participate in Social Anxiety Research Study for $20!

**Text:**
Are you anxious in social situations?
Do you go out of your way to avoid social situations?

Participate in a study looking at how mood and social anxiety affects people’s understanding of others’ thoughts and feelings! The study involves completing 3 tasks and filling out 3 questionnaires. You would also do an interview that will ask about your mood and how comfortable you feel in social situations. All information that is collected is completely confidential.

The study takes approximately 2 hours, and compensation is $20.
Age range: 18-38
Please respond to this posting for more information. Thanks very much.
Appendix C

Letter of Information and Consent Form
Letter of Information and Consent Form

Project title: Depression, Social Phobia, and Understanding Others’ Thoughts and Emotions

Researchers: Dustin Washburn, BA., Dr Kate Harkness, Ph.D., Dr Mark Sabbagh, Ph.D., Gill Wilson, Honours student
Department of Psychology, Queen’s University

Purpose:

The goal of this project is to learn more about how mood affects people’s understanding of others’ thoughts and feelings. If you decide to participate, you will be asked to complete three tasks. In one task, you will be asked to look at pictures of eyes and animals on a computer screen. You will be asked to make two types of judgments: (a) what emotion is expressed in the eyes (e.g., happy, sad, embarrassed, or guilty), or (b) the qualities of the animals (e.g., ferocious, shy, unfriendly, or playful). In the next task, you will watch a 15-minute video of four people all talking together and answer questions about the people in the video. In a third task, you will be shown a grid in which there will be different objects, and you will be asked to move them around. We will use a video recorder in this last task so that we can learn more about how you respond. There are no foreseeable risks involved in these tasks.

After the tasks are finished, you will be interviewed. During this interview you will be asked about your mood and any symptoms of depression and anxiety that you might be experiencing. This interview is not part of any kind of therapy, but solely for the purpose of data gathering. There is a possibility that you may feel uncomfortable with the kind of information we ask for. You are not obligated to answer questions that you object to or that make you feel uncomfortable, and you are free to stop participating at any time without any negative consequences. If you experience any psychological discomfort or distress from participating in this interview you may let the interviewer know.

Next, you will be asked to fill out two questionnaires, one about your mood and the other about how comfortable you feel in social situations. The entire study will take approximately 2 hours, and there will be no follow-up studies. You will be given $20 or 2 credits for your Psychology 100 course through the Queen’s University Psychology subject pool (if relevant) to compensate you for your time and effort.

Confidentiality will be protected. All information we collect from you will be identified with a code number and your name will not be associated in any way with this material. All information you provide at the interview and on the questionnaires is confidential and will not be shared with anyone. Reports of this study will combine interview data and will not discuss individual interviews. Interview notes will be stored on a password-protected computer at Queen’s University and destroyed after 3 years. Only the researchers and research assistants in the laboratory will have access to this data. Your signature below indicates that you understand these conditions of confidentiality and anonymity. We are, however, obligated to break...
confidentiality and report if you reveal a threat to seriously harm yourself or others.

Participation is voluntary and you are free to withdraw at any time. Your decision whether or not to participate will not affect your relationship with Queen’s University. If you decide to participate you will be free to withdraw your consent and stop participating at any time. If you withdraw from the study, your interview and questionnaire material will be destroyed in order to ensure your confidentiality. Your signature below indicates that you understand that your participation is voluntary and that you are free to withdraw at any time.

Research results will be presented at conferences and/or in academic print journals and/or in open access publications relevant to the digital library community. There are no foreseeable secondary uses of the data.

This study has been granted clearance according to the recommended principles of Canadian ethics guidelines, and Queen’s policies.

Any questions about study participation may be directed to Dr Kate Harkness at 613-533-2886 or harkness@queensu.ca. Any ethical concerns about study participation may be directed to the Chair of the General Research Ethics Board at 613-533-6081 or Chair.GREB@queensu.ca.

Your signature below indicates that you have read this Letter of Information and have had any questions answered to your satisfaction. Please keep a copy of this letter for your records.

Name: ___________________________
Date: ___________________________
Signature: ________________________

I agree to be contacted for future studies being conducted by this laboratory.
Signature: ________________________
Appendix D

Pre-Screening and Task Scripts
Pre-Screening Telephone Script

(i) **Introduction**
Hello could I speak to _____________, please? My name is ____________, and I am calling from the Mood Research Lab at Queen’s University. I’m calling because you might be eligible to participate in a study in our lab based on the prescreening questionnaires you filled out at the beginning of your psyc100 class. Are you interested in receiving more information?

(ii) **Explanation of the Experiment**
- This study is looking at how mood affects people’s understanding of others’ thoughts and feelings. During the experiment, you would complete three tasks.
- In one task, you will be asked to look at pictures of eyes and animals on a computer screen and answer some questions about them.
- In a second task, you will watch a 15-minute video of four people all talking together and answer questions about the people in the video.
- In a third task, you will be shown a box in which there will be different objects, and you will be asked to move them around. We will use a video recorder in this last task so that we can learn more about how you respond.
- After the tasks are finished, you will be asked to fill out three questionnaires, one about your mood and the other about how comfortable you feel in social situations.
- Next, you will be interviewed about your mood and any symptoms of depression and anxiety that you might be experiencing.

- The entire study will take approximately 2 hours.
- You will be compensated $20 or 2 credits for Psyc100 course
- Are you still interested in participating?

[If NO: Thank them for their time]

(iii) **Inclusion/Exclusion Criteria for the study**
- Great! Now I would like to ask you a few questions to see if you are eligible to participate.
  1. How old are you?
     - **Accept:** 16-27 yrs old

  2. Have you been diagnosed, or have you had any treatment, (presently or in the past) for any psychiatric disorder, including a dependence on drugs or alcohol?
     If so, what was it?
     - **Exclude:** participants who report a history of:
       - psychotic disorder (e.g., schizophrenia),
       - bipolar disorder
       - drug/alcohol dependence
       - developmental disability (e.g., autism),
       - conduct disorder
(iv) **Mood Module Screen**

Now I would like to ask you some questions about your mood over the last couple of weeks. These questions aren’t meant to diagnose you with any type of disorder or in any way meant to determine whether you need any type of treatment. They’re just to give me an idea for whether or not you qualify for this study. These questions will take about 5 minutes or so. Do you have time now?

“In the last two weeks....”

<table>
<thead>
<tr>
<th>Question</th>
<th>Response:</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Has there been a period of time when you were feeling depressed or down most of the day nearly every day?</td>
<td>No (N); Maybe (M); Definitely (D)</td>
</tr>
<tr>
<td>If YES, When did it start? How long did it last?</td>
<td>N</td>
</tr>
<tr>
<td>[If at least TWO WEEKS, circle D]</td>
<td>M</td>
</tr>
<tr>
<td>“During this time.....”</td>
<td>D</td>
</tr>
<tr>
<td>(2) have you lost interest or pleasure in doing things that you usually enjoyed?</td>
<td>N</td>
</tr>
<tr>
<td>IF DOESN’T MEET (1) OR (2), PROBE FOR PAST EPIS.</td>
<td>M</td>
</tr>
<tr>
<td>(3) have you lost or gained any weight? (How is your appetite? Are you trying to lose weight?)</td>
<td>D</td>
</tr>
<tr>
<td>(4) how have you been sleeping? (insomnia or hypersomnia) (Any trouble falling asleep? Getting up in night?)</td>
<td>N</td>
</tr>
<tr>
<td>(5) what has your energy been like? (tired all the time?)</td>
<td>M</td>
</tr>
<tr>
<td>(6) how have you been feeling about yourself? (worthless?) (What about feeling guilty about things you did or did not do?)</td>
<td>D</td>
</tr>
<tr>
<td>(7) have you had trouble thinking or concentrating? (Is it hard to make decisions about everyday things?)</td>
<td>N</td>
</tr>
<tr>
<td>(8) have you been so fidgety or restless that you were unable to sit still? (What about the opposite, are you talking or moving more slowly than usual? Like you’re moving in water?)</td>
<td>N</td>
</tr>
</tbody>
</table>

[* At least 5 of the above symptoms need to be coded ‘D’. **Must NOT be CURRENTLY in an episode**]
(v) **Anxiety Module Screen**

<table>
<thead>
<tr>
<th>Question</th>
<th>Response:</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Do you often feel very afraid, uncomfortable, or anxious around people that aren’t in your family?</td>
<td>No (N); Maybe (M); Definitely (D)</td>
</tr>
<tr>
<td>(2) Do you often feel very afraid, uncomfortable, or anxious in one or more types of social situations? For example, meeting new people, or answering questions in class?</td>
<td>No (N); Maybe (M); Definitely (D)</td>
</tr>
<tr>
<td>(3) Do you avoid this/these situations or else try to cope with the intense anxiety?</td>
<td>No (N); Maybe (M); Definitely (D)</td>
</tr>
</tbody>
</table>

[All 3 of the above symptoms need to be coded ‘D’]

Okay. Those questions were probably unexpectedly heavy. We’re finished with those questions, and thank you for your openness.

* If the participant is not eligible:

Unfortunately, you are not eligible to participate in this study, thank you for your interest.

** IF CURRENTLY DEPRESSED: ** See if we can refer them to Blue Sky:
- However, there is another study our lab is doing, and you may be eligible to participate in it. Would you like to hear more about it?
- **Blue Sky Project** is a study looking at environmental and biological factors behind depression. The study consists of some questionnaires and interviews about you mood, as well as stressful things that have happened to you recently and in your life. We will also be taking a saliva sample to look for a gene we think is involved in depression.
- The study takes place over two 2.5 hour sessions (usually 1 week apart). For your participation you will be compensated $70; $50 at the end of the two interviews, and another $20 after a follow-up 18 months later.
- If you’re interested, I can pass your contact information onto our lab coordinator and he can contact you with more information. Would you like to do that?

* If the participant is eligible:

According to these answers you are eligible to participate in this study, we can set an appointment time.

80
(vi) **Set an appointment**
- Check with the lab calendar and write down the scheduled time.
- Appointment:
  - Date: __________
  - Time: __________
  - Location: **Humphrey Hall, rm 245 (weekdays)**
    - Main doors of Humphrey Hall (after 8pm & weekends)

(vii) **Confirmation**
- Confirm the time and date of the appointment
- Ask for an email address to send them a reminder at least 24 hours before the appointment.
- Give them the lab’s contact information in case they ever have any questions:
  - Email: tomdepsudy@gmail.com
  - Phone: 613-533-6003

(viii) **Write Appointment in Google Calendar**
- Input the following info under ToM Study
  - Date, Time
  - Name
  - Email address
  - Phone #
  - PID #
  - Experimenter
  - Confederate

(ix) **Send Confirmation Email**
- See “ToM Dep – Email Confirmation”
Experimental Task Scripts

**EYES TASK**

- If the participant is a bit younger, make sure he/she understands all of the words in the task. Refer to
  - I’ll get you to sit at this computer
  - First, they fill out Demographic information:
    - Now you’re going to do a task on this computer. But before that, there are some questions about you that I’d like you to answer.
  - Then they read the instructions. Stay for this:
    - As you go through the instructions, click “Continue” in the lower right corner to move forward. You can go ahead and read the instructions.
  - I’m going to leave you to it and close the door.
  - I’d like you to respond as quickly and accurately as possible. When the task is finished, you’ll be asked for a password. When you’re asked for a password, open the door and I’ll come in to explain the next task.
  - Do you have any questions? If you have any questions during the task, open the door and I’ll come in. Just remember to keep your fingers on the keys.

**MASC**

- I’ll get you to sit at this computer
- First, they fill out Demographic information:
  - Now you’re going to do a task on this computer. But before that, there are some questions about you that I’d like you to answer.
  - Once you’re ready, click “Continue” in the lower right corner and you’ll be presented with the instructions.
- Then they read the instructions. Stay for this:
  - As you go through the instructions, click “Continue” in the lower right corner to move forward. You can go ahead and read the instructions.
- After the video clip is finished, click “Continue” to go to the question, then click the correct answer choice. Be sure to wait until the clip disappears before clicking “Continue”
- When the task is finished, you’ll be asked for a password. When you’re asked for a password, open the door and I’ll come in to explain the next task.
- Do you have any questions? If you have any questions during the task, open the door and I’ll come in.
- I’ll just get you to put on these headphones.
Now we’re going to go on to the next task. There’s another participant that has been doing these same things in another room. I’m going to bring him/her in here to do this task together.

So this is [Confederate’s name], and this is [Participant’s name].

In this task I will assign you each to a role. One of you will be the Director, and the other will be the Addressee.

The Director will sit on this side of the grid (back wall), and the Addressee sits here (door).

Objects will be placed in the boxes. These are the columns [indicate a column] and these are the rows [indicate a row].

I will give the Director a photo of the grid with the objects in different positions. The Director’s job is to give the Addressee instructions on how to move the objects so that the real grid looks the same as the grid in the photo. The Director will give only four instructions, and then I’ll change the objects.

When the Director says “left” or “right,” he/she is referring to the Addressee’s left of right, not their own.

Notice that some of the boxes are hidden from the Director’s view [Show them]. The Director can’t see objects in these boxes. These boxes will be hidden in the photos that I give the director too. See? [Show a photo]

Model how the Addressee is to respond:

- The Addressee has to keep his/her hands on his/her knees while the Director gives the instructions, and can only lift his/her hands away from his/her knees when he/she is moving an object.
- Also, we want the Addressee to sit as still as possible because we are recording your eye movements with this camera down here.

We will practice first, so that you each get to try being the Director, and you each get to try being the Addressee. Let’s have you (gesture to participant) be the Addressee first.

- Practice Trial #1 - Participant is Addressee:
  - Arrange the objects according to “Starting Position, Practice Trial #1”
  - Give participant the photo, let him/her try to give directions. Make sure he/she refers to addressee’s left and right, and that they call objects correct names.

- Practice Trial #2 - Participant is Director:
  - Arrange the objects according to “Starting Position, Practice Trial #2”
  - Director does fake trial.
    - Correct Director when
      1. he/she calls a block a lego: “We’re calling this a block, not lego.”
      2. he/she says “left” (instead of “right”): “Remember to give the directions from the Addressee’s left and right, not yours.”

- Role Assignment: Alright, now that you have both tried each role, we’re going to assign one role to each of you for the task. I will ask you (refer to participant) to choose a slip of paper from my hand. It will tell you what your role is.
- What is it?
- Great, so (gesture to participant) you’re the addressee, and (gesture to confederate) you’re the Director.
- Let’s begin.
- Adjust chair so that participant’s eyes are level with the center slot.
- Say to the Addressee: Remember to keep yourself as still as possible.

- Begin the task:
  - Arrange the objects according to “Starting Position, Trial #1”.
    - Now we’re going to change the objects. We’re going to drop this sheet so that the Director doesn’t see them, and I’ll ask you to sit over here for a moment. [Have participant sit in big blue chair]
  - Lift the sheet and give Director the 1st photo (Trial# in top-right corner)
  - To the Director:
    - Remember, your task is to instruct [Addressee] on how to move the objects so that they are placed exactly how they are in the photo.
  - Director will discretely flip it over to see the instructions. He/she should look from the photo to the grid once or twice between giving each instruction to keep up the façade.
  - When trial #1 is finished:
    - Now I’ll drop the sheet and I’ll get you to sit over here again.
  - Arrange the objects according to “Starting Position, Trial #2”.
  - Etc…
Appendix E

Demographics Questionnaire
Demographics Questionnaire

Please type your age: __________

Please choose your sex: Male   Female

How many years of education have you completed, including this academic year? (For example, if you are currently in grade 6, type “6”, and if you are currently in your second year of university, type “14”.) __________

What medications are you currently taking: _____________________________________
Appendix F

Measures
Name: ____________________________ Marital Status: ______ Age: _____ Sex: ______
Occupation: __________________________ Education: __________________________

**Instructions:** This questionnaire consists of 21 groups of statements. Please read each group of statements carefully, and then pick out the one statement in each group that best describes the way you have been feeling during the past two weeks, including today. Circle the number beside the statement you have picked. If several statements in the group seem to apply equally well, circle the highest number for that group. Be sure that you do not choose more than one statement for any group, including Item 16 (Changes in Sleeping Pattern) or Item 18 (Changes in Appetite).

| 1. Sadness                                                                 |
| 0 I do not feel sad.                                                        |
| 1 I feel sad much of the time.                                              |
| 2 I am sad all the time.                                                    |
| 3 I am so sad or unhappy that I can’t stand it.                            |

| 2. Pessimism                                                               |
| 0 I am not discouraged about my future.                                    |
| 1 I feel more discouraged about my future than I used to be.              |
| 2 I do not expect things to work out for me.                              |
| 3 I feel my future is hopeless and will only get worse.                   |

| 3. Past Failure                                                           |
| 0 I do not feel like a failure.                                            |
| 1 I have failed more than I should have.                                  |
| 2 As I look back, I see a lot of failures.                                |
| 3 I feel I am a total failure as a person.                                |

| 4. Loss of Pleasure                                                       |
| 0 I get as much pleasure as I ever did from the things I enjoy.           |
| 1 I don’t enjoy things as much as I used to.                              |
| 2 I get very little pleasure from the things I used to enjoy.             |
| 3 I can’t get any pleasure from the things I used to enjoy.               |

| 5. Guilty Feelings                                                       |
| 0 I don’t feel particularly guilty.                                       |
| 1 I feel guilty over many things I have done or should have done.        |
| 2 I feel quite guilty most of the time.                                   |
| 3 I feel guilty all of the time.                                          |

| 6. Punishment Feelings                                                   |
| 0 I don’t feel I am being punished.                                       |
| 1 I feel I may be punished.                                               |
| 2 I expect to be punished.                                                |
| 3 I feel I am being punished.                                             |

| 7. Self-Dislike                                                          |
| 0 I feel the same about myself as ever.                                  |
| 1 I have lost confidence in myself.                                      |
| 2 I am disappointed in myself.                                           |
| 3 I dislike myself.                                                      |

| 8. Self-Criticalness                                                     |
| 0 I don’t criticize or blame myself more than usual.                     |
| 1 I am more critical of myself than I used to be.                        |
| 2 I criticize myself for all of my faults.                               |
| 3 I blame myself for everything bad that happens.                        |

| 9. Suicidal Thoughts or Wishes                                           |
| 0 I don’t have any thoughts of killing myself.                           |
| 1 I have thoughts of killing myself, but I would not carry them out.     |
| 2 I would like to kill myself.                                           |
| 3 I would kill myself if I had the chance.                               |

| 10. Crying                                                                |
| 0 I don’t cry anymore than I used to.                                     |
| 1 I cry more than I used to.                                              |
| 2 I cry over every little thing.                                          |
| 3 I feel like crying, but I can’t.                                        |
11. Agitation
0  I am no more restless or wound up than usual.
1  I feel more restless or wound up than usual.
2  I am so restless or agitated that it’s hard to stay still.
3  I am so restless or agitated that I have to keep moving or doing something.

12. Loss of Interest
0  I have not lost interest in other people or activities.
1  I am less interested in other people or things than before.
2  I have lost most of my interest in other people or things.
3  It’s hard to get interested in anything.

13. Indecisiveness
0  I make decisions about as well as ever.
1  I find it more difficult to make decisions than usual.
2  I have much greater difficulty in making decisions than I used to.
3  I have trouble making any decisions.

14. Worthlessness
0  I do not feel I am worthless.
1  I don’t consider myself as worthwhile and useful as I used to.
2  I feel more worthless as compared to other people.
3  I feel utterly worthless.

15. Loss of Energy
0  I have as much energy as ever.
1  I have less energy than I used to have.
2  I don’t have enough energy to do very much.
3  I don’t have enough energy to do anything.

16. Changes in Sleeping Pattern
0  I have not experienced any change in my sleeping pattern.
1a  I sleep somewhat more than usual.
1b  I sleep somewhat less than usual.
2a  I sleep a lot more than usual.
2b  I sleep a lot less than usual.
3a  I sleep most of the day.
3b  I wake up 1–2 hours early and can’t get back to sleep.

17. Irritability
0  I am no more irritable than usual.
1  I am more irritable than usual.
2  I am much more irritable than usual.
3  I am irritable all the time.

18. Changes in Appetite
0  I have not experienced any change in my appetite.
1a  My appetite is somewhat less than usual.
1b  My appetite is somewhat greater than usual.
2a  My appetite is much less than before.
2b  My appetite is much greater than usual.
3  I have no appetite at all.
3b  I crave food all the time.

19. Concentration Difficulty
0  I can concentrate as well as ever.
1  I can’t concentrate as well as usual.
2  It’s hard to keep my mind on anything for very long.
3  I find I can’t concentrate on anything.

20. Tiredness or Fatigue
0  I am no more tired or fatigued than usual.
1  I get more tired or fatigued more easily than usual.
2  I am too tired or fatigued to do a lot of the things I used to do.
3  I am too tired or fatigued to do most of the things I used to do.

21. Loss of Interest in Sex
0  I have not noticed any recent change in my interest in sex.
1  I am less interested in sex than I used to be.
2  I am much less interested in sex now.
3  I have lost interest in sex completely.
The Social Anxiety and Avoidance Scale for Adolescents (SAASA)

**Instructions**

Presented below is a list of situations in which people might feel distress/anxiety, often leading the individual to avoid those situations. Rate (1) how much stress distress/anxiety and (2) how often you avoid each situation, on a scale from 1 to 5. If you have never been confronted with one or more situations, imagine what level of distress/anxiety you would feel and how often you would avoid that (those) situation(s).

<table>
<thead>
<tr>
<th>Social situations</th>
<th>I feel anxious</th>
<th>I avoid</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 = None</td>
<td>1 = Never</td>
</tr>
<tr>
<td></td>
<td>2 = Little</td>
<td>2 = Sometimes</td>
</tr>
<tr>
<td></td>
<td>3 = Some</td>
<td>3 = Many times</td>
</tr>
<tr>
<td></td>
<td>4 = Much</td>
<td>4 = Most of the times</td>
</tr>
<tr>
<td></td>
<td>5 = Very much</td>
<td>5 = Almost always</td>
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<tr>
<td>1. Eating in public.</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
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<tr>
<td>2. Drinking in front of other people.</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
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<tr>
<td>3. Going to a party given by a classmate.</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
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<tr>
<td>4. Reading out loud in front of the class.</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
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<tr>
<td>5. Writing while being observed.</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
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<tr>
<td>6. Phoning a classmate I don’t know very well.</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
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<tr>
<td>7. Talking to someone I don’t know very well.</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
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<tr>
<td>8. Meeting strangers.</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
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<tr>
<td>9. Urinating in a public toilet.</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
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<tr>
<td>10. In a bus or train, sitting in front of other people.</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
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<tr>
<td>11. Expressing disagreement or disapproval to a</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
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<tr>
<td>person I don’t know very well.</td>
<td></td>
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<tr>
<td>12. Making eye contact with someone I don’t know very</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
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<tr>
<td>well.</td>
<td></td>
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<tr>
<td>13. Expressing my feelings to the person I like.</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
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<tr>
<td>14. Being alone with a classmate of the opposite sex.</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
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<tr>
<td>15. Performing, for the first time, a new task or role</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
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<td>in front of classmates.</td>
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<tr>
<td></td>
<td>I feel anxious</td>
<td>I avoid</td>
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<tr>
<td>16. Saying “no” to a classmate that has asked me to do something I don’t want to do.</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
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<tr>
<td>17. Mingling in a group where there are mainly people of the opposite sex.</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
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<tr>
<td>18. Asking someone for a favor.</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
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<tr>
<td>19. Asking someone out for the first time.</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
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<tr>
<td>20. Making a compliment to someone of the opposite sex.</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>21. Having a conversation with someone of the opposite sex.</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
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<tr>
<td>22. Talking with people in my school that are older than me.</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
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<tr>
<td>23. Asking a classmate to change a way of behaving that annoys me.</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
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<tr>
<td>24. Doing exercises during gym class.</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
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<tr>
<td>25. Changing in the locker room.</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
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<tr>
<td>26. Taking an oral test or exam.</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
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<tr>
<td>27. Complaining when someone tries to cut in line.</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
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<tr>
<td>28. Being asked to solve a problem on the blackboard.</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
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<tr>
<td>29. Taking the initiative of asking a question or requesting an explanation in a class or meeting.</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
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<tr>
<td>30. Being late or early to a meeting or class.</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
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<tr>
<td>31. Participating in a group sport.</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
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<tr>
<td>32. Crossing the hall, corridors, or going to the school lunchroom when it is full of students.</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
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<tr>
<td>33. Participating in school parties.</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>34. Answering back to a classmate who is trying to make fun of me.</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
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</tbody>
</table>

*Source: European Psychologist 2008; Vol. 13(3):197–213 © 2008 Hogrefe & Huber Publisher*
Appendix G

Sample from SCID: Modules A (Mood Disorders) and F (Anxiety Disorders)
STRUCTURED CLINICAL INTERVIEW FOR DSM-IV AXIS I DISORDERS

SCID

CLINICIAN VERSION

ADMINISTRATION BOOKLET

Michael B. First, M.D.
Robert L. Spitzer, M.D.
Miriam Gibbon, M.S.W.
Janet B.W. Williams, D.S.W.

Biometrics Research Department
New York State Psychiatric Institute
Department of Psychiatry, Columbia University
A. MOOD EPISODES

MAJOR DEPRESSIVE EPISODE

Now I am going to ask you some more questions about your mood.

...has there been a period of time when you were feeling depressed or down most of the day, nearly every day? (What was that like?)

IF YES: How long did it last? (As long as two weeks?)

...what about losing interest or pleasure in things you usually enjoyed?

IF YES: Was it nearly every day? How long did it last? (As long as two weeks?)

MDE CRITERIA

A. Five (or more) of the following symptoms have been present during the same two week period and represent a change from previous functioning; at least one of the symptoms is either (1) depressed mood, or (2) loss of interest or pleasure.

(1) depressed mood most of the day, nearly every day, as indicated by subjective report (e.g., feels sad or empty) or observation made by others (e.g., appears tearful). Note: in children or adolescents can be irritable mood

(2) markedly diminished interest or pleasure in all, or almost all, activities most of the day, nearly every day (as indicated either by subjective account or observation made by others).

If neither A1 nor A2 are "+" during the current month, check for past Major Depressive Episode by asking questions A1 and A2 again looking for lifetime episodes, beginning with "Has there EVER..."

IF AT LEAST ONE PAST DEPRESSED PERIOD: Have you had more than one time like that? Which one was the worst?

If neither A1 nor A2 has ever been "++", go to A16, page 8 (Manic Episode).
FOR THE FOLLOWING QUESTIONS, FOCUS ON THE WORST TWO-WEEK PERIOD:

During (TWO-WEEK PERIOD)...

A3 ...did you lose or gain any weight? (How much? Were you trying to lose weight?)

IF NO: How was your appetite? (What about compared to your usual appetite? Did you have to force yourself to eat? Eat [less/more] than usual? Was that nearly every day?)

A3 (3) significant weight loss when not dieting, or weight gain (e.g., a change of more than 5% of body weight in a month) or decrease or increase in appetite nearly every day. Note: in children, consider failure to make expected weight gains.

A4 ...how were you sleeping? (Trouble falling asleep, waking frequently, trouble staying asleep, waking too early, OR sleeping too much? How many hours a night compared to usual? Was that nearly every night?)

A4 (4) insomnia or hypersomnia nearly every day

A5 ...were you so fidgety or restless that you were unable to sit still? (Was it so bad that other people noticed it? What did they notice? Was that nearly every day?)

IF NO: What about the opposite — talking or moving more slowly than is normal for you? (Was it so bad that other people noticed it? What did they notice? Was that nearly every day?)

A5 (5) psychomotor agitation or retardation nearly every day (observable by others, not merely subjective feelings of restlessness or being slowed down)

NOTE: ALSO CONSIDER BEHAVIOR DURING THE INTERVIEW

A6 ...what was your energy like? (Tired all the time? Nearly every day?)

A6 (6) fatigue or loss of energy nearly every day
A7

...how did you feel about yourself? (Worthless? Nearly every day?)

IF NO: What about feeling guilty about things you had done or not done? (Nearly every day?)

(7) feelings of worthlessness or excessive or inappropriate guilt (which may be delusional) nearly every day (not merely self-reproach or guilt about being sick)

NOTE: CODE "-" IF ONLY LOW SELF-ESTEEM

A8

...did you have trouble thinking or concentrating? (What kinds of things did it interfere with? Nearly every day?)

IF NO: Was it hard to make decisions about everyday things?

(8) diminished ability to think or concentrate, or indecisiveness, nearly every day (either by objective account or as observed by others)

A9

...were things so bad that you were thinking a lot about death or that you would be better off dead? What about thinking of hurting yourself?

IF YES: Did you do anything to hurt yourself?

(9) recurrent thoughts of death (not just fear of dying), recurrent suicidal ideation without a specific plan, or a suicide attempt or a specific plan for committing suicide

A10

AT LEAST FIVE OF A(1)-A(9) ARE "+" AND AT LEAST ONE OF THESE IS ITEM A(1) OR A(2).

If A10 above is "-" (i.e., fewer than five are "+"), ask the following:

Have there been any other times when you’ve been depressed and had even more of the symptoms that we’ve just talked about?

If "yes", go back to A1, page 3, and ask about that episode.
If "no", go to A16, page 8 (Manic Episode).
A11 IF UNCLEAR: Has (depressive episode/OWN WORDS) made it hard for you to do your work, take care of things at home, or get along with other people?

B. The symptoms cause clinically significant distress or impairment in social, occupational, or other important areas of functioning.

If A11 above is "-" (i.e., sx not clinically significant), ask the following:

Have there been any other times when you've been depressed and it had more of an effect on your life?

If "yes", go back to A1, page 3, and ask about that episode.
If "no", go to A16, page 8 (Manic Episode).

A12 Just before this began, were you physically ill?

Just before this began, were you taking any medications?

IF YES: Any change in the amount you were taking?

Just before this began, were you drinking or taking any street drugs?

C. Not due to the direct physiological effects of a substance (e.g., a drug of abuse, medication) or to a general medical condition.

Etiological general medical conditions include degenerative neurological illnesses (e.g., Parkinson's disease), cerebrovascular disease (e.g., stroke), metabolic conditions (e.g., Vitamin B-12 deficiency), endocrine conditions (e.g., hyper- and hypothyroidism, hypo- and hypoadrenocorticism); viral or other infections (e.g., hepatitis, mononucleosis, HIV), and certain cancers (e.g., carcinoma of the pancreas).

Etiological substances include alcohol, amphetamines, cocaine, hallucinogens, inhalants, opioids, phenycyclidine, sedatives, hypnotics, anxiolytics. Medications include antihypertensives, oral contraceptives, corticosteroids, anabolic steroids, anticancer agents, analgesics, anticholinergics, cardiac medications.

If A12 above is "-" (i.e., mood is due to substance or general medical condition), ask the following:

Have there been any other times when you've been depressed and it was not because of (GENERAL MEDICAL CONDITION/SUBSTANCE USE)?

If "yes", go back to A1, page 3, and ask about that episode.
If "no", go to A16, page 8 (Manic Episode).
IF UNKNOWN: Did this begin soon after someone close to you died?

D. Not better accounted for by Bereavement, i.e., after the loss (death) of a loved one, the symptoms persist for longer than 2 months or are characterized by marked functional impairment, morbid preoccupation with worthlessness, suicidal ideation, psychotic symptoms, or psychomotor retardation.

If A13 above is "-" (i.e., the depressed mood is better accounted for by bereavement), ask the following:
Have there been any other times when you've been depressed and it was not because of the loss of a loved one?

If "yes", go back to A1, page 3, and ask about that episode.
If "no", go to A16, page 8 (Manic Episode).

A14

CRITERIA A, B, C, AND D ARE "+"

(MAKE A DIAGNOSIS OF MAJOR DEPRESSIVE EPISODE)

A15

How many separate times have you been (depressed/OWN WORDS) nearly every day for at least two weeks and had several of the symptoms that you just described, like ($XS OF WORST EPISODE)?

Total number of Major Depressive Episodes, including current (CODE 99 if too numerous or indistinct to count).
SOCIAL PHOBIA

* F40 * Currently, in social situations where you might be observed or evaluated by others or when you are meeting new people, do you feel fearful, anxious or nervous? (Are you overly concerned that you may do and/or say something that might embarrass or humiliate yourself in front of others or that others may think badly of you?)

What kinds of social situations are a problem for you?
(- public speaking?
- eating in front of others?
- writing in front of others?
- social gatherings?
- being assertive; saying no or making a request?)

IF PUBLIC SPEAKING ONLY ASK: Do you think you are more uncomfortable than most people are in that situation?

What are you concerned will happen in these situations?

** IF F40 IS "-" (i.e., no marked social fear) OR THE FOCUS OF FEAR IS BETTER ACCOUNTED FOR BY ANOTHER MENTAL DISORDER (SUCH AS PANIC DISORDER) GO TO F41, PAGE 70-6 **
Do you experience the anxiety nearly every time you encounter _______?

B. Exposure to the feared social situation almost invariably provokes anxiety, which may take the form of a situationally-bound or -predisposed panic attack.

Do you think you are more afraid of _______ than you should be (or than makes sense)?

C. The person recognizes that the fear is excessive or unreasonable.

IF AVOIDANCE IS UNCLEAR ASK:
Do you go out of your way to avoid _______?
IF NO ASK: How hard is it for you to _______?

D. The feared social or performance situations are avoided, or else endured with intense anxiety or distress.

IF INTERFERENCE IS UNCLEAR ASK:
In what ways have these social fears interfered with your life? Has your current job or educational attainment been influenced by these fears? How much are you bothered by these social fears?

E. The avoidance, anxious anticipation, or distress in the feared social or performance situation(s) interferes significantly with the person's normal routine, occupational (or academic) functioning, or with social activities or relationships with others, or there is marked distress about having the phobia.
Just before these social fears began, were you taking any drugs or medicines?

Just before these social fears began, were you physically ill?

G. The fear or avoidance is not due to the direct physiological effects of a substance or a general medical condition;

... and is not better accounted for by another mental disorder

H. If a general medical condition or other mental disorder is present, the fear in A is unrelated to it, e.g., the fear is not of stuttering, trembling (in Parkinson's disease) or exhibiting abnormal eating behavior (in Anorexia Nervosa or Bulimia Nervosa)
Appendix H

Debriefing Form
DEBRIEFING FORM

Theory of Mind Decoding and Reasoning Abilities in Depression, Social Phobia, and Comorbid Conditions

Thank you very much for participating in our study. The purpose of this study was to look at differences among groups of people who have depression and/or social anxiety, versus no disorder, on ‘theory of mind’. Theory of mind is our ability to understand what other people are thinking or feeling by looking at things like their facial expressions, eyegaze direction, or taking their perspective. We all have a theory of mind, but some people are better at it than others. We’re interested in how different moods, like depression and anxiety, affect theory of mind ability. We’re hoping that what we learn will help people with depression and social phobia function better in social situations.

If your involvement in this study has caused you to feel depressed or anxious, and if you would like to talk about these feelings with someone, please call your clinician. If you are not currently in treatment and would like to talk to someone about depression, anxiety, or other problems you may be experiencing, please consult your family doctor and he or she can refer you for treatment. If you do not have a family doctor, here are some other resources in the Kingston community:

Queen’s Health Counseling and Disability Centre 533-6000 x.78264
Queen’s Psychology Clinic 533-2625
Kingston Community Counseling Centre 549-7850
Kingston Family Centre 549-5777
Pathways for Children & Youth 546-8535
Adolescent Outpatient Psychiatry Centre (COPC) 544-2153
24-hour Crisis Line 544-4229

If you would like more information on depression/anxiety, here are a couple of readings to get you started:

- The Feeling Good Handbook by David D. Burns

If you would like to learn more about theory of mind, here is an article:


* This study was granted clearance by the General Research Ethics Board for compliance with the TCPS: Ethical Conduct of Research Involving Humans, and Queen’s policies.

If you have any complaints, concerns, or questions about this research, or if you would like information on the results when the study is completed, please feel free to contact Dustin Washburn at dustin.washburn@queensu.ca; 613-533-6001, or Dr. Kate Harkness at harkness@queensu.ca; 613-533-2886. Any ethical concerns about the study may be directed to the Chair of the General Research Ethics Board at <613-533-6081 or Chair.GREB@queensu.ca>.