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Do socially anxious individuals lack behavioural mimicry? Examining the relationships among social anxiety, self-focused attention and mimicry

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DO SOCIALLY ANXIOUS INDIVIDUALS LACK BEHAVIOURAL MIMICRY? EXAMINING THE RELATIONSHIPS AMONG SOCIAL ANXIETY, SELF-FOCUSED ATTENTION AND MIMICRY

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Abstract

This dissertation examines behavioural mimicry – defined as the unintentional alteration of one's behaviour to match that of an interaction partner – within individuals with high social anxiety. Reduced mimicry behaviour among individuals with high social anxiety has been demonstrated in past research using a virtual environment and interaction partner (Vrijsen, Lange, Becker, & Rinck, 2010; Vrijsen, Lange, Dotsch, Wigboldus, & Rinck, 2010). The following studies further examined the relationship between high social anxiety and mimicry behaviour in several contexts. In Study 1 (N = 81), the Automatic Imitation Task (AIT) was used to examine motor resonance, the tendency for corresponding motor activity to occur during observation of another individual acting. It was hypothesized that individuals with high social anxiety would show reduced motor resonance compared to those with low social anxiety; however, individuals with high and low social anxiety did not significantly differ on levels of motor resonance. In Study 2 (N = 84), an experimental environment that simulated a natural human social interaction was used to examine the relationship between mimicry and social anxiety. The simulated interaction involved a confederate (fake participant) who made a series of target movements during the interaction. Individuals with high social anxiety mimicked the confederate less (made fewer target movements) than those with low social anxiety; however, the reduced mimicry finding only occurred during the period in which the participants were talking, but not while they were listening. In addition, during the period in which participants were talking, increased self-focused attention was associated with reduced behavioural mimicry. Study 3 (N = 95) manipulated self-focused attention in participants with high social anxiety before they

engaged in the mimicry task outlined in Study 2. Individuals with high social anxiety who were manipulated to have increased self-focused attention did not show reduced mimicry behaviour compared to individuals manipulated to have other-focused attention. However, among participants in the self-focused attention condition, increased self-focused attention was associated with reduced mimicry behaviour during the portion of the experiment when participants were listening, but not while they were talking. Collectively, these three studies provided partial evidence to support the notion of reduced mimicry among individuals with high social anxiety. Future research can further evaluate the contexts in which those with high levels of social anxiety may mimic less, as well as factors that may play a role (e.g., self-focused attention).

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Do socially anxious individuals lack behavioural mimicry? Examining the relationships among social anxiety, self-focused attention and mimicry

Social anxiety disorder – defined as an excessive fear that one is being negatively evaluated in social and/or performance situations (American Psychiatric Association, 2013) – has an estimated lifetime prevalence rate of 12.1% (Kessler, Chiu, Demler, & Walter, 2005). Individuals with high social anxiety can experience symptoms that include, but are not limited to, sweating, shaking, nausea, and blushing while in a social situation. However, social anxiety is more than its physiological symptoms; it is also an interpersonal disorder. Individuals with high social anxiety are liked less by their conversation partners in first meeting situations (Wallace & Alden, 1995), and are perceived as less friendly (Stangier, Heidenreich, & Schermelleh-Engel, 2006) and less likeable and comfortable to be around (Heerey & Kring, 2007; Meleshko & Alden, 1993). The importance of developing strong interpersonal relationships is well recognized in the literature. For instance Baumeister and Leary (1995) state that as a human species we "have the pervasive drive to form and maintain at least a minimum quantity of lasting, positive, and significant interpersonal relationships" (p. 497). In this sense, the development of meaningful connections with others is an imperative aspect for our survival as a species. Given the pervasiveness of social anxiety disorder and the importance of developing strong interpersonal relationships, this dissertation aims to explore one factor that may contribute to the poor interpersonal outcomes experienced by individuals with high social anxiety, namely behavioural mimicry.

Behavioural mimicry – defined as the unintentional alteration of one's behaviour to match that of the other person in a social interaction (Chartrand & Bargh, 1999) –

leads to increased feelings of liking, trust, and closeness (Lakin et al., 2008), allowing individuals to develop and maintain harmonious relationships (Lakin et al., 2003). Past research has shown a reduced mimicry effect among individuals with high social anxiety using a virtual environment and interaction partner (Vrijsen, Lange, Becker, & Rinck, 2010; Vrijsen, Lange, Dotsch, Wigboldus, & Rinck, 2010). A reduction in mimicry behaviour may have negative implications for the social interactions patterns and interpersonal relationships of individuals with high social anxiety; however, more research is needed to better elucidate this relationship. The current program of research was designed to further investigate mimicry behaviour among individuals with high social anxiety.

Factors that Maintain Social Anxiety

The cognitive model of social anxiety proposed by Clark and Wells (1995) is well researched and utilized in the psychological literature. According to Clark and Wells' (1995) model, social anxiety results from problematic beliefs in oneself and one's social world, which lead individuals with high social anxiety to interpret social situations in a negative way. Biased information processing that occurs both within (e.g., self-focused attention and safety behaviours) and between (e.g., pre- and post-event processing) social situations reinforces these negative self-beliefs (e.g., "I'm stupid," "I'm ugly," and "I'm boring") (Clark & McManus, 2002; Hirsch & Clark, 2004). Therefore, negative self-beliefs and high social anxiety are linked in a positive feedback loop, whereby they act to maintain one another (Clark & Wells, 1995; Mansell & Clark, 1999; Rapee & Heimberg, 1997).

According to the Clark and Wells' (1995) model, four interrelated processes maintain anxiety and negative self-beliefs in individuals with high social anxiety. First, individuals with high social anxiety may shift attention away from the social situation and instead are characterized by an (1) increased self-focused attention, which is related to a decreased observation of other people and their responses. Individuals may then use potentially distorted images of their perceived self to make negative inferences about how they appear to others, which may result in the use of (2) safety behaviours (e.g., avoidance and/or refraining from talking about oneself). These safety behaviours are intended to prevent the feared social outcomes, however they often end up having the opposite effect. Safety behaviours tend to perpetuate self-focused attention and uncomfortable social interactions, thereby confirming an individual's negative self-beliefs. Finally, these individuals may then engage in distorted information processing (3) prior to (anticipatory) and (4) after (post-event processing) the feared social situation, retrieving negative information about themselves and their social performances. The following paragraphs will further explain the four processes listed above: self-focused attention, safety behaviours, anticipatory processing, and post-event processing.

Self-focused attention, per the Clark and Wells' (1995) model, asserts that when individuals with high social anxiety enter a feared social situation they shift their attention inward and are characterized by an increased self-focused attention – an inward focus of attention on arousal, behaviour, thoughts, emotions, and appearance. An increased self-focused attention has been found to perpetuate and maintain increased anxiety during a feared social situation (e.g., Clark & McManus, 2002; Hirsch & Clark, 2004). Instead of paying attention to cues in a particular social interaction, individuals

with high social anxiety are predominantly attending to themselves which reduces their ability to process external social cues, such as the behaviour of other individuals. As a result of increased self-focus, individuals with high social anxiety are assumed to engage in self-evaluation causing them to be aware of their fear and physical arousal symptoms (e.g., increased heart rate, see Wells & Papageorgiou, 2001), as well as possible flaws in their behaviour (e.g., being perceived as boring). It follows that increased self-focused attention and formation of negative self-beliefs reduces the ability to concentrate on the social interaction itself, resulting in heightened social anxiety (Bögels & Lamers, 2002; Bögels, Rijsemus, & de Jong, 2002; Woody & Rodriguez, 2000) and a disjointed social performance (Clark & McManus, 2002; Rapee & Heimberg, 1997; Woody, 1996; Woody, Chambles, & Glass, 1997).

Moreover, when entering a feared social situation, individuals with high social anxiety are suggested to show increased vigilance for cues that signal a social threat (Rapee & Heimberg, 1997). Individuals with high social anxiety are found to detect negative cues despite the presence of more positive cues, for example, noticing an audience member frowning while three others nod and smile (Veljaca & Rapee, 1998). In addition, emotional Stroop tests have been used to test for vigilance to social threat in individuals with high social anxiety. As part of the Stroop test, participants are asked to name the colour of the words while ignoring the content of the words, for example, “humiliation” written in red. Hope, Rapee, Heimberg, and Dombeck (1990) used the Stroop test and found that individuals with social anxiety disorder spent a longer time naming the colour of words with a socially threatening connotation than for words with a neutral connotation, whereas individuals with panic disorder spent a longer time naming

the colour of words with a physically threatening connotation than for words with a neutral connotation. These findings suggest that individuals with high social anxiety show attention biases to social threat and that these biases may divert their attention resources from processing other information.

However, evidence of attentional biases in social anxiety has not been consistent as other studies indicate an avoidance of social threat, as opposed to vigilance towards social threat, in individuals with high social anxiety (e.g., Chen, Ehlers, Clark, & Mansell, 2002). To explore avoidance of social stimuli, Chen et al. (2002) tested whether individuals with high social anxiety directed their attention to or away from faces displaying a wide range of emotional expressions. Chen et al. (2002) measured whether participants with elevated social anxiety attended more to faces or household objects, compared to non-anxious controls, using a dot probe paradigm. Individuals with high social anxiety were found to respond faster to the probe when it occurred in the location of the household objects, regardless of whether the facial expressions were positive, neutral or negative, whereas non-anxious controls did not show an attention bias. Further, a "vigilance-avoidance" model has also been proposed. Amir, Foa, and Coles (1998) found that initially individuals with high social anxiety showed inappropriate attention to socially relevant information, followed later by an inhibition of this attention. According to this model, individuals with high social anxiety may be characterized initially by vigilance to threatening stimuli, followed by avoidance of such information.

Despite mixed results for a vigilance, avoidance or vigilance-avoidance model, past research has found that the process of increased self-focused attention and focus on external threat cues both exacerbates and maintains social anxiety (e.g., Rapee &

Heimberg, 1997). It is also suggested that these processes interact with each other and form a feedback loop, for instance, a biased detection of an interaction partner's behaviours (e.g.. yawning) would likely result in a greater focus on the self (e.g., images of the self coming across as boring), resulting in increased negative self-beliefs and anxiety.

The safety behaviours component of the Clark and Wells' (1995) model suggests that when an individual with high social anxiety enters a feared social situation they will attempt to protect themselves against social disapproval by engaging in certain actions. Safety behaviours have been found to lead to negative social interaction patterns and outcomes for individuals with high social anxiety (e.g., Alden & Bieling, 1998), and may include but are not limited to: avoiding eye contact (Langer & Rodebaugh, 2013) and talking only briefly (Stevens et al., 2010). Safety behaviours are intended to prevent these individuals from doing something that may attract the negative attention they fear the most; however, they are also believed to inadvertently contribute to an individual's anxiety given that they often produce the negative outcome they are trying to avoid (Alden, 1998; Clark & Wells, 1995; Leary & Kowalski, 1995). For example, McManus, Sacadura, and Clark (2008) found that individuals with social anxiety who were manipulated to have increased safety behaviours reported increased anxiety, belief in social fears, and negative perceptions of their performance. Furthermore, safety behaviours have been found to lead to an increased self-focused attention (e.g., Spurr & Stopa, 2002), and similarly an increased self-focused attention may lead to greater use of safety behaviours (e.g., Hedman et al., 2013), contributing to the maintenance and perpetuation of anxiety elicited by the social situation.

The third and fourth processes that contribute to the maintenance of anxiety in individuals with high social anxiety, according to the Clark and Wells' (1995) model, occur outside the feared social situation. These processes are the thoughts and feelings that occur prior to the social situation (anticipatory processing) and after the social situation (post-event processing). In anticipatory processing, individuals with high social anxiety often recall perceived past failures and think about the potential negative consequences of the upcoming social interaction (Clark & Wells, 1995). Anticipatory processing has been associated with greater anxiety, as the individual with high social anxiety enters the social situation already expecting to fail (e.g., Mansell, Clark, Ehlers, & Chen, 1999). In post-event processing, individuals with high social anxiety review all of their perceived inadequacies and mistakes that occurred during the interaction (Clark & Wells, 1995). Thoughts replayed during post-event processing are associated with greater anxiety, given that individuals with high social anxiety tend to spend more time negatively reflecting on their behaviours following the interaction (e.g., Field & Morgan, 2004).

Overall, Clark and Wells' (1995) cognitive model of social anxiety helps to provide a framework for describing how processes – such as self-focused attention, safety behaviours, anticipatory processing, and post-event processing – serve to maintain and exacerbate high social anxiety in a positive feedback loop. The current thesis investigates how increased self-focused attention may lead individuals with high social anxiety to miss out on important external (social) information, namely behavioural mimicry, which would be beneficial for successful social interactions.

Social Anxiety and Interpersonal Relationships

Given the cyclic and self-perpetuating nature of social anxiety outlined by Clark and Wells (1995), it is no surprise that elevated social anxiety disrupts an individual's ability to develop relationships with others. For example, individuals with high social anxiety are less likely to be in a romantic relationship and have fewer close friends (Montgomery, Haemmerlie, & Edwards, 1991). Several studies have found that the presence of social anxiety impairs an individual's ability to develop strong interpersonal relationships (see Alden & Taylor, 2004).

Several studies have found that participants who interacted with individuals with high social anxiety, were less likely to desire future interactions and rated these individuals less favourably following the interaction, compared to participants who interacted with the non-socially anxious controls (e.g. Meleshko & Alden, 1993). Alden and Wallace (1995) found that following a brief interaction; individuals with high social anxiety were rated by their interaction partners as conveying less warmth and interest, as well as displaying less positive verbal behaviours, compared to controls. In displaying these reduced social communicative behaviours, interaction partners were less likely to desire future interactions with individuals with high social anxiety, compared to controls.

Further, Meleshko and Alden's (1993) study uncovered two factors that had negative implications for the relationship development of individuals with high social anxiety using these brief interactions. One factor, related to poor social interaction outcomes, was related to anxiety behaviour (e.g., anxious mannerisms like avoidance of eye-contact). Research by Alden and Bieling (1998) provided additional support for the negative impact anxiety behaviours might have on the interaction patterns of individuals

with high social anxiety. Individuals who used safety behaviours were perceived as more distant and uninterested by their interaction partners, compared to controls. The second factor identified by Meleshko and Alden (1993) was failing to reciprocate their interaction partner's self-disclosure – what an individual reveals about him or herself (e.g., personal thoughts or experiences). A failure to self-disclose led the interaction partner to perceive individuals with high social anxiety as disinterested in both them and the conversation. Cuming and Rapee (2010) found additional support for the relationship between reduced self-disclosure and poor interaction outcomes in individuals with high social anxiety. In adopting a communication style that was low in self-disclosure, individuals with high social anxiety were described as less likeable as well as less comfortable to converse with, compared to controls. In addition, Plasencia, Alden, and Taylor (2011) found that in a simulated social interaction, individuals with high social anxiety who engaged in avoidance-type safety behaviours (e.g., limiting speech and avoiding eye-contact) during the interaction garnered less interest for future interaction from their interaction partner.

Overall, elevated social anxiety appears to disrupt an individual's relationships with others. It is important to continue to investigate what factors may contribute to the poor interpersonal outcomes experienced by individuals with high social anxiety, to ultimately allow them to engage in more positive social interactions and develop strong interpersonal relationships.

Interpersonal Function of Behavioural Mimicry

Individuals have a fundamental need to belong and to affiliate with others (Baumeister & Leary, 1995; Brewer, 1991). From an evolutionary perspective these

fundamental needs developed to enhance an individual's ability to survive (Caporael & Brewer, 1991). The ability to successfully cooperate with others and maintain harmonious relationships enabled individuals to develop and maintain group membership, putting them at an evolutionary advantage (de Waal, 1989; Lewin, 1993; Rand & Nowak, 2013).

Behavioural mimicry is a functional process that aids an individual's ability to get along with others and gain social acceptance. Individuals automatically mimic many different aspects of their interaction partner, including their facial expressions, postures, and mannerisms (see Chartrand & Bargh, 1999). The capacity to successfully process and understand the behaviour of others has been found to have positive consequences on social interactions, such as increased affiliation (Ashton-James, Van Baaren, Chartrand, Decety, & Karremans, 2007), increased ability to empathize (Pfeifer, Iacoboni, Mazziotta, & Dapretto, 2008), and the capacity to make communication more smooth and enjoyable (Wang & Hamilton, 2012).

The relationship between mimicry and affiliation is bi-directional: when an interaction partner is mimicked, he/she might experience an increased affiliation with this mimicking partner, and an individual is more inclined to mimic an interaction partner that he/she had a previous positive affiliation with. For example, Chartrand and Bargh (1999) found that individuals reported higher likeability and a more smooth and harmonious interaction with the mimicking confederate compared to the non-mimicking one. On the other hand, Jefferis, van Baaren, and Chartrand (2003) found support for the reciprocal relationship; rapport and interpersonal closeness caused the person to mimic more. For example, when participants engaged with a foot shaking confederate and the questions

during the interaction remained impersonal the amount of mimicry did not change over the course of the interaction. However, when participants engaged with a foot shaking confederate and the questions became more personal throughout the interaction, the amount of mimicry the participant engaged in increased over the course of the interaction. This research suggests that sharing more personal information led to a greater level of rapport and in turn expression of behavioural mimicry.

More support for the functional role mimicry plays in our ability to gain and maintain social acceptance stems from studies that restrained mimicry behaviour. Stel and Vonk (2010) found that when mimicry was restrained, both individuals in the interaction reported feeling less close to one another and rated the interaction as less smooth, compared to the interaction where mimicry was present. Reduced mimicry behaviour does not only have negative implications for the social interaction and interpersonal development, but it has also been shown to have negative implications on subsequent unrelated tasks. For example, Finkel et al. (2006) tested the relationship between poor interpersonal coordination and self-regulation. Self-regulation is defined as an individual's executive function that makes decisions and exerts control (Baumeister, 1998). In a mimicry manipulation study by Finkel et al. (2006), participants engaged in either an interaction where the confederate engaged in mimicry (defined as a low-maintenance interaction) or an interaction where the confederate engaged in anti-mimicry (defined as a high maintenance interaction). The participants then performed a fine motor skill activity. Participants in the anti-mimicry condition showed impaired self-regulation and therefore had reduced success on the subsequent fine motor task. Finkel et al. (2006) suggest that anti-mimicry created a high maintenance interaction that impaired the

participant's subsequent self-regulatory success. Dalton, Chartrand, and Finkel (2010) went a step further in testing the relationship between anti-mimicry and reduced subsequent self-regulatory processes, by considering social norms. Dalton et al. (2010) found that when mimicry norms were violated, mimicry was not present when it normally would be (e.g., when an individual was not mimicked by their friend) these participants performed more poorly on a subsequent task, compared to individuals who were appropriately mimicked. Dalton et al. (2010) suggest that mimicry's negative effect on self-regulatory processes is not simply dependent on the presence or absence of mimicry but depends on whether the mimicry behaviour adheres to the social norm(s) present.

Therefore, the presence, absence and/or inappropriate social prescription of mimicry behaviour can have important implications for the success of a social interaction. An important goal of this dissertation is to explore how mimicry behaviour unfolds within the interaction patterns of individuals with high social anxiety.

Behavioural Mimicry and Social Anxiety

There is considerable literature studying mimicry (e.g., Chartrand & Lakin, 2013), but fewer studies have investigated mimicry as it relates to social anxiety. Studies conducted by Kouzakova, van Baaren, and van Knippenberg (2010) and Guéguen (2011) extended prior mimicry literature by finding that not only does mimicry change the perceptions of the mimicker (e.g., increased affiliation) but also an individual's physiological state and self-perceptions, respectively. In a female undergraduate student sample, Kouzakova and colleagues (2010) found that an individual's physiological state varies as a function of whether or not they were mimicked. Salivary cortisol levels, an indicator of increased stress levels, increased in participants who were not mimicked,

whereas mimicked participant's cortisol levels remained unchanged from baseline. Kouzakova et al. (2010) suggested that the lack of behavioural mimicry from the interaction partner increased stress levels because it was interpreted as a rejection signal. These results are to be interpreted with caution given that cortisol levels were measured before and after, not during, the manipulation, and change in cortisol levels over time cannot be confidently extrapolated. Also using a sample of female undergraduates, Guéguen (2011) investigated the impact of mimicry on self-consciousness and social anxiety of the individual being mimicked. Participants completed an advertisement description task during which a confederate either mimicked or did not mimic the participant's postures and movements. After the task, participants completed the self-consciousness scale (SCS; Scheier & Carver, 1985), a measure of self-consciousness and social anxiety. Participants in the mimicry condition reported increased public and private self-consciousness and reduced social anxiety compared to those who were not mimicked. Guéguen suggested that by being mimicked the participants might have inferred a positive relationship with the interaction partner, thereby reducing their social anxiety levels. However, these results should also be interpreted with caution given that the SCS was developed as a trait measure, but used as a state measure and the sample size was low (18 per condition). Overall, these studies provide some initial support for the influence of mimicry on the mimicked individual in the interaction, beyond the findings of enhanced affiliation and likeability found in previous literature.

Two studies have specifically investigated mimicry within a preselected sample of individuals with high social anxiety (Vrijsen, Lange, Becker, & Rinck, 2010; Vrijsen, Lange, Dotsch, Wigboldus, & Rinck, 2010). Both studies consisted of a female sample of

undergraduate students who were prescreened for high and low levels of social anxiety. Mimicry was measured through an immersive virtual environment, in which participants were mimicked by (Vrijsen, Lange, Becker, et al., 2010) or were to mimic (Vrijsen, Lange, Dotsch, et al., 2010) a male avatar. In both studies participants wore a head-mounted display, which displayed the virtual environment and measured the participant's head movements, while listening to a male avatar give an opinionated speech. Vrijsen, Lange, Becker, et al. (2010) found that individuals with low social anxiety regarded a mimicking avatar as more positive than a non-mimicking one, but individuals with high social anxiety did not differ in their ratings of the mimicking and non-mimicking avatars. Vrijsen, Lange, Dotsch, et al. (2010) found that individuals with high social anxiety showed significantly less mimicry during the interaction with a male avatar, compared to individuals with low social anxiety. These findings suggest that individuals with high social anxiety experience difficulty in processing and displaying mimicry. Given the ubiquity and utility of mimicry, this deficit could be very damaging in social interactions.

The following three studies were designed to examine the relationship between social anxiety and reduced mimicry by investigating, (a) whether the relationship exists outside a social environment, at the level of automatic imitation, (b) whether the relationship exists in an experimental environment that simulates a more natural human social interaction, rather than a virtual one, and (c) whether individuals with high social anxiety and an increased self-focused attention, compared to an other-focused attention, show reduced mimicry behaviour.

Study 1

Motor resonance is defined as the tendency for motor areas of an observer's brain to become active when they watch another individual acting (Di Pellegrino, Fadiga, Fogassi, Gallese, & Rizzolatti, 1992). Study 1 explored if the relationship between automatic imitation and social anxiety can be detected outside the context of a social interaction, at the level of motor resonance. To investigate this relationship, level of motor resonance was measured between individuals with low and high social anxiety. It is believed that motor resonance is the product of a mirror system in the brain that displays similar activity during performance and observation of specific actions (Rizzolatti & Sinigaglia, 2010). Through connections between mirror areas and the limbic system, emotions that are associated with the observed action can also be evoked (Iacoboni & Dapretto, 2006). In this way, through inner simulation of observed actions, associated thoughts and feelings can be evoked, which enable empathy and an understanding of other individuals, thus increasing one's ability to communicate effectively with another individual. Study 1 was the first investigation of whether individuals who vary on levels of social anxiety also vary in the extent to which they resonate with observed actions.

Motor resonance as measured through automatic imitation has been found to respond similarly to social priming; participants when primed with an affiliation goal engaged in more automatic imitation and behavioural mimicry (e.g., Leighton, Bird, Orsini, & Heyes, 2010). Heyes (2011) suggested that the same core processes generate automatic imitation and behavioural mimicry, but the capacity to copy an action is not fully expressed at the level of automatic imitation. Despite the similarities identified

between automatic imitation and behavioural mimicry, recent research by Genschow, van Den Bossche, Cracco, Bardi, Rigoni, and Brass (2017) found that automatic imitation and behavioural mimicry are not correlated. Despite the lack of association, Genschow et al. (2017) suggest that the paradigms that measure automatic imitation (e.g., the Automatic Imitation Task) and behavioural mimicry (e.g., picture description task developed by Chartrand & Bargh, 1999) are measuring the same construct but different aspects of it – where automatic imitation captures imitation in a laboratory context, behavioural mimicry captures imitation in a social context. Study 1 explored reduced automatic imitation in individuals with high social anxiety outside a social environment and within the context of a laboratory.

To investigate motor resonance, Study 1 utilized a previously established imitation paradigm, the Automatic Imitation Task (AIT; Hogeveen & Obhi, 2013), a computer task that requires participants to respond to on-screen symbolic cues with index and middle finger actions (Brass, Bekkering, & Prinz, 2001; Heyes, 2011; Hogeveen & Obhi, 2013). The symbolic cues were presented in the form of a "1" and "2", which are mapped on to an index and middle finger response, respectively (see Obhi & Hogeveen, 2010). The key manipulation of the AIT is an exposure to an incidental action stimulus, in the form of a video of either an index finger action or a middle finger action. The incidental exposure is achieved by superimposing the numeric cue over a video action of an index or middle finger lift. Participants were told only to respond to the numeric cue, and thus exposure to the action is incidental and task irrelevant. The robust finding is that, when the action is incongruent with the cued response (e.g., the symbolic cue does not match the finger lift action) there is a reaction time (RT) and error rate (ER) cost to

execute the cued response, compared with the congruent case (e.g., the symbolic cue matches the finger lift action; Brass, Bekkering, & Prinz, 2001; Hogeveen & Obhi, 2013). This interference effect is thought to be attributable to the automatic activation of a topographically similar action to the action in the video, such that when the cued response refers to the incongruent action a response conflict will result. This response conflict is manifested in an elevated RT and ER on incongruent trials (see Obhi & Goodale, 2005).

Study 1 was the first investigation into whether individuals with high and low social anxiety vary on the extent to which they resonate with observed actions. Prior research found reduced mimicry behaviour, imitation in a social context, in individuals with high social anxiety, compared to low social anxiety, by measuring mimicry behaviour in a virtual environment (Vrijsen, Lange, Becker, & Rinck, 2010; Vrijsen, Lange, Dotsch, Wigboldus, & Rinck, 2010). Study 1 explored the relationship between high social anxiety and reduced automatic imitation, imitation in a laboratory context, by investigating level of motor resonance between individuals with high and low social anxiety. Specifically, we hypothesized that individuals with high social anxiety would (i) show less reaction time interference, resulting in faster reaction times on finger incongruent trials, compared to individuals with low social anxiety and (ii) show less error rate interference, resulting in more accurate responses on finger incongruent trials, compared to individuals with low social anxiety. This supports the idea that differences in resonance might account for differences in how people with social anxiety perceive and react to other individuals.

Method

Participants

University students were prescreened for high and low levels of social anxiety and right-handedness. The Social Interaction Anxiety Scale (SIAS; Mattick & Clarke, 1998) was used to prescreen individuals for varying levels of social anxiety, with cut off scores of greater than 33 and less than 20 to create the high and low social anxiety groups, respectively. Cut off scores on the SIAS have been used in prior literature (e.g., Brown et al., 1997) and stem from studies conducted by Mattick and Clarke (1998). Our intention was to recruit a sample with social anxiety scores similar to those found in a clinical sample of people with social anxiety disorder, and to have a sample with low social anxiety as a comparison group. A total of 96 participants enrolled in the study and received course credit for their participation. However, 11 individuals were removed from analyses given that they did not meet social anxiety cut off scores, due to technical errors in the prescreening process, and there were four outliers (mean RT and/or ER 3 *SD* above the mean). Therefore 81 participants were retained, 45 individuals with low social anxiety and 36 individuals with high social anxiety. Participants' ages ranged from 17-42 ($M = 20$, $SD = 3.95$), with the majority being female (70%). Participants identified as: White (75%), Asian (14%), African Canadian (3%), or other/mixed race (8%).

Materials

The experiment was programmed using Superlab v.4 (Cedrus, San Pedro, CA) and run on a Mac computer (Apple, Cupertino, CA) with stimuli displayed on a 15-inch LCD monitor. Stimuli were adapted from published work on automatic imitation (Cook & Bird, 2011; Hogeveen & Obhi, 2013; cf. Brass et al., 2001). Each stimulus was a

sequence of eight images, displaying various stages of either an index finger lift movement, middle finger lift movement, index dot lift movement, or middle dot lift movement (See Figure 1). The first image depicted a hand in a resting position on a table for 800, 1600, or 2400 ms. For both image sequences, the second image displayed a neutral hand position with the initial cue for 34 ms, and the third and fourth images displayed the lifting movement (finger or dot) for 34 and 500 ms, respectively (see Figure 2). The participant was cued to respond by the presentation of a "1" or "2" located between the observed index and middle finger, which was presented in time with the second image of the neutral hand, and remained on screen for the lifting movement from the third through to the fourth image. To allow for responses later than 568 ms, and act as a warning stimulus before the next trial, a blue screen was presented for 3000, 22500, or 1500 ms, depending on the cue onset time. To reduce spatial compatibility effect due to the directional alignment of the cues and responses, the stimuli were rotated (see Jiménez et al., 2012). Further, dots were superimposed as a spatial control, such that individuals are expected to show an increased interference effect on finger trials compared to dot trials, due to the cost associated with cancelling an imitative motor plan associated with the finger trials.

Measures

A measure of social anxiety was used for pre-selection purposes. The Social Interaction Anxiety Scale (SIAS; Mattick & Clarke, 1998), is a 20-item scale that measures anxiety in social interaction contexts, an example item "I find myself worrying that I won't know what to say in social situations." The measure uses a five-point Likert scale (0 = *not at all*, 4 = *extremely*) with total scores ranging from 0 - 80, whereby higher

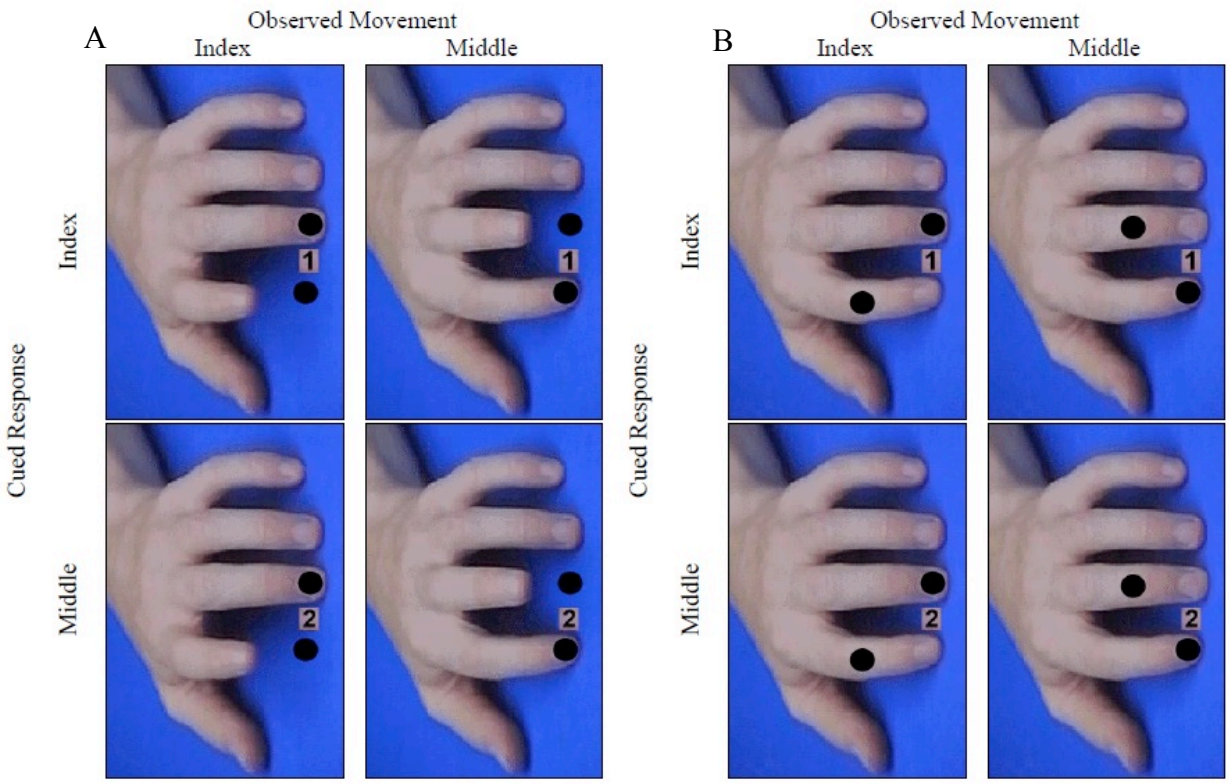

Figure 1. Study 1 conditions in the experiment (A) fingers conditions, and (B) dot conditions.

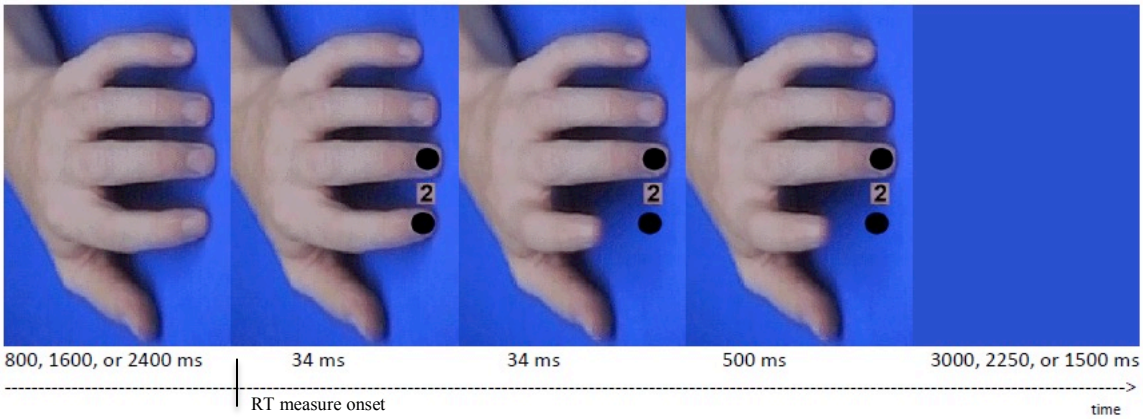

Figure 2. Study 1 sequence of events in a trial. The incongruent middle finger response is depicted. *Note:* RT = Reaction Time.

scores indicate higher social interaction anxiety. The scale has shown high test-retest reliability in prior research (Mattick & Clarke, 1998), and displayed high internal consistency in the present study (α = .94).

A measure of depression was included as a covariate throughout the studies, given that depression has been found to show high levels of comorbidity with anxiety (e.g., Gorman, 1996). The Beck Depression Inventory-II (BDI-II; Beck, Steer, & Brown, 1996), is a widely used 21-item questionnaire that assesses depression in accordance with the Diagnostic and Statistical Manual of Mental Disorders-Fifth Edition (American Psychiatric Association, 2013), an example item "I can't get any pleasure from the things I used to enjoy." The measure uses a four-point scale, with total scores ranging from 0-63, with higher scores indicating greater depressive symptoms. The scale demonstrated very good internal consistency in previous research (Beck, Steer, & Garbin, 1988) and high internal consistency in the present study (α = .87).

Procedure

Each participant completed the experiment individually in a laboratory office. To ensure that participants performed the task properly the researcher sat behind them for the duration of the study. Before starting the experiment, the researcher instructed the participants that they would be holding down the 'v' and 'b' keys on the keyboard with their index and middle finger, and would perform speeded finger lifts to the '1' or '2' numerical cue, respectively, while ignoring what the hand or the dot on-screen does. Specifically, they were instructed:

> When the number '1' appears, lift your index finger as quickly as possible. When the number '2' appears, lift your middle finger as quickly as possible. NO

MATTER WHAT THE HAND OR THE DOT ON-SCREEN DOES, PERFORM THE MOVEMENT YOU WERE PLANNING TO MAKE.

Participants performed a set of eight practice trials containing two repetitions of each trial type (i.e., index finger congruent, middle finger congruent, index finger incongruent, middle finger incongruent, index dot congruent, middle dot congruent, index dot incongruent, middle dot incongruent). Following practice trials, the experiment contained 480 total trials, split in 4 randomized blocks of 120. Each block contained 15 repetitions of each trial type, displayed an even number of times at each cue onset time. The three cue onsets were included to reduce temporal predictability. After completing the AIT, participants completed the experimental questionnaire, which included measures of social anxiety (SIAS), depression (BDI), and demographic information before they were debriefed on the hypotheses and purpose of the study.

Results

Data Screening

Before conducting analyses, trials were removed if participants responded three standard deviations above or below the mean for each condition and if trials did not have a recorded response (see Hogeveen & Obhi, 2013).

Reaction Time (RT) Analysis

Response times were entered into a 2 (stimulus type: dot, finger) x 2 (congruence: congruent, incongruent) x 2 (social anxiety: high, low) repeated measure ANOVA. There were significant main effects of congruence and stimulus ($F(1,79) = 26.23$, $p < .001$, $\eta^2 = .25$, $F(1,79) = 11.42$ and $p = .001$, $\eta^2 = .13$, respectively). However, a 3-way interaction (congruence by stimulus type by social anxiety) was not significant, ($p = .75$, $\eta^2 = .001$).

A significant interaction between stimulus type and congruence was found ($F(1,79) = 20.17$, $p < .001$, $\eta^2 = .20$), such that individuals showed more interference on the finger (imitative) stimuli than the dot (spatial) stimuli on incongruent trials. In relation to our main hypotheses, no significant congruence by social anxiety interaction ($p = .15$, $\eta^2 = .03$; See Figure 3) or stimulus by social anxiety interaction ($p = .42$, $\eta^2 = .01$) was found. Individuals with high social anxiety ($M = 481.68$, $SE = 9.44$) executed marginally faster responses on all trials than individuals with low social anxiety ($M = 503.30$, $SE = 8.44$; $F(1,79) = 2.92$, $p = .092$, $\eta^2 = .04$).

Error Rate (ER) Analysis

Error rates were entered into a 2 (stimulus type: dot, finger) x 2 (congruence: congruent, incongruent) x 2 (social anxiety: high, low) repeated measure ANOVA. In line with the RT results, there were significant main effects of congruence and stimulus, ($F(1,79) = 15.12$, $p < .001$, $\eta^2 = .16$ and $F(1,79) = 6.18$, $p = .01$, $\eta^2 = .07$, respectively). However, a 3-way interaction (congruence by stimulus type by social anxiety) was not significant, ($p = .74$, $\eta^2 = .001$). A significant interaction between stimulus type and congruence was found ($F(1,79) = 12.96$, $p = .001$, $\eta^2 = .14$), such that individuals had more interference on the finger (imitative) stimuli than the dot (spatial) stimuli on incongruent trials. Similar to RT results, no significant congruence by social anxiety interaction ($p = .87$. $\eta^2 = .000$; see Figure 4) or stimulus by social anxiety interaction ($p = .53$, $\eta^2 = .005$) was found. Finally, individuals with high social anxiety ($M = 5.47\%$, $SE = 1.29\%$) executed marginally less errors on all trials than individuals with low social anxiety ($M = 8.85\%$, $SE = 1.15\%$; $F(1,79) = 3.76$, $p = .06$, $\eta^2 = .05$).

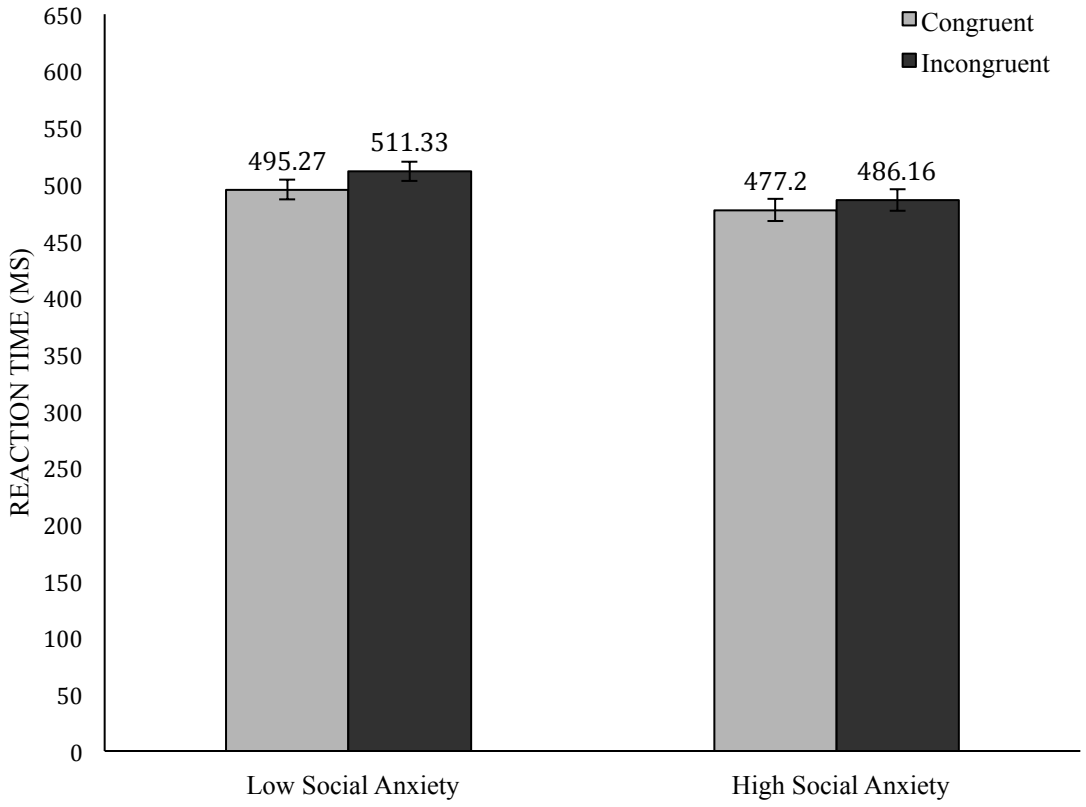

Figure 3. Study 1 reaction time (RT) for individuals with high and low social anxiety on congruent and incongruent trials. Standard errors are represented in the figure by the error bars.

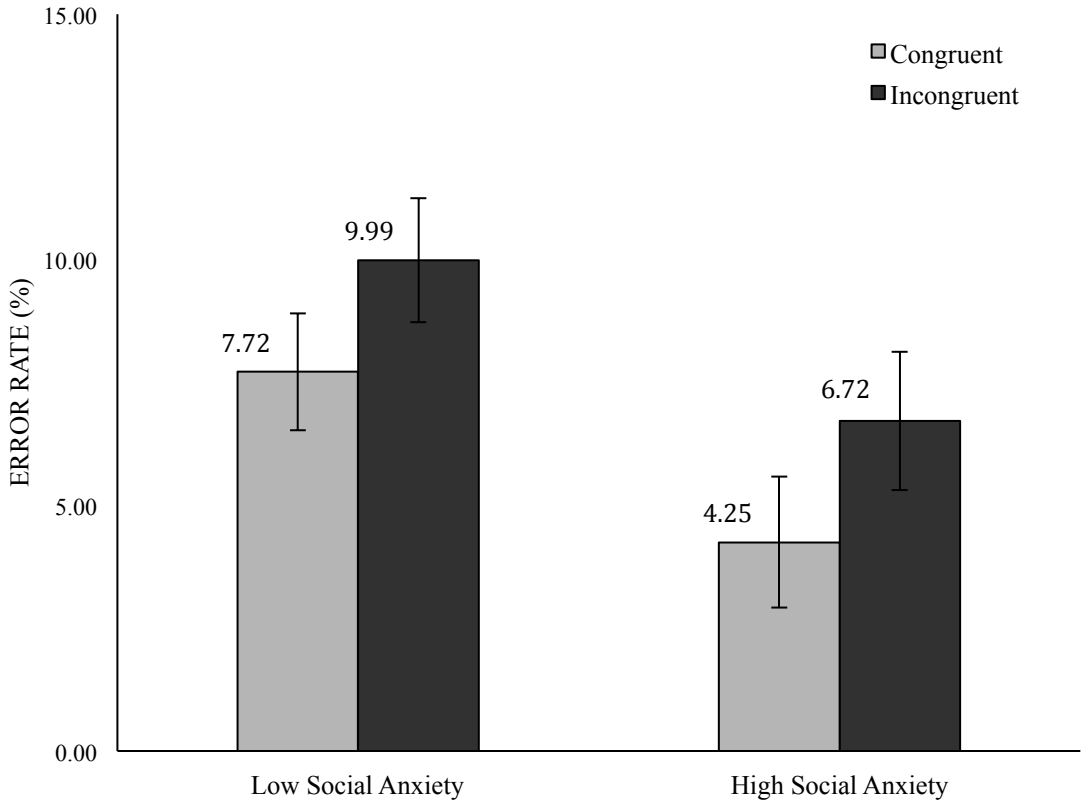

Figure 4. Study 1 error rate (ER) for individuals with high and low social anxiety across congruent and incongruent trials. Standard errors are represented in the figure by the error bars.

Discussion

The current study examined the relationship between high social anxiety and reduced automatic imitation by investigating level of motor resonance between individuals with high and low social anxiety. We expected that individuals with high social anxiety, compared to low social anxiety, would have faster reaction times (RT) and lower error rates (ER) on finger incongruent trials. Results did not support the hypotheses that individuals with high social anxiety would show reduced RT and ER interference compared to individuals with low social anxiety. Thus, a reduced level of motor resonance was not found within individuals with high social anxiety, compared to those with low social anxiety. However, in line with prior literature using the AIT, a significant interaction between stimulus type and congruence was found on RT and ER; individuals responded slower and with a higher error rate, respectively, on both incongruent and finger (imitative) stimuli trials (see Obhi & Hogeveen, 2013). These results demonstrate that participants performed the AIT consistently with previous studies and that the lack of findings regarding interaction with social anxiety, were not related to inconsistencies with the performance of the AIT.

There was a modest trend ($p = .09$) that individuals with high social anxiety were characterized by faster responses and fewer errors on all trials (whether incongruent/congruent or finger/dot). This modest increased RT and reduced ER across trials might suggest that individuals with high social anxiety were more vigilant during the AIT, such that they performed the task slightly better and faster than individuals with low social anxiety. Given the low effect sizes for this trend, these results are to be interpreted with caution and will not be expanded upon further.

The current study sought to determine if individuals with social anxiety showed a deficit in automatic imitation, a construct proposed to underlie imitation (see Genschow, van Den Bossche, Cracco, Bardi, Rigoni, & Brass, 2017), outside the context of a social interaction. Depaulo, Epstein, and LeMay (1990) found that individuals with high social anxiety demonstrated maladaptive behaviours only under certain social contexts, for example under impending evaluation or when ambiguity was present. Moreover, Alden and Bieling (1998) demonstrated that individuals with high social anxiety displayed more self-protective behaviours than individuals with low social anxiety in a negative appraisal condition but not during the positive appraisal condition. In the current study, individuals may not have been in a context that would stimulate maladaptive behaviours, therefore suggesting that the specific context of the current study might not have been conducive to identifying the potential differences in automatic imitation between individuals with high and low social anxiety. Lastly, recent findings by Genschow et al. (2017) found that automatic imitation and behavioural mimicry were not correlated but suggest that they may stem from the same underlying construct, imitation. The current study's results and Genschow et al.'s (2017) findings suggest that individuals with high social anxiety may not vary on the extent to which they exhibit automatic imitation, compared to individuals with low social anxiety. However, automatic imitation is just one construct proposed to underlie imitation and is measured within a laboratory context, thus automatic imitation may not fully capture the expression of imitation, like behavioural mimicry, as found within a social context.

In summary, Study 1 results did not support differences in motor resonance between individuals with low and high social anxiety on the AIT. This may stem from the

lack of social context and/or by investigating differences in automatic imitation, a laboratory measure of imitation. Given that Study 1 was conducted in lab, with little to no social interaction, individuals with high social anxiety may not have shown increased levels of social fear during the task, compared to individuals with low social anxiety. In addition, individuals with high and low social anxiety may not differ on automatic imitation, a laboratory construct of imitation. Therefore, differences in imitation may not have been found using the AIT, but may be present when investigating imitation using a behavioural study simulating a more naturalistic social context. Given the shortcomings of Study 1, Study 2 focused on improving ecological validity by simulating a more natural social environment and in measuring imitation within a social context.

Study 2[1]

Study 2 examined the relationship between social anxiety and mimicry in a social interaction. Participants interacted with a confederate, who made a series of target movements (facial touches), in a photo description task based on Chartrand and Bargh's (1999) mimicry paradigm. It was hypothesized that individuals with high social anxiety would mimic the mannerisms of the confederate less (i.e., they would engage in fewer target movements) than those with low social anxiety. Given that socially anxious individuals tend to be more self-focused (Clark & Wells, 1995), an inward focus of attention on aspects of the self (e.g., thoughts and appearance), a secondary goal of the present study was to examine the relationship between self-focused attention and mimicry. It was hypothesized that increased self-focused attention would be related to decreased mimicry behaviour.

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[1] A modified version of Study 2 has been accepted for publication in the *Journal of Social and Clinical Psychology*.

[2] All results for Study 2 were also run using the two continuous dependent variables

Method

Participants

University students were prescreened for high and low levels of social anxiety using the Social Interaction Anxiety Scale (SIAS; Mattick & Clarke, 1998) and the Social Phobia Inventory (SPIN; Connor et al., 2000). Participants scoring greater than 33 on the SIAS and 29 on the SPIN were categorized as individuals with high social anxiety and participants soring lower than 20 on the SIAS and 11 on the SPIN were categorized as individuals with low social anxiety. Cut off scores on the SIAS and SPIN have been used in prior literature (e.g., Brown et al., 1997 and Moser et al., 2008, respectively) and stem from studies conducted by Mattick and Clarke (1998) and Connor et al. (2000), respectively. The SIAS cut off scores were used in Study 1; however, in addition to the SIAS, Study 2 and Study 3 also used SPIN cut off scores to increase the reliability of categorizing participants into high and low social anxiety groups. A total of 90 participants enrolled in the study and received course credit for their participation. However, six individuals were removed from analyses (three individuals with high social anxiety and three individuals with low social anxiety); three individuals were removed due to technical difficulties (interaction was not recorded), one due to illness, one due to suspicions regarding the confederate, and one outlier. Therefore the final sample consisted of 84 participants, 45 individuals with low social anxiety and 39 high individuals with high social anxiety. These 84 participants ranged from 17–46 years of age (M = 19.07, SD = 3.26), with the majority being female (75%). Participants identified as: White (67.90%), Asian (16.70%), African Canadian (6.00%), or other/mixed race (9.50%).

Materials

Photographs for the social interaction task were chosen from National Geographic (based on Chartrand & Bargh, 1999). Twelve photos were selected, with six of 12 photos being reserved for the confederate (so they could memorize a prepared script for each) and the other six were reserved for the participant.

Two measures of social anxiety were used for pre-selection purposes. The Social Interaction Anxiety Scale (SIAS; Mattick & Clarke, 1998), displayed high internal consistency in the present study (α = .96; See Study 1 for full description). The Social Phobia Inventory (SPIN; Connor et al., 2000), is a 17-item scale designed to assess several aspects of social anxiety, such as fear, avoidance, and physiological factors (e.g., blushing and heart palpitations), an example item "I avoid talking to people I don't know." The measure uses a five-point Likert scale (0 = *not at all*, 4 = *extremely*) with total scores ranging from 0-68, whereby higher scores indicate higher social anxiety. The scale has shown high test-retest reliability in prior research (Connor et al., 2000), and displayed high internal consistency in the present study (α = .93).

Self-focused attention was assessed using the Focus of Attention Questionnaire – Self (FAQ-self; Woody, 1996), which is a five-item measure of self-focused attention for use immediately following a social task (e.g., "I was focusing on the impression I was making on the other person"). Participants rated their agreement with the statements using a five-point Likert scale (1 = *not at all*, 5 = *totally*). The FAQ-self has demonstrated good construct validity in response to the manipulation of focus of attention (Woody, Chambles, & Glass, 1997), and displayed good internal consistency in the present study (α = .81). The Beck Depression Inventory-II (BDI-II; Beck, Steer, &

Brown, 1996) was also administered and demonstrated high internal consistency in the present study (α = .91; See Study 1 for full description).

Procedure

One male and two female research assistants served as confederates, and the primary researcher, a female, served as the experimenter. Two chairs for the participant and confederate were placed approximately 1.2 m apart, half facing each other at 45 degrees, allowing the participant to see the confederate's mannerisms and be in a body position for video recording during the baseline and experimental sessions via a hidden webcam.

Each participant completed the experiment individually. Prior to each session, the experimenter turned on the web cam that would video record the participant throughout the session. Following informed consent, the experimenter brought the participant into the laboratory room to be seated in the participant's chair, facing the hidden webcam. The experimenter then left the participant alone in the room for one minute, ostensibly to go over consent procedures with the other participant (confederate). This one-minute baseline period was later coded to determine the extent to which participants touched their faces spontaneously in the absence of any social interaction.

The experimenter reentered the room with the confederate and explained the picture description task:

> We are in the initial stage of creating working sets of photographs to serve as the stimuli for a future study. In order to figure out if they will work, we need you two to take turns describing them for 1-2 minutes. We've already run this with single people, but now we are interested in how easily people can describe the

> photographs to one another. You can discuss the visual aspects of the photo, or free associate and say whatever comes to mind (including what the photo brings to mind, what the individuals in the photos are thinking and feeling), or both. Let the other participant know when you feel you have adequately described the photo, show them the photo, and try your best to take approximately 1-2 minutes to describe each of them.

The experimenter then handed out the 12 photographs and began the picture description task by asking the confederate to turn over their first photo and describe the photograph. The confederate followed a memorized script to ensure that picture description responses were standardized across different confederates and different experimental sessions. Further, confederates were trained to deliver the picture description responses with natural hesitation, including pauses, *umms,* and *uhhs*. In addition, confederates had built in mimicry movements (four facial touches) within their scripts, for each photo. One example of a scripted picture description response refers to a photo of two individuals hiking in the snow:

> There are two people hiking in the middle of the arctic or something with big snowy mountains. [chin touch] Umm they are connected by a few ropes and it looks like they are using ice picks to stabilize themselves. It looks as if they have travelled far and are quite good at hiking. Uhh [forehead touch]… they are wearing yellow and are looking at a few mountains with a large haze behind them. Umm [cheek touch], I am sure they feel really accomplished and excited about making it that far [hair touch].

The experimenter then asked the participant to turn over a photo and describe it. After the participant finished, the experimenter stepped outside the room, and the confederate and participant continued alternating turns until both completed their sets of photographs. Following the experiment, the experimenter said that the questionnaire and debriefing would take place individually, and escorted the participant outside the room. Following the completion of the questionnaire package the experimenter then queried the participant in a "funneled" debriefing (i.e., from general to increasingly specific questions about awareness of hypotheses; see Chartrand & Bargh, 1999) to determine if they were (a) suspicious that the other participant was a confederate, (b) noticed that the confederate displayed certain mannerisms throughout the session, or (c) thought the purpose of the experiment was anything other than what the cover story indicated. During the "funneled" debriefing one participant mentioned that they were suspicious that the other participant was associated with the experiment, however, they did not mention anything regarding facial touches. Thus, it appears that participants were truly engaging in behavioural mimicry, and that initiation of mimicry was occurring outside conscious awareness. Finally, participants were informed that they were covertly video-taped throughout the session. All participants consented for the use of the video footage.

Results

Mimicry Coding and Interrater Reliability

Undergraduate student coders, blind to the hypotheses and participant's anxiety status, coded the video footage for mimicry behaviour, number of facial touches within 5 seconds of the confederate's target movement (facial touch). Three separate time periods were coded for each participant: baseline period – before interacting with the confederate,

the cued period – when the confederate made cued target movements while he/she described their photographs, and non-cued period – when the confederate made natural movements while the participant described his/her photographs (see Figure 5). It should be noted that in this paradigm the cued period coincided with the participant listening and the non-cued period coincided with the participant talking. The coding procedure did not include the first photographic description, when the experimenter was in the room for the trial, thus it commenced when the experimenter left the room after the first photo was described. The coding procedure yielded the following two dependent variables: 1. The number of times the participant touched his/her face within five seconds of the confederate during the cued period, and 2. The number of times the participant touched his/her face within five seconds of the confederate during the non-cued period.

Coding mimicry within five-seconds of the confederate stems from several studies that have determined that mimicry, as opposed to random behaviour, occurs within a short period following the interaction partner's movements (Bailenson, Beail, Loomis, Blascovitch, & Turk, 2004; Stel, van Baaren, & Vonk, 2008). Further, number of facial touches was utilized as the mimicry variable of interest, consistent with past mimicry research (e.g., Chartrand & Bargh, 1999; Lakin & Chartrand, 2003).

A two-way random effect intra-class correlation (ICC) coefficient was used to evaluate the reliability of the coding method for both dependent variables (i.e., participant facial touches during the cued and non-cued periods). Interrater reliability (n = 25), was excellent during both the cued and non-cued period, ICC = .99 and ICC = .99, respectively. Given the high ICC for the dependent variables, coding data was utilized from the primary student coder who went on to code the rest of the data.

	Picture Description Task	
Baseline (Participant Alone)	Cued (Participant Listening)	Non-Cued (Participant Talking)

Figure 5. Study 2 and 3 three coded time periods during the mimicry paradigm.

Normality of the Dependent Variables[2]

The two dependent variables: mimicry during the cued period (number of participant facial touches within five seconds of the confederate during the cued period), and mimicry during the non-cued period (number of facial touches within five seconds of the confederate during the non-cued period) were not normally distributed with skewness of 1.65 (*SE* = 0.26) and 1.53 (*SE* = 0.26), respectively, and kurtosis of 2.62 (*SE* = 0.52) and 1.77 (*SE* = 0.52), respectively. Non-parametric transformations were not performed on the dependent variables due to the high percentage of individuals who did not mimic during the cued (34.5%) and non-cued periods (59.5%). The dependent variables were dichotomized by distinguishing individuals who mimicked (engaged in greater than zero facial touches within five-seconds of the confederate) from those that did not mimic (engaged in zero facial touches within five-seconds of the confederate). The following dependent variables were utilized throughout our analyses: (1) mimicry during the cued period (0 = *no*, 1 = *yes*) and (2) mimicry during the non-cued period (0 = *no*, 1 = *yes*).

Comparing Social Anxiety Groups on Baseline Variables, Confederate Behaviour, and Duration

High and low social anxiety groups were compared on depression scores, self-focused attention scores, baseline facial touches, and experimental duration (time elapsed during the picture description task, covering the cued and non-cued time period). Compared to individuals low in social anxiety, those high in social anxiety reported higher levels of depression (high: *M* = 15.21, *SD* = 10.79; low: *M* = 9.69, *SD* = 6.29) and self-focused attention (high: *M* = 12.67, *SD* = 4.33; low: *M* = 9.04, *SD* = 3.26), *t*(81) = -

[2] All results for Study 2 were also run using the two continuous dependent variables and findings were consistent with the results contained in this document.

2.90, $p = .005$, $d = 0.63$, and $t(82) = -4.36$, $p < .001$, $d = 0.95$, respectively. No differences on baseline facial touches (high: $M = 3.08$, $SD = 3.28$; low: $M = 3.87$, $SD = 4.29$), and experimental duration (high: $M = 18.22$ minutes, $SD = 5.27$ minutes; low: $M = 17.54$ minutes, $SD = 5.32$ minutes) were found between high and low social anxiety groups, $t(82) = -.94$, $p = .35$, $d = 0.21$, and $t(82) = -.59$, $p = .56$, $d = 0.13$, respectively.

In addition, high and low social anxiety groups were compared on confederate facial touches during the non-cued period (i.e., while the participants were describing photos and there were no planned movements for the confederate) and cued period (i.e., while the confederate described the photos and made planned facial touches). No differences on confederate facial touches were found between high and low social anxiety groups during the non-cued, $t(82) = .51$, $p = .61$, $d = 0.11$, and cued period, $t(82) = -.83$, $p = .41$, $d = 0.18$. See Table 1 for means and standard deviations of confederate facial touches, participant facial touches, and target mimicry behaviour.

Social Anxiety and Behavioural Mimicry

The outcome variable, mimicry (facial touches within 5 seconds of the confederate), was coded as individuals who engaged in mimicry (1 = *yes*, 0 = *no*), and the main predictor was social anxiety group. Social anxiety was coded as 1 = *individuals with high social anxiety* and 0 = *individuals with low social anxiety*. The social anxiety group distribution was nearly even with 53.57% ($n = 45$) individuals with low social anxiety and 46.43% ($n = 39$) individuals with high social anxiety.

A one-predictor logistic model was fitted to the data to test the research hypothesis regarding the relationship between the likelihood that an individual will

engage in mimicry based on their level of social anxiety. During the cued time period the model including social anxiety did not significantly predict the occurrence of mimicry

Table 1

Study 2 Mean Number of Facial Touches and Mimicry Behaviour for High and Low Social Anxiety Groups During the Non-Cued and Cued Period

	Low Social Anxiety		High Social Anxiety	
	Non-Cued	Cued	Non-Cued	Cued
Confederate Facial Touches	11.40(9.30)	22.11(8.26)	10.41(8.29)	23.54(7.48)
Participant Facial Touches	7.27(9.05)	6.42(5.52)	6.03(5.28)	6.38(5.89)
Target Mimicry Behaviours	1.00(1.13)	1.40(1.63)	0.38(0.88)	1.49(1.86)

Note: Standard deviations are in (parentheses).

behaviour, $X^2_{(1)} = 0.50$, $p = .48$. However, during the non-cued time period the model including social anxiety did significantly predict the occurrence of mimicry behaviour, $X^2_{(1)} = 9.42$, $p = .002$, and explained 14.3% (Nagelkerke R^2) of the variance in mimicry.

ODDS (MIMICRY) = 0.22 - 1.43*SOCIAL ANXIETY

According to the model, social anxiety was a significant predictor of mimicry ($p = .003$; see Table 2), such that individuals with high social anxiety were .24 times less likely to mimic than individuals with low social anxiety.

Testing Depression as a Covariate

A two-predictor logistic model was fitted to the data to test the research hypothesis regarding the relationship between the likelihood that an individual will engage in mimicry and their level of social anxiety and depression. During the cued time period the model including social anxiety and depression did not significantly predict the occurrence of mimicry behaviour, $X^2_{(2)} = 0.82$, $p = .66$. However, during the non-cued time period, the model including social anxiety and depression did significantly predict the occurrence of mimicry behaviour, $X^2_{(2)} = 9.89$, $p = .007$, and explained 15.2% (Nagelkerke R^2) of the variance in mimicry.

ODDS (MIMICRY) = 0.51 - 1.26*SOCIAL ANXIETY – 0.03*DEPRESSION

According to the model, social anxiety was a significant predictor of mimicry ($p = .012$), such that, holding all other variables constant, individuals with high social anxiety were .28 times less likely to mimic than individuals with low social anxiety. Depression was not a significant predictor of mimicry behaviour ($p = .33$).

Table 2

Study 2 Effect of Social Anxiety Group on Mimicry Behaviour During the Non-Cued Period

Predictor	β	SE β	Wald's X^2	*df*	*p*	EXP(β) Odds Ratio
Social Anxiety	-1.43	.48	8.69	1	.003	.24
Test			X^2	*df*	*p*	
Likelihood ratio test			9.42	1	.002	

Note. 1 = *high social anxiety* group and 0 = *low social anxiety group*. Nagelkerke R^2 = .143.

Exploring the Role of Self-focused Attention

A one-predictor logistic model was fitted to the data to test the exploratory hypothesis regarding the relationship between the likelihood that an individual will engage in mimicry and their level of self-focused attention. During the cued time period the model including self-focused attention did not significantly predict the occurrence of mimicry behaviour, $X^2_{(1)} = 0.03$, $p = .87$. However, during the non-cued time period, the model including self-focused attention did significantly predict the occurrence of mimicry behaviour, $X^2_{(1)} = 6.78$, $p = .009$, and explained 10.5% (Nagelkerke R^2) of the variance in mimicry.

ODDS (MIMICRY) = 1.16 – 0.15*SELF-FOCUSED ATTENTION

According to the model, self-focused attention was a significant predictor of mimicry ($p = .014$; see Table 3), such that, an increase in self-focused attention was associated with a reduction in the likelihood of mimicry.

Table 3

Study 2 Effect of Self-Focused Attention (SFA) on Mimicry Behaviour During the Non-Cued Period

Predictor	β	SE β	Wald's X^2	*df*	*p*	EXP(β) Odds Ratio
SFA	-0.15	.06	6.06	1	.014	.86
Test			X^2	*df*	*p*	
Likelihood ratio test			6.78	1	.009	

Note. Nagelkerke R^2 = .105.

Discussion

The current study examined the relationship between social anxiety and mimicry in a simulated social interaction. It was hypothesized that individuals with high social anxiety would mimic the mannerisms of the interaction partner less (i.e., engage in fewer target movements) than those with low social anxiety. A secondary goal of Study 2 was to examine the relationship between self-focused attention and mimicry. We hypothesized that increased self-focused attention will be related to decreased mimicry behaviour. The current study provided partial evidence that individuals with high social anxiety show reduced mimicry behaviour in a social situation. Prior work supporting reduced mimicry among individuals with high social anxiety used a virtual environment (Vrijsen, Lange, Becker, & Rinck, 2010; Vrijsen, Lange, Dotsch, Wigboldus, & Rinck, 2010). In an experimentally simulated human social interaction, the current study found partial support for a reduced mimicry effect in individuals with high social anxiety. Further, in addition to improving upon ecological validity, the current study explored the relationship between self-focused attention and mimicry. Increased self-focused attention was associated with reduced mimicry.

The reduced mimicry effect in individuals with high social anxiety was only found during the non-cued period, when the confederate made natural movements while the participant described photographs, and not during the cued-period, when the confederate made planned movements while describing photographs. This finding is new to the literature, given that prior studies employing this picture description task methodology (e.g., Chartrand & Bargh, 1999) have not examined mimicry behaviour during the non-cued period but have only focused on the cued period.

We suggest several reasons why we found reduced mimicry only during the non-cued period. First, the movements in the non-cued period may have been more subtle and natural, compared to the cued period, given that they were not scripted. Second, it is possible that the mimicry behaviour of individuals with elevated levels of social anxiety may be differentially impacted when they are listening (which happened during the cued period) compared to talking (which happened during the non-cued period). Third, and in our view most likely, state anxiety may have played a role. Describing the photographs to the other participant (confederate) may have been more anxiety-inducing than listening to the descriptions provided by the confederate. According to cognitive theories of social anxiety (e.g., Clark & Wells, 1995), when individuals with high social anxiety are placed into an anxiety-inducing situation they display an increased self-focused attention and decreased external focus of attention. In describing the photographs, participants with high social anxiety may have experienced increased state anxiety and in-turn elevated self-focused attention and reduced external attention compared to individuals with low social anxiety. Increased self-focused attention and state anxiety during the non-cued period may be one of the possible mechanisms by which individuals with high social anxiety showed reduced mimicry behaviour compared to individuals with low social anxiety.

In addition, the current study found that increased self-focused attention reduced the probability of behavioural mimicry. This relationship was also only evident during the non-cued period, the same time period when high social anxiety was linked to reduced mimicry and proposed, as a post-hoc hypothesis, to be a period in which participants were characterized by an increased state-anxiety, given that they were

undergoing the task of describing the photographs. This relationship is consistent with one previous study that used a computer based automatic imitation task, and found that when high self-focus was induced (by placing a mirror near participants), participant's automatic imitation of an on-screen finger movement was reduced (Spengler, Brass, Kuhn, & Schutz-Bosbach, 2010). Although this previous study used a computer-based task, the underlying suggestion that high self-focus reduces automatic imitative behaviour is consistent with our current finding.

In summary, Study 2 found partial support for a reduced mimicry effect in individuals with high social anxiety in an experimentally simulated social context. In addition, an association between increased self-focused attention and reduced behavioural mimicry was found. Increased self-focused attention is one of the mechanisms that may increase social anxiety and decrease interpersonal connectedness (see Clark & Wells, 1995), therefore, further research should explore increased internal focus as a potential mechanism underlying why individuals with high social anxiety show reduced mimicry behaviour.

Study 3

Study 2 found a relationship between increased self-focused attention and reduced mimicry behaviour. Recognizing that individuals with high social anxiety experience increased self-focused attention and decreased external attention during a social situation (e.g., Clark & Wells, 1995), investigating the impact of elevated self-focused attention on behavioural mimicry is prudent. The purpose of Study 3 was to further investigate the relationship between increased self-focused attention and mimicry behaviour, by manipulating focus of attention (self-focused vs. other-focused) within individuals with

high social anxiety before entering an experimentally simulated natural human interaction (mimicry paradigm). We hypothesized that individuals with high social anxiety who are instructed to be self-focused will show reduced mimicry behaviour compared to those instructed to have an other-focused attention.

Method

Participants

University students were prescreened for high levels of social anxiety using the same procedure as Study 2 (scores of greater than 33 on the SIAS and greater than 29 on the SPIN). A total of 120 participants enrolled in the study and received course credit for their participation. However, a total of 20 individuals were removed from the dataset; 12 individuals were removed due to technical difficulties (interaction was not recorded) and eight due to failing to meet prescreen cut off scores for high social anxiety, due to technical errors in the prescreening process. Therefore the final sample consisted of 100 participants, 50 in the self-focused attention (SFA) condition and 50 in the other-focused attention (OFA) condition. Participants' ages ranged from 17-30 years (M = 18.65, SD = 1.83), with the majority being female (84%). Participants identified as: White (66%), Asian (17%), African Canadian (4%), or other/mixed race (13%).

Materials

The same materials and mimicry paradigm were used (see Study 2 for more information). The Social Interaction Anxiety Scale (SIAS; Mattick & Clarke, 1998) and the Social Phobia Inventory (SPIN; Connor et al., 2000) both showed high internal consistency in the present study, $\alpha = .87$ and $\alpha = .84$, respectively. The Focus of Attention Questionnaire – Self (FAQ-self; Woody, 1996) displayed good internal consistency in the

present study (α = .73). The Beck Depression Inventory-II (BDI-II; Beck, Steer, & Brown, 1996) demonstrated high internal consistency in the present study (α = .88).

Procedure

Four female research assistants served as confederates, and the primary researcher, a female, and two female research assistants, served as the experimenter. The set up and procedure for Study 3 was the same as Study 2 with two exceptions: participants were all individuals with high social anxiety and were randomly assigned to the self-focused attention or the other-focused attention condition. The self-focused attention manipulation instructions were adapted from Gaydukevych and Kocovski (2012). Participants assigned to the high self-focused attention condition were instructed to pay attention to their thoughts, feelings, actions, and body sensations during the task. Participants in the other-focused attention condition were asked to attend to the other participant's actions, words, expressions, and body position during the task. After receiving their instructions, participants were asked to write down a few words on a cue card to remind themselves of the instructions (self or other focus) during the task. They were allowed to keep this card with them, but were asked not to reveal what they had written to the other participant. After participants were assigned to the self-focused or other-focused condition, they proceeded to complete the picture description task, questionnaire, and debriefing as outlined in Study 2.

Results

Mimicry Coding and Interrater Reliability

The same coding procedure was used as Study 2; undergraduate student coders, blind to the hypotheses and participant's condition, coded the video footage for mimicry

behaviour, number of facial touches within 5 seconds of the confederate's target movement (facial touch). Three separate time periods were coded for each participant: baseline period - before interacting with the confederate, the cued period – when the confederate made cued target movements while he/she described photographs, and non-cued period – when the confederate made natural movements while the participant described photographs. It should be noted that in this paradigm, as in Study 2, the cued period coincided with the participant listening and the non-cued period coincided with the participant talking. The coding procedure yielded the same two dependent variables as Study 2: mimicry behaviour during the cued and non-cued periods.

A two-way random effect intra-class correlation (ICC) coefficient was used to evaluate the reliability of the coding method for both dependent variables (i.e., participant facial touches during the cued and non-cued periods). Interrater reliability (n = 25), was good during both the cued and non-cued period, ICC = .93 and ICC = .99, respectively. Given the high ICC for the dependent variables, coding data was utilized from the primary student coder who went on to code the rest of the data.

Normality of the Dependent Variables

The two dependent variables: mimicry during the cued period (number of participant facial touches within five seconds of the confederate during the cued period), and mimicry during the non-cued period (number of facial touches within five seconds of the confederate during the non-cued period) were not normally distributed with skewness of 1.83 (SE = 0.25) and 1.74 (SE = 0.25), respectively, and kurtosis of 3.42 (SE = 0.49) and 2.63 (SE = 0.49), respectively. Non-parametric transformations were not performed on the dependent variables due to the high percentage of individuals who did not mimic

during the cued (27.4%) and non-cued periods (62.1%). Using the same procedure as Study 1, the dependent variables were dichotomized by distinguishing individuals who mimicked (engaged in greater than zero facial touches within five-seconds of the confederate) from those that did not mimic (engaged in zero facial touches within five-seconds of the confederate). The following dependent variables were utilized throughout our analyses: (1) mimicry during the cued period (0 = *no*, 1 = *yes*) and (2) mimicry during the non-cued period (0 = *no*, 1 = *yes*).

Manipulation Check

To ensure our manipulation of self-focused attention worked, self-focused attention and other-focused attention groups were compared on self-focused attention scores. In line with our intended manipulation, individuals in the self-focused attention condition reported significantly higher levels of self-focused attention (SFA: $M = 14.63$, $SD = 3.94$), compared to those in the other-focused attention condition (OFA: $M = 13.04$, $SD = 3.94$), $t(93) = -1.97$, $p = .05$, $d = 0.40$.

Comparing Conditions on Baseline Variables, Confederate Behaviour, and Duration

Self-focused attention (SFA) and other-focused attention (OFA) groups were compared on social anxiety scores (SIAS & SPIN), depression scores (BDI), baseline facial touches, and experimental duration. No differences between the SFA and OFA conditions were found on either of the social anxiety measures, SIAS, $t(90) = -0.23$, $p = .82$, $d = 0.05$) and SPIN, $t(89) = 0.70$, $p = .49$, $d = 0.15$), the depression measure (BDI), $t(93) = -0.19$, $p = .85$, $d = 0.04$), on baseline facial touches, $t(93) = 1.02$, $p = .31$, $d =$

0.21) or on experimental duration, $t(93) = -1.77$, $p = .08$, $d = 0.36$) . See Table 4 for means and standard deviations of baseline variables.

In addition, SFA and OFA groups were compared on confederate facial touches during the non-cued period and cued period. No difference on confederate facial touches was found between conditions during the non-cued, $t(93) = -1.20$, $p = .23$, $d = 0.25$, and cued period, $t(93) = 0.49$, $p = .62$, $d = 0.10$. See Table 5 for means and standard deviations of confederate facial touches, participant facial touches, and target mimicry behaviour during the non-cued and cued periods.

Self-Focused Attention and Behavioural Mimicry

The outcome variable, mimicry (facial touches within 5 seconds of the confederate), was coded as individuals who engaged in mimicry (1 = *yes*, 0 = *no*), and the main predictor was condition. Condition was coded as 1 = *self-focused attention* and 0 = *other-focused attention*. The condition distribution was nearly even with 48.4% ($n = 46$) individuals in the self-focused attention condition and 51.6% ($n = 49$) individuals in the other-focused attention condition.

Using a Pearson Chi-square test, we compared conditions on mimicry. No relationship was found between condition and mimicry during the non-cued, $X^2_{(1)} = 0.06$, $p = .81$, or cued period, $X^2_{(1)} = 1.23$, $p = .27$. See Table 6 for distribution of participants in the SFA and OFA conditions that mimicked during the non-cued and cued period.

Table 4

Study 3 Means and Standard Deviations on Baseline Variables for Self-Focused Attention (SFA) and Other-Focused Attention (OFA) Groups

	SFA	OFA
Social Anxiety (SIAS)	46.02(10.33)	45.51(10.82)
Social Anxiety (SPIN)	38.20(7.00)	39.48(10.04)
Depression	16.72(7.78)	16.36(10.52)
Baseline Touches	2.96(2.77)	3.65(3.79)
Experimental Duration	13.21(4.01)	11.91(3.08)

Note: Standard deviations are in parentheses. Experimental duration is reported in minutes.

Table 5

Study 3 Mean Number of Facial Touches and Mimicry Behaviour for Self-Focused Attention (SFA) and Other-Focused Attention (OFA) Groups During the Non-Cued and Cued Period

	SFA		OFA	
	Non-Cued	Cued	Non-Cued	Cued
Confederate Facial Touches	7.35(9.27)	27.85(7.68)	5.45(5.89)	28.55(6.19)
Participant Facial Touches	6.80(7.66)	5.11(4.55)	5.08(6.74)	4.67(4.52)
Target Mimicry Behaviours	0.89(1.37)	2.39(2.88)	0.55(0.84)	2.25(2.54)

Note: Standard deviations are in parentheses.

Table 6

Study 3 Distribution of Individuals in the Self-Focused Attention (SFA) and Other-Focused Attention (OFA) Conditions that Engaged in Mimicry During the Non-Cued and Cued Period

Parameters	Non-Cued Mimicry		*P* value[a]	Cued-Mimicry		*P* value[a]
	Yes	No		Yes	No	
Total	36 (37.9%)	59 (62.1%)		69 (72.6%)	26 (27.4%)	
Condition			.81			.27
SFA	18 (39.1%)	28 (60.9%)		31 (67.4%)	15 (32.6%)	
OFA	18 (36.7%)	31 (63.3%)		38 (77.6%)	11 (22.4%)	

Note: [a] Pearson Chi-squared test.

Exploratory Analysis: Closer Examination of Self-Focused Attention

A one-predictor logistic model was fitted to the data to test the exploratory hypothesis regarding the relationship between the likelihood that an individual will engage in mimicry and their level of self-focused attention within the SFA condition. During the non-cued period the model including self-focused attention did not significantly predict the occurrence of mimicry behaviour, $X^2_{(1)} = 0.33$, $p = .57$. However, during the cued period, the model including self-focused attention did significantly predict the occurrence of mimicry behaviour, $X^2_{(1)} = 5.53$, $p = .02$, and explained 15.8% (Nagelkerke R^2) of the variance in mimicry.

ODDS (CUED-MIMICRY) = 3.80 – 0.20*SELF-FOCUSED ATTENTION

According to the model, self-focused attention was a significant predictor of mimicry during the cued period ($p = .03$; see Table 7), such that, a one unit increase in self-focused attention score was associated with a 0.82 reduction in the likelihood of mimicry.

Table 7

Study 3 Effect of Self-Focused Attention (SFA) on Mimicry Behaviour During the Cued Period within the SFA Condition

Predictor	β	SE β	Wald's X^2	*df*	*p*	EXP(β) Odds Ratio
SFA	-0.20	.09	4.78	1	.03	.82
Test			X^2	*df*	*p*	
Likelihood ratio test			5.53	1	.02	

Note. Nagelkerke R^2 = .16.

Discussion

The current study investigated the relationship between increased self-focused attention and mimicry behaviour within individuals with high social anxiety. We hypothesized that individuals with high social anxiety who are instructed to be self-focused would show reduced mimicry behaviour compared to those instructed to have an other-focused attention. The current study did not find support for the hypothesis, however, among individuals in the self-focused attention condition, increased self-focused attention was associated with reduced mimicry behaviour during the cued (but not the non-cued) period.

There are several reasons as to why the hypothesized difference in mimicry behaviour between the self-focused and other-focused attention conditions may not have been found. According to the manipulation check, although individuals in the self-focused attention condition had significantly higher levels of self-focused attention compared to the other-focused attention condition, the effect size was perhaps smaller (d = 0.40) than required to have an effect on mimicry. Gaydukevych and Kocovski (2012) used the same manipulation and found a significant difference on post-event processing between the self-focused attention and other-focused conditions. In checking that the manipulation worked correctly, Gaydukevych and Kocovski's (2012) study found that following the self-focused attention manipulation participants successfully reported having paid more attention to their internal symptoms, thoughts, and feelings compared to the other-focused attention manipulation. However, participants also reported equal attention to the confederate. This finding suggests that participants may have shown an increased self-focused attention, as intended following the self-focused attention

manipulation, but may not have shown differences in other-focused attention between conditions.

One of the limitations of the current study was not measuring other-focused attention as part of the manipulation check. Therefore, the current study may not have found differences in mimicry behaviour across conditions due to (a) small effect sizes for the difference in level of self-focused attention between conditions, and (b) perhaps a lack of difference in other-focused attention (attention to the confederate), which may have led both the self-focused attention and the other-focused attention conditions to attend to the confederate to the same degree. Future research should test both self and other focused attention as part of the manipulation check.

Despite the aforementioned limitations, Study 3 found, among individuals in the self-focused attention condition, an association between self-focused attention and reduced mimicry behaviour. This association was only detected during the cued period, when the confederate made planned movements while they described their photographs (which happened when the participant was listening), but not during the non-cued period, when the confederate made natural movements while the participant described their photographs (which happened when the participant was talking). The association between reduced mimicry behavior and self-focused attention during the cued period, but not the non-cued, may be explained by the nature of the task (i.e., heavy on instruction). Participants were required to remember their condition assignment and instructions for describing the photographs, and may have only been able to properly attend to their condition instructions when they were listening but not while they were talking. To test

this explanation, a more simplistic mimicry paradigm could be used in future research to potentially enhance the effects of the self-focused attention manipulation.

The significant relationship between increased self-focused attention and reduced mimicry behaviour was found during the cued period in Study 3, but in Study 2 it was found during the non-cued period. The relationship between increased self-focused attention and reduced mimicry behaviour are not directly comparable between studies, given that: (a) Study 3 manipulated participants to have either a self- or other-focused attention before measuring level of self-focused attention, whereas Study 2 did not use this manipulation, and (b) Study 3 tested the relationship among individuals with high social anxiety, whereas Study 2 tested the relationship among individuals with low and high social anxiety.

The current study extends Study 2 and contributes new information to the literature by investigating the relationship between increased self-focused attention and reduced mimicry behaviour in individuals with high social anxiety. Results could not clearly delineate whether increased self-focused attention reduces mimicry behaviour within individuals with high anxiety. However, the current study provides a first step towards better understanding one factor, self-focused attention, found to be a characteristic of individuals with social anxiety (e.g., Clark & Wells, 1995), that may influence mimicry behaviour in a social interaction. Further research is needed to determine what factors, like self-focused attention, might influence the mimicry behaviour of individuals with high social anxiety.

General Discussion

Past research found reduced mimicry within individuals with high social anxiety (Vrijsen, Lange, Becker, & Rinck, 2010; Vrijsen, Lange, Dotsch, Wigboldus, & Rinck, 2010), however the current studies paint a more complex picture. Cognitive theories suggest that when an individual with high social anxiety enters a social context in which they fear evaluation they are characterized by increased self-focused attention and decreased external attention (Clark & Wells, 1995). With a reduced external focus, it is plausible that individuals with high social anxiety may be missing out on a non-conscious behaviour (i.e., behavioural mimicry) that helps facilitate a positive social interaction (Chartrand & Bargh, 1999). Across the three studies we investigated the relationship between social anxiety and mimicry behaviour; findings suggest a more nuanced relationship, than identified in past research (e.g., Vrijsen, Lange, Becker, & Rinck, 2010), between high social anxiety and reduced mimicry. The current studies identify important factors (e.g., social context and self-focused attention) that may influence the relationship between social anxiety and mimicry. Study 1 did not find a relationship between high social anxiety and reduced automatic imitation, the laboratory context of imitation, outside a social context. Study 2 found a relationship between high social anxiety and reduced mimicry behaviour in one portion (non-cued period) of a simulated natural social interaction and also found a relationship between increased self-focused attention and reduced mimicry behaviour during the same portion of the simulated interaction (non-cued period). Study 3 manipulated self- and other-focused attention in individuals with high social anxiety and did not find a relationship between self-focused attention condition and reduced mimicry behaviour, however, among individuals in the

self-focused attention condition, a relationship between self-focused attention and reduced mimicry behaviour was found. The following paragraphs will further outline the results of each study.

Study 1 found no differences on imitation, as measured by level of automatic imitation, thought to index motor resonance, between individuals with high and low social anxiety. It is possible that automatic imitation (laboratory context of imitation) is not influenced by social anxiety or that the context of this experiment did not elicit enough social fear (see DePaulo, Epsteing & LeMay, 1990) to elevate levels of state social anxiety to find differences in automatic imitation between individuals with high and low social anxiety.

Study 2 improved upon ecological validity by investigating mimicry behaviour (social context of imitation) in an experimentally simulated human social interaction. Study 2 found partial support for a reduced mimicry effect in individuals with high social anxiety. In conjunction with prior research (e.g., Vrijsen, Lange, Becker, & Rinck, 2010), the findings provide some additional support that reduced mimicry behavior during social interactions may be one factor by which to explain prior findings that individuals with high social anxiety are regarded as uncomfortable to interact with and have less than optimal performances in social situations (e.g., Clark & McManus, 2002).

We coded both the cued and non-cued periods of the simulated interaction and perhaps captured important contextual information that may explain why individuals with high social anxiety show reduced mimicry behaviour. The reduced mimicry effect was only found during the non-cued period, which coincided with the portion of the paradigm when the participants were talking, and was not found during the cued period, which

coincided with the portion of the paradigm when participants were listening. In describing the photographs (non-cued period), participant's social anxiety may have been elevated, relative to when they were listening (cued period). Describing the photographs during the non-cued period may have provided the contextual situation (increased social fear) necessary for reduced mimicry behaviour. Increased state anxiety is one post-hoc hypothesis we suggest to delineate why the reduced mimicry effect was found during the non-cued but not the cued period. However, this suggestion should be interpreted with caution given that state anxiety was not measured in the current study.

In addition, Study 2 found an association between greater self-focused attention and reduced mimicry behaviour. This relationship was also only present during the non-cued period, when state-anxiety was hypothesized to be higher, due to the anxiety-inducing context of this portion of the interaction – when participants described the photograph to the other participant (confederate).

To further explore the influence that increased self-focused attention may have on mimicry behaviour in individuals with high social anxiety, Study 3 randomly assigned individuals with high social anxiety to have either an increased self-focused attention or other-focused attention before engaging in the mimicry paradigm utilized in Study 2. Contrary to hypotheses, no differences were found in mimicry behaviour between the two conditions, despite a successful manipulation check. However, among individuals in the self-focused attention condition, a relationship between increased self-focused attention and reduced mimicry behaviour was found during the cued period – when participants were listening to the other participant (confederate) describe his/her photo. As a post-hoc hypothesis, we suggest that individuals were better able to recall and enact the

manipulation instructions (e.g., focus on how you feel) during the portion of the experiment in which they were listening compared to talking.

The significant relationship between increased self-focused attention and reduced mimicry behaviour in Study 2 occurred during the non-cued period, but in Study 3 it occurred during the cued period. Findings in Study 2 and Study 3 are not directly comparable given that Study 3 manipulated participants to have a self-focused or other-focused attention whereas Study 2 did not, and Study 2 examined the relationship across individuals with low and high social anxiety whereas Study 3 used a sample of only individuals with high social anxiety. Further, differences between Study 2 and 3 findings may also be explained by the nature of the manipulation task used in Study 3. In Study 3 participants were required to remember both their condition assignment and the picture description task instructions. Given the instruction heavy condition and task, participants may have only been able to attend to their condition instructions when they were listening, but not while they were talking. Thus, participants may have lost sight of their self-focus instructions during the non-cued period, but were able to attend to their instructions during the cued period, resulting in reduced mimicry behaviour. Unfortunately, we can only speculate that participants were not able to attend to their self-focus instructions during the non-cued period given that self-focused attention was not measured separately for the cued and non-cued period. Despite the methodological and sample differences, Study 2 and Study 3 lay the groundwork for an investigation into the potential role self-focused attention may play on the relationship between social anxiety and reduced mimicry behaviour. Given that self-focused attention has been identified as a key component in the maintenance of social anxiety (e.g. Clark & Wells,

1995), and it is linked to poor interaction outcomes for individuals with high social anxiety (e.g., Clark & McManus, 2002), it is important to further delineate the relationship between increased self-focused attention and reduced behavioural mimicry within individuals with high social anxiety.

Clinical Implications

Overall, findings have implications for individuals with high levels of social anxiety. Given that mimicry is associated with positive interaction outcomes, such as increased affiliation and rapport with the interaction partner (Lakin & Chartrand, 2003), strategies aimed at increasing mimicry may be helpful. However, training an individual to mimic may not be the best strategy, as conscious mimicry has been found to lead to negatives outcomes, such as feelings of coldness from the interaction partner (Leander, Chartrand, & Bargh, 2012). Based on data underlining the potential role of increased self-focused attention on reduced mimicry behaviour, another strategy may be to focus on reducing self-focused attention and thereby increasing external focus of attention in social situations. Prior research has outlined the importance of reducing self-focused attention and increasing external attention in the treatment of social anxiety disorder (Hofmann, 2000; Spurr & Stopa, 2002). The reduction of self-focused attention is part of cognitive therapy treatment protocols. Past studies have supported that treatments focused on reducing self-focused attention and increasing external attention, lead to reduced social anxiety symptoms and increased positive interactional outcomes (e.g., Hoffman, 2000; Woody, Chambles, & Glass, 1997; Wells & Papageorgious, 1998). The current findings further support the continued utility of interventions aimed at the reduction of self-focused attention.

Limitations and Future Directions

Participants across all three studies were undergraduate students, some with elevated social anxiety and despite using empirically supported cut-off scores, the ability to generalize findings to a clinical sample is limited. Further, there was a gender disparity in the samples; with a predominantly female sample, the ability to generalize findings to the male population is limited.

Although the aims of the Study 2 and 3 were to simulate a 'true' social interaction, various aspects of the interaction were constrained. For instance, the confederate followed a script while describing photos and the conversation took place within a lab setting. Despite these constraints, ecological validity was increased beyond that of a virtual environment, and other computer based experimental tasks. Additionally, mimicry in Studies 2 and 3 was restricted to one target behaviour, facial touches, but mimicry actually incorporates much more subtle behaviour, for example body posture and facial expressions (Chartrand & Bargh, 1999). The effect may be more pronounced when whole body mimicry is taken into account. Future research could focus on broadening the type of mimicry behavior examined, for instance zooming out and looking at mimicry of body position or the reciprocal influence of the interaction partner's mimicry behavior on the participant's mimicry behavior. Further, a high percentage of individuals did not engage in the target mimicry behaviour, leading to non-normally distributed dependent variables in Studies 2 and 3. As a result, dependent variables were dichotomized and variation in mimicry behaviour was lost.

It is important to look at the different contexts and factors that may be at play within the relationship between social anxiety and mimicry, such as self-focused attention

and state anxiety. Future research could modify Study 3 by simplifying the mimicry paradigm to a 5-10 minute unstructured conversation with a confederate, and use additional manipulation checks to ensure participants were successfully manipulated to have a self-focused or other-focused attention as per their assigned condition. As noted in the discussion section of Study 3, the self-focused attention subscale of the Focus of Attention Question (FAQ-self) was used as the manipulations check, but not the other-focused attention subscale (FAQ-other). Future research would benefit by including a more comprehensive manipulation check. In addition, it would be important to measure state anxiety, given that it is important to understand if the context created by the lab is enough to simulate a natural social interaction that would illicit social fear in an individual with high social anxiety. Future research could also investigate other possible factors that may contribute to reduced mimicry among individuals with high social anxiety, for example, individuals with social anxiety often engage in safety behaviours in an attempt to avoid or hide anxiety (e.g., avoiding eye contact), which may also affect their ability to mimic others. Finally, it would be important to examine whether efforts aimed at decreasing self-focused attention during social interactions for individuals with high social anxiety lead to improved mimicry.

Conclusion

The current research complements and extends prior work on social anxiety and behavioural mimicry. We found partial support for a reduced mimicry effect among individuals with high social anxiety. This effect was found previously in a virtual environment (Vrijsen, Lange, Becker, & Rinck, 2010; Vrijsen, Lange, Dotsch, Wigboldus, & Rinck, 2010). Individuals with high social anxiety did not show reduced

automatic imitation, compared to individuals with low social anxiety; however, in improving upon ecological validity, partial support for a reduced mimicry effect in individuals with high social anxiety was found within a simulated live human social interaction. Support for reduced mimicry behaviour in individuals with high social anxiety was only found during the portion of the interaction in which individuals were talking as opposed to listening, which may point to the importance of social fear (e.g., increased state anxiety) within the relationship between social anxiety and reduced mimicry. In addition, the current research began exploration into self-focused attention, which may contribute to the maintenance of social anxiety by reducing mimicry behaviour in interaction settings. There was some support for self-focused attention as a continued intervention target in the treatment of social anxiety disorder. Overall, results support the need for continued investigation into the nuanced relationship between high social anxiety and reduced mimicry behaviour. In particular, results encourage further exploration into the contexts and factors that may play a role in the relationship between social anxiety and reduced mimicry; this would elicit a better understanding of the potential barriers between individuals with high social anxiety and the development of strong interpersonal relationships.

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Appendices

STUDY 1 MATERIALS

Appendix A: Consent Form

WILFRID LAURIER UNIVERSITY
INFORMED CONSENT STATEMENT/INFORMATION LETTER
Department of Psychology

Processing the Actions of the Self and Other (REB#3903)
Principal Investigator, Kayleigh Abbott
Supervisors, Dr. Nancy Kocovski and Dr. Sukhvinder Obhi

You are invited to participate in a research study. The purpose of this study is to examine the mechanisms underlying the representation of our own and other people's actions during a social interaction. The research is being conducted by Kayleigh Abbott, a doctoral student (email: abbo9240@myaurier.ca), under the supervision of Dr. Sukhvinder S. Obhi and Dr. Nancy Kocovski, at Wilfrid Laurier University (sobhi@wlu.ca and nkocovski@wlu.ca, respectively).

INFORMATION
In this experiment we will use a behavioural task that will instruct participants to imitate simple observed movements. Some details of this study cannot be revealed at this time, but will be explained in a debrief at the end of the study.

The experiment will take place in a laboratory at the Wilfrid Laurier University (WLU) Waterloo campus. In total, approximately 60 participants from WLU will be recruited for the study. To participate in this study, you must be right-handed and have already completed the Wilfrid Laurier University's mass testing, which took place online. At the start of the experiment, participants will be required to complete a few short questionnaires and asked to provide some basic personal information (i.e. age and gender).

Following these questionnaires participants will perform a behavioural task in which they will be in front of a computer display and observing either still pictures depicting certain motor actions or actual movies of actions being performed. Thereafter participants will be required to make a pre-instructed response as quickly as possible. This pre-instructed response will be measured using a keyboard.

After the behavioural task participants will complete two additional short questionnaires and then will be debriefed. The entire study should take approximately 60 minutes to complete.

RISKS
As a result of participating in this study you may experience feelings of discomfort and anxiety during the completion of the questionnaires and behavioural task, however these

feelings are normal and should only be temporary. If these feelings persist or worsen, or you have any concerns, you may contact the researcher or Wilfrid Laurier's Counselling Services. The researcher, Kayleigh Abbott, can be reached by email abbo9240@mylaurier.ca. In addition, Wilfrid Laurier's Counselling Services can be reached by phone (519) 884-0710 ext. 2338, by email (counselling@wlu.ca), and in person at the Student Services Building, second floor.

Secondly, the behavioural task might lead you to become somewhat bored during the experiment. However, breaks will be included throughout the session.

BENEFITS

Participation in this study will help us to advance the current understanding of the psychological mechanisms that enable humans to engage in efficient social interaction. The experimenter will elaborate on the benefits from the present study after it has been completed during the debrief.

COMPENSATION

For participating in this study you will be accredited with 1.0 PREP Credits. If you withdraw from the study prior to its completion, you will receive the same course credit as you would have for the completion of the study. Please note that an alternative way to earn credit is to complete a critical review of a research article (for more information about this option: http://www.wlu.ca/documents/50647/PREP.alt.assignment.pdf).

PARTICIPATION

Your participation in this study is voluntary; you may decline to participate without penalty. If you decide to participate, you may withdraw from the study at any time without penalty and without loss of benefits to which you are otherwise entitled. If you withdraw from the study before data collection is completed your data will be destroyed; however, your data cannot be withdrawn after data collection is complete because they are stored without identifiers. You have the right to omit any question(s)/procedure(s) you choose.

CONFIDENTIALITY

All data collected in this research will remain confidential, and your participation in this research will remain undisclosed. The principal investigator, Kayleigh Abbott, and the research advisors, Dr. S. S. Obhi and Dr. Nancy Kocovski, will be the only individuals with access to the data. Rebecca Blackie (research assistant) assisted with participant recruitment, but will not have access to the data. All data will be stored in Dr. Obhi's locked lab. Electronic data will be securely stored on password-protected computers and an external hard drive backup. Consent forms will be stored within a locked cabinet until they are scanned and securely stored as electronic files. Kayleigh Abbott will destroy the hardcopy documents by September 1, 2014 and Dr. Obhi will destroy the electronic copies by August 31, 2021. Anonymous electronic data will be stored indefinitely. Any publications arising out of this research will not mention any personal details about participants. A number will refer to participants and only performance data will be shown. There will be absolutely no way, in which individual performance can be linked

back to a particular participant. The results of this study may be published or presented to colleagues, however, all data will be presented in aggregate form.

FEEDBACK AND PUBLICATION

Feedback regarding this research will be posted on the psychology bulletin. The results of this research will also go on to be published in psychology or cognitive neuroscience journals. They may be included in Kayleigh Abbott's doctoral dissertation. All personal information about participants will be kept fully confidential. You are fully entitled to receive feedback about the outcomes of this research and should let the experimenter know if you wish to receive such feedback. It is expected that this will be available on or before August 31, 2014.

CONTACT

If you have any questions at any time about the study or the procedures, you may contact the researcher, Kayleigh Abbott, by e-mail abbo9240@mylaurier.ca. Alternatively, you may contact the research advisors, Dr. Sukhvinder S. Obhi by email sobhi@wlu.ca and/or Dr. Nancy Kocovski by email nkocovski@wlu.ca. If you feel you have not been treated according to the description in this form, or your rights as a participant in research have been violated during the course of this project, you may contact Dr. Robert Basso, Chair, University Research Ethics Board, Wilfrid Laurier University, (519) 884-1970, extension 4994, or rbasso@wlu.ca.

CONSENT

I have read and understand the above information. I have received a copy of this form. I agree to participate in this study. Please also provide your e-mail address, indicating whether you would like to receive feedback about the study's results on or before August 31, 2014. You do not have to write down your e-mail if you would not like to receive feedback.

Participant's signature_____

Date_____

Participant's e-mail_____ Feedback? Y___ N___

Investigator's signature_____

Date_____

Appendix B: PREP Advertisement

Title: Processing the Actions of the Self and Other (REB #3903)

Researchers: Kayleigh Abbott, Dr. Sukhvinder S. Obhi, and Dr. Nancy Kocovski.

Credit: 1.0 PREP Credit

Participant Exclusion Criteria:

Approximately 60 participants from Wilfrid Laurier University will be recruited. To participate in this study, you must be right-handed and have already completed the Wilfrid Laurier University's mass testing, which took place online.

Study Information:

The purpose of this study is to understand the psychological mechanisms by which people represent their own and other people's actions.

The study will take approximately 1 hour, and participants will be compensated 1.0 PREP credit for their participation.

In this study you will come into the lab fill out some demographic information and then complete some brief questionnaires. Next, you will be asked to perform a simple action observation/execution task, where you make hand movements in response to stimuli displayed on a computer screen. Following this behavioural task you will complete two additional questionnaires and then you will be debriefed. All participants will be tested individually.

For additional information please contact myself at abbo9240@mylaurier.ca or the other investigators, Dr. Nancy Kocovski (nkocovski@wlu.ca) and Dr. Sukhvinder Obhi (sobhi@wlu.ca).

Appendix C: Debriefing Form

WILFRID LAURIER UNIVERSITY
DEBRIEFING FORM
Processing the Actions of Self and Other

Kayleigh Abbott, Dr. Nancy Kocovski, and Dr. Sukhvinder S. Obhi, Department of Psychology

The information obtained in this form is very important to read. Some **concealment** was used in this study, in which all of the relevant details of the research were not disclosed. Concealment was necessary in order to maintain the integrity of the study's purpose and any research findings. In order to better understand our use of concealment, **please take some time to carefully read the following information**.

It is recommended that you save a copy of this form for your records.

Based on right-handedness and social anxiety scores, which you had completed during mass testing, you were eligible to participate in this research study. These scores were based on answers that you had provided in the **Social Interaction Anxiety Scale**. Those scoring 14 or lower on this scale (indicating lower levels of social anxiety) were grouped, those scoring between 15 and 33 on this scale (indicating moderate levels of social anxiety) were grouped, and those score 34 or greater on this scale (indicating elevated social anxiety, but not necessarily diagnostic levels of social anxiety) were grouped, and participants were evenly distributed between these three groups and selected as eligible to participate in this **experimental research study**.

Most people consider social interactions enjoyable, however, individuals suffering from social anxiety fear them. Social anxiety has been conceptualized as a fear that one is being negatively evaluated in social and performance situations (Abbott & Rapee, 2004). As a result, people with high social anxiety (HSA, associated with our group that received SIAS scores of 34 or greater) often avoid such anxiety-provoking situations and are also regarded as being less pleasant to interact with, than individuals with low social anxiety (LSA; Heerey & Kring, 2007). The exact properties of the unskilled behaviour in HSA people are largely unknown; one reason that has been proposed may be that some of the shortcomings are reflected in automatic, subtle behaviour patterns that are not easily observed.

Behavioural mimicry is one such automatic social behaviour. It refers to changing one's behaviour unintentionally in order to match that of the other person in a social interaction (Chartrand & Bargh, 1999). Individuals automatically mimic many different aspects of interaction partners, including but not limited to their facial expressions, emotions, and mannerisms. The capacity to successfully process and understand the behaviour of others has been found to have positive consequences

on social interaction, such as increased liking and affiliation, increased ability to empathize, and the capacity to make communication more smooth and enjoyable (Wang & Hamilton, 2012). This relationship is bi-directional: being mimicked creates a stronger affiliation with the interaction partner, and individuals are more inclined to mimic a person they like better. Research has highlighted the potential role of low-level resonance in mimicry, specifically known as "motor resonance". Motor resonance describes the tendency for motor areas of an observer's brain to become active when they watch another individual acting. It is believed that motor resonance is the product of a mirror system in the human brain that displays similar activity during performance and observation of specific actions (Rizzolatti & Sinigaglia, 2010). Through connections between mirror areas and the limbic system, emotions that are associated with the observed action can also be evoked (Iacoboni & Dapretto, 2006). In this way, through inner simulation of observed actions associated thoughts and feelings can be evoked, which enable empathy and an understanding of other individuals, thus increasing one's ability to communicate effectively with another individual.

The present research used a behavioural task to investigate the deficits in motor resonance that has been proposed to underlie deficits in communication and affiliation among those with high social anxiety. Specifically asking if individuals who varied in levels of social anxiety also varied in the extent to which they resonate with observed actions.

Demographic information was collected to check for individual differences, we expect that individual differences such as age and income do not vary with the level of social anxiety and automatic mimicry. Scores on the depression questionnaire were collected in order to check for comorbidity, such that results on the behavioural task were not driven by level of depression but level of social anxiety. Scores on the “Inclusion of Others in the Self” will be correlated with scores on the automatic mimicry task. We expect that scores that indicate more overlap between the self and others will be highly and positively correlated with high motor resonance and an increased ability to communicate effectively with another individual.

Participation in this study may have led to some feelings of discomfort, increased feelings of anxiety, and/or boredom when completing the questionnaires or behavioural computer task. However, these feelings are normal and should only be temporary. If they persist or worsen, or you have any concerns, you may contact the researchers or Wilfrid Laurier’s Counseling Services (contact information provided below).

If you have any questions or comments regarding this study, or of your participation in this study, please contact the experimenters below. As well, a summary of the results will be posted on the psychology bulletin board by August 31, 2014. If you provided your email address on the consent form, the summary will be sent to you

by August 31, 2014. You may also email the researcher if you would like a copy of this document.

Kayleigh Abbott Department of Psychology Wilfrid Laurier University Email: abbo9240@mylaurier.ca Phone: 519-884-0710 ext. 2587 Lab: N2059 or SR211	**Dr. Nancy Kocovski** Department of Psychology Wilfrid Laurier University Email: nkocovski@wlu.ca Phone: 519-884-0710 ext. 3519 Office: N2025	**Dr. Sukhvinder S. Obhi** Department of Psychology Wilfrid Laurier University Email: sobhi@wlu.ca Phone: 519-884-0710 ext. 3519 Office: N2023

This study was reviewed and approved by the Research Ethics Board (REB #3903). If you feel your rights as a participant in research have been violated during the course of this project, you may contact Dr. Robert Basso, Chair, University Research Ethics Board, Wilfrid Laurier University, (519) 884-1970, extension 4994 or rbasso@wlu.ca.

If you are interested in further readings about this topic, you can visit the Anxiety Disorders section of Chapter 14 of your Introduction to Psychology textbook.

Weiten, W., & McCann, D. (2010). *Psychology: Themes and variations* (2nd Canadian ed.). Toronto: Thomson & Nelson.

If you would like to discuss or learn more about social anxiety, please refer to the following list of resources:

Counselling Services
Wilfrid Laurier University
75 University Avenue West
Waterloo, Ontario, N2L 3C5
(519) 884 0710 x2338
http://www.mylaurier.ca/counselling/home.htm
counselling@wlu.ca

Canadian Mental Health Association
Kitchener Branch
67 King Street East
Kitchener, ON N2G 2K4
Ph: (519) 744-7645
http://www.cmha.ca
http://www.cmhawrb.on.ca

Appendix D: Demographics Questionnaire

Please answer the following questions listed below by writing your response or checking the most appropriate answer.

1. What is your age? _____

2. What is your gender?

Male □
Female □
Transgender □

3. Which ethnicity do you most closely identify with?

White/Caucasian □
Asian □
Black/African Canadian □
First Nations □
Other □ Please specify
_____

4. What is the highest level of education that you have completed?

Completed some high school □
Graduated from high school □
Completed some college or university (i.e., taken some courses) □

Graduated from university:
Undergraduate degree □
Masters degree □
Doctoral degree □
Graduated from college □
Other professional degree (e.g., medicine, education, pharmacy, etc.) □

5. What is your occupational status?

Full time Student □ Part time Student □ Full time Employee □

Part time Employee □ Unemployed □ Other _____
_____
(Please specify)

6. What is your marital status?

Married □ Separated □ Divorced □

Cohabitating □ Single □ Widowed □

Appendix E: Handedness Questionnaire

Oldfield, R.C. (1971) The assessment and analysis of handedness: the Edinburg inventory. *Neuropsychologia*, *9*(1), 97-113. 1971.

Handedness:

Which hand do you prefer to use when:		no pref		Do you ever use the other hand?
Writing:	Left ○	○	○ Right	☐ Yes
Drawing:	Left ○	○	○ Right	☐ Yes
Throwing:	Left ○	○	○ Right	☐ Yes
Using Scissors:	Left ○	○	○ Right	☐ Yes
Using a Toothbrush:	Left ○	○	○ Right	☐ Yes
Using a Knife (without a fork):	Left ○	○	○ Right	☐ Yes
Using a Spoon:	Left ○	○	○ Right	☐ Yes
Using a broom (upper hand):	Left ○	○	○ Right	☐ Yes
Striking a Match:	Left ○	○	○ Right	☐ Yes
Opening a Box (holding the lid):	Left ○	○	○ Right	☐ Yes
Holding a Computer Mouse:	Left ○	○	○ Right	☐ Yes
Using a Key to Unlock a Door:	Left ○	○	○ Right	☐ Yes
Holding a Hammer:	Left ○	○	○ Right	☐ Yes
Holding a Brush or Comb:	Left ○	○	○ Right	☐ Yes
Holding a Cup while Drinking	Left ○	○	○ Right	☐ Yes

Appendix F: Social Interaction Anxiety Scale

For each item, please circle the number to indicate the degree to which you feel the statement is characteristic or true for you.

Characteristic	Not at all	Slightly	Moderately	Very	Extremely
1. I get nervous if I have to speak with someone in authority (teacher, boss).	0	1	2	3	4
2. I have difficulty making eye contact with others.	0	1	2	3	4
3. I become tense if I have to talk about myself or my feelings.	0	1	2	3	4
4. I find difficulty mixing comfortably with the people I work with.	0	1	2	3	4
5. I find it easy to make friends my own age.	0	1	2	3	4
6. I tense up if I meet an acquaintance on the street.	0	1	2	3	4
7. When mixing socially, I am uncomfortable.	0	1	2	3	4
8. I feel tense if I am alone with just one person.	0	1	2	3	4
9. I am at ease meeting people at parties, etc.	0	1	2	3	4
10. I have difficulty talking with other people.	0	1	2	3	4
11. I find it easy to think of things to talk about.	0	1	2	3	4
12. I worry about expressing myself in case I appear awkward.	0	1	2	3	4
13. I find it difficult to disagree with another's point of view.	0	1	2	3	4
14. I have difficulty talking to attractive people of the opposite sex.	0	1	2	3	4
15. I find myself worrying that I won't know what to say in social situations.	0	1	2	3	4
16. I am nervous mixing with people I don't know well.	0	1	2	3	4
17. I feel I'll say something embarrassing when talking.	0	1	2	3	4
18. When mixing in a group, I find myself worrying I will be ignored.	0	1	2	3	4
19. I am tense mixing in a group.	0	1	2	3	4
20. I am unsure whether to greet someone I know only slightly.	0	1	2	3	4

STUDY 2 MATERIALS

Appendix G: Consent Form

WILFRID LAURIER UNIVERSITY
INFORMED CONSENT STATEMENT/INFORMATION LETTER
Department of Psychology

Testing Photographic Stimuli (REB#4388)
Principal Investigator, Kayleigh Abbott
Supervisors, Dr. Nancy Kocovski and Dr. Sukhvinder Obhi

You are invited to participate in a research study. The purpose of this study is to test experimental photographic stimuli in pairs. The research is being conducted by Kayleigh Abbott, a doctoral student (email: abbo9240@mylaurier.ca), under the supervision of Dr. Nancy Kocovski (email: nkocovski@wlu.ca) at Wilfrid Laurier University and Dr. Sukhvinder S. Obhi (email: obhi@mcmaster.ca) at McMaster University.

INFORMATION

In this experiment we will be testing photographic stimuli previously used in a single person experiment. Some details of this study cannot be revealed at this time, but will be explained in a debrief at the end of the study.

The experiment will take place in a laboratory at the Wilfrid Laurier University (WLU) Waterloo campus. In total, approximately 80 participants from WLU will be recruited for the study. To participate in this study, you must have already completed the Wilfrid Laurier University's mass testing, which took place online.

At the start of the experiment, in lab, the photographic stimuli task will be described. Following the task description another participant will join and the task will be completed together, as a pair.

After the task is completed, you will be asked, individually, to provide some basic personal information (i.e. age and gender) in a questionnaire format and complete a few questionnaires online.

Once the questionnaires are completed, you will answer a few short questions and then will be debriefed. The entire study should take approximately 1 hour to complete.

RISKS

As a result of participating in this study you may experience feelings of discomfort and anxiety during the completion of the questionnaire and/or due to the experimental tasks, however these feelings are normal and should only be temporary. If these feelings persist or worsen, or you have any concerns, you may

contact the researcher or Wilfrid Laurier's Student Wellness Centre. The researcher, Kayleigh Abbott, can be reached by email abbo9240@mylaurier.ca. In addition, Wilfrid Laurier's Student Wellness Centre can be reached by phone (519) 884-0710 ext. 3146, by email (wellness@wlu.ca), and in person at the Student Services Building, second floor.

BENEFITS

Participation in this study will help us to advance the procedure surrounding the photographic stimuli task. The experimenter will elaborate on the benefits from the present study after it has been completed during the debrief.

COMPENSATION

For participating in this study you will be accredited with 1.0 PREP Credits. If you withdraw from the study prior to its completion or omit from answering certain questions, you will receive the same course credit as you would have for the completion of the entire study. Please note that an alternative way to earn credit is to complete a critical review of a research article (for more information about this option: http://www.wlu.ca/documents/50647/PREP.alt.assignment.pdf).

PARTICIPATION

Your participation in this study is voluntary; you may decline to participate without penalty. If you decide to participate, you may withdraw from the study at any time without penalty and without loss of benefits to which you are otherwise entitled. If you withdraw from the study before data collection is completed your data will be destroyed; however, your data cannot be withdrawn after data collection is complete because they are stored without identifiers. You have the right to omit any question(s)/procedure(s) you choose.

CONFIDENTIALITY

All data collected in this research will remain confidential, and your participation in this research will remain undisclosed. The principal investigator, Kayleigh Abbott, and the research advisors, Dr. Nancy Kocovski and Dr. S. S. Obhi, will be the only individuals with access to the data. All data will be stored in Dr. Kocovski's locked lab. Electronic data will be securely stored on password-protected computers and an external hard drive backup. Consent forms will be stored within a locked cabinet until they are scanned and securely stored as electronic files. Kayleigh Abbott will destroy the hardcopy documents by December 1, 2015 and Dr. Kocovski will destroy the electronic copies by November 30, 2022. Anonymous electronic data will be stored indefinitely. Confidentiality of data cannot be guaranteed while in transmission over the internet. The researchers acknowledge that the host of the online survey (Qualtrics) may automatically collect participant data without their knowledge (i.e., IP addresses). Although this information may be provided or made accessible, the researchers will not use or save this information without participants' consent. Any publications arising out of this research will not mention any personal details about participants. Only performance data will be shown and there will be absolutely no way, in which individual performance can be linked back

to a particular participant. The results of this study may be published or presented to colleagues, however, all data will be presented in aggregate form.

FEEDBACK AND PUBLICATION

Feedback regarding this research will be posted on the psychology bulletin. The results of this research will also go on to be published in psychology or cognitive neuroscience journals. They may be included in Kayleigh Abbott's doctoral dissertation. All personal information about participants will be kept fully confidential. It is expected that feedback on this study will be available on or before December 1, 2015.

CONTACT

If you have any questions at any time about the study or the procedures, you may contact the researcher, Kayleigh Abbott, by e-mail abbo9240@mylaurier.ca. Alternatively, you may contact the research advisors, Dr. Nancy Kocovski by email nkocovski@wlu.ca and/or Dr. Sukhvinder S. Obhi by email obhi@mcmaster.ca. This study has been reviewed and approved by the Wilfrid Laurier University Research Ethics Board (REB #4388). If you feel you have not been treated according to the description in this form, or your rights as a participant in research have been violated during the course of this project, you may contact Dr. Robert Basso, Chair, University Research Ethics Board, Wilfrid Laurier University, (519) 884-1970, extension 4994, or rbasso@wlu.ca.

CONSENT

I have read and understand the above information. I have received a copy of this form. I agree to participate in this study.

Participants Name (PRINT)_____ ID_____

Participant's signature_____ Date_____

Investigator's signature_____ Date_____

Appendix H: PREP Advertisement

Study Information

Study Name: Testing Photographic Stimuli

Study Type: In lab

Study Status: Open

Duration: 1 hours

Credits: 1.0 Prep Credit

Abstract: The purpose of this study is to test experimental photographic stimuli in pairs.

Description: Approximately 80 participants will be recruited to participate in this study. As a participant you will come into the lab and complete a photographic stimuli task with another participant and then individually participants will fill out some demographic information and a few questionnaires. After the experiment, participants will be asked a few additional questions and be debriefed.

Eligibility Requirements: Completion of the Wilfrid Laurier University's mass testing, which took place online.

Preparation: No preparation necessary.

Additional Study Information

REB Approval Code: 4388

Researcher Information

Researcher: Kayleigh Abbott [abbo9240@mylaurier.ca]

Principal Investigator(s): Dr. Nancy Kocovski [nkocovski@wlu.ca] and Dr. Sukhvinder S. Obhi [obhi@mcmaster.ca]

Appendix I: Debriefing Form

WILFRID LAURIER UNIVERSITY
DEBRIEFING FORM
Testing Photographic Stimuli
Kayleigh Abbott, Dr. Nancy Kocovski, and Dr. Sukhvinder S. Obhi, Department of Psychology

The information obtained in this form is very important to read. Some **deception** and **concealment** was used in this study, in which the purpose and all of the relevant details of the research were not disclosed. Deception and concealment were necessary in order to maintain the integrity of the study's purpose and any research findings. In order to better understand our use of deception and concealment, **please take some time to carefully read the following information**.

It is recommended that you save a copy of this form for your records.

Based on social anxiety scores, which you had completed during mass testing, you were eligible to participate in this research study. These scores were based on answers that you had provided in the **Social Interaction Anxiety Scale**. Those scoring 20 or lower on this scale (indicating lower levels of social anxiety) were grouped and those scoring 34 or greater on this scale (indicating elevated social anxiety, but not necessarily diagnostic levels of social anxiety) were grouped, and participants were evenly distributed between these two groups and selected as eligible to participate in this **experimental research study**.

Furthermore, there was deception regarding the true **purpose of the study;** the study is investigating the relationship between **social anxiety**, excessive fear of negative evaluation in social and performance situations (Abbott & Rapee, 2004), and **behavioural mimicry**, unconscious process of changing one's own behaviour and/or mannerisms in order to match that of the interacting partner (Chartrand & Bargh, 1999). The photographic stimuli task served as a mimicry paradigm, in which it was expected that you as the participant would pick up on a mimicry cue, face touching or foot shaking, and mimic this cue, by touching one's own face or shaking one's own foot. As well, you were induced to believe that you were interacting with another participant during this task, however that participant was a trained confederate trained to induce mimicry behaviour during the photographic stimuli task. Please see study overview below for further information. Furthermore, during the task you were video recorded in order to capture mimicry behaviour. These **video recordings** will be coded by two blind coders to measure face touching or foot shaking. This data will be password protected, stored in a locked laboratory, and only associated with your generic participant code. There is a separate consent form for the use of the video. If you do not consent to its use, it will be deleted before you leave the lab.

Most people consider social interactions enjoyable, however, individuals suffering from social anxiety fear them. Social anxiety has been conceptualized as a fear that one is being negatively evaluated in social and performance situations (Abbott & Rapee, 2004). As a result, people with high social anxiety (HSA, associated with our group that received SIAS scores of 34 or greater) often avoid such anxiety-provoking situations and are also regarded as being less pleasant to interact with, than individuals with low social anxiety (LSA; Heerey & Kring, 2007). The exact properties of the unskilled behaviour in HSA people are largely unknown; one reason that has been proposed may be that some of the shortcomings are reflected in automatic, subtle behaviour patterns that are not easily observed.

Behavioural mimicry is one such automatic social behaviour. It refers to changing one's behaviour unintentionally in order to match that of the other person in a social interaction (Chartrand & Bargh, 1999). Individuals automatically mimic many different aspects of interaction partners, including but not limited to their facial expressions, emotions, and mannerisms. The capacity to successfully process and understand the behaviour of others has been found to have positive consequences on social interaction, such as increased liking and affiliation, increased ability to empathize, and the capacity to make communication more smooth and enjoyable (Wang & Hamilton, 2012). This relationship is bi-directional: being mimicked creates a stronger affiliation with the interaction partner, and individuals are more inclined to mimic a person they like better.

The present research uses a photographic stimuli task and mimicking confederate to investigate deficits in behavioural mimicry that have been proposed to underlie deficits in communication and affiliation amongst those with HSA. The purpose of this research is to determine if individuals who vary in levels of social anxiety also vary in the extent to which they unconsciously mimic observed actions.

Demographic information was collected to check for individual differences, we expect that individual differences such as age and income do not vary with the level of social anxiety and automatic mimicry. Scores on the depression questionnaire were collected in order to check for comorbidity, such that results on the behavioural mimicry response were not driven by level of depression but level of social anxiety. Scores on the “Inclusion of Others in the Self” will be correlated with scores of mimicry based on the coded “face touching” score. We expect that scores that indicate more overlap between the self and others will be highly and positively correlated with high levels of behavioural mimicry, measured by more “face touching” mannerisms enacted by the participant. We also have included the “Big Five Inventory” to explore the relationship between personality variables and behavioural mimicry.

Participation in this study may have led to some feelings of discomfort, increased feelings of anxiety when completing the questionnaires and completing the “photographic stimuli task.” However, these feelings are normal and should only be

temporary. If they persist or worsen, or you have any concerns, you may contact the researchers or Wilfrid Laurier's Counseling Services (contact information provided below).

If you have any questions or comments regarding this study, or of your participation in this study, please contact the experimenters below. As well, a summary of the results will be posted on the psychology bulletin board by December 1, 2015. If you provided your email address on the consent form, the summary will be sent to you by December 1, 2015. You may also email the researcher if you would like a copy of this document.

Kayleigh Abbott Department of Psychology Wilfrid Laurier University Email: abbo9240@mylaurier.ca Phone: 519-884-0710 ext. 2587 Lab: N2059	**Dr. Nancy Kocovski** Department of Psychology Wilfrid Laurier University Email: nkocovski@wlu.ca Phone: 519-884-0710 ext. 3519 Office: N2025	**Dr. Sukhvinder S. Obhi** Department of Psychology McMaster University Email: obhi@mcmaster.ca Phone: 905-525-9140 ext. 23030 Office: PC306

This study was reviewed and approved by the Research Ethics Board (REB #4388). If you feel your rights as a participant in research have been violated during the course of this project, you may contact Dr. Robert Basso, Chair, University Research Ethics Board, Wilfrid Laurier University, (519) 884-1970, extension 4994 or rbasso@wlu.ca.

If you are interested in further readings about this topic, you can visit the Anxiety Disorders section of Chapter 14 of your Introduction to Psychology textbook.

Weiten and McCann (2013), Psychology: Themes and variations, 3rd Canadian Edition, Nelson Publishing.

If you would like to discuss or learn more about social anxiety, please refer to the following list of resources:

Student Wellness Centre
Wilfrid Laurier University
2nd Floor, Student Services Building
75 University Avenue West
Waterloo, Ontario, N2L 3C5
(519) 884 0710 x3146
http://legacy.wlu.ca/homepage.php?grp_id=14001
wellness@wlu.ca

Canadian Mental Health Association
Kitchener Branch

67 King Street East
Kitchener, ON N2G 2K4
Ph: (519) 744-7645
http://www.cmha.ca
http://www.cmhawrb.on.ca

Appendix J: Video Consent Form

WILFRID LAURIER UNIVERSITY
VIDEO FOOTAGE CONSENT STATEMENT/INFORMATION LETTER
Department of Psychology

Testing Photographic Stimuli (REB#4388)
Principal Investigator, Kayleigh Abbott
Supervisors, Dr. Nancy Kocovski and Dr. Sukhvinder Obhi

INFORMATION
During the "photographic stimuli task" you were video recorded. Video footage was obtained for the purpose of recording mimicry behaviour elicited by the confederate in the experiment, face touching or foot shaking. All video footage will be password protected and only be used for data analysis purposes.

RISKS
As a result of participating in this study you may experience feelings of discomfort and anxiety due to being video recorded, however these feelings are normal and should only be temporary. If these feelings persist or worsen, or you have any concerns, you may contact the researcher or Wilfrid Laurier's Student Wellness Centre. The researcher, Kayleigh Abbott, can be reached by email abbo9240@mylaurier.ca. In addition, Wilfrid Laurier's Student Wellness Centre can be reached by phone (519) 884-0710 ext. 3146, by email (wellness@wlu.ca), and in person at the Student Services Building, second floor.

BENEFITS
Participation in this study will help us investigate the relationship between social anxiety and behavioural mimicry, however, the experimenter will elaborate on the benefits from the present study during the debrief.

COMPENSATION
For participating in this study you will be accredited with 1.0 PREP Credits. If you choose to not consent to the use of your video footage, you will receive the same course credit as you would have for the completion of the study.

PARTICIPATION
Release of your video footage is voluntary; you may decline to release without penalty. If you choose to decline video footage release your video footage will be destroyed.

CONFIDENTIALITY
Video footage collected in this research will remain confidential, and your participation in this research will remain undisclosed. The principal investigator, Kayleigh Abbott, and the research advisors, Dr. Nancy Kocovski and Dr. S. S. Obhi, will be the only individuals with access to the footage. All video footage will be

securely stored on password-protected computers and an external hard drive backup. Video consent forms will be stored within a locked cabinet until they are scanned and securely stored as electronic files. Kayleigh Abbott will destroy the hardcopy documents by December 1, 2015 and Dr. Kocovski will destroy the electronic copies by November 30, 2022. Any publications arising out of this research will not mention any personal details about participants. Only performance data will be shown and there will be absolutely no way, in which individual performance can be linked back to a particular participant. The results of this study may be published or presented to colleagues, however, all data will be presented in aggregate form.

FEEDBACK AND PUBLICATION

Feedback regarding this research will be posted on the psychology bulletin. The results of this research will also go on to be published in psychology or cognitive neuroscience journals. They may be included in Kayleigh Abbott's doctoral dissertation. All personal information about participants will be kept fully confidential. It is expected that feedback on this study will be available on or before December 1, 2015.

CONTACT

If you have any questions at any time about the study or the procedures, you may contact the researcher, Kayleigh Abbott, by e-mail abbo9240@mylaurier.ca. Alternatively, you may contact the research advisors, Dr. Nancy Kocovski by email nkocovski@wlu.ca and/or Dr. Sukhvinder S. Obhi by email obhi@mcmaster.ca. This study has been reviewed and approved by the Wilfrid Laurier University Research Ethics Board (REB #4388). If you feel you have not been treated according to the description in this form, or your rights as a participant in research have been violated during the course of this project, you may contact Dr. Robert Basso, Chair, University Research Ethics Board, Wilfrid Laurier University, (519) 884-1970, extension 4994, or rbasso@wlu.ca.

CONSENT

I have read and understand the above information. I have received a copy of this form. I agree to allow the video footage to be saved under the consents terms.

Participant's signature_____ Date_____

Investigator's signature_____ Date_____

Appendix K: Social Phobia Inventory

Please indicate how much the following problems have bothered you during the past week. Click only one box for each problem, and be sure to answer all items.

Statement	**Not at all**	**A little bit**	**Somewhat**	**Very much**	**Extremely**
1. I am afraid of people in authority.	0	1	2	3	4
2. I am bothered by blushing in front of people.	0	1	2	3	4
3. Parties and social events scare me.	0	1	2	3	4
4. I avoid talking to people I don't know.	0	1	2	3	4
5. Being criticized scares me a lot.	0	1	2	3	4
6. Fear of embarrassment causes me to avoid doing things or speaking to people.	0	1	2	3	4
7. Sweating in front of people causes me distress.	0	1	2	3	4
8. I avoid going to parties.	0	1	2	3	4
9. I avoid activities in which I am the centre of attention.	0	1	2	3	4
10. Talking to strangers scares me.	0	1	2	3	4
11. I avoid having to give speeches.	0	1	2	3	4
12. I would do anything to avoid being criticized.	0	1	2	3	4
13. Heart palpitations bother me when I am around people.	0	1	2	3	4
14. I am afraid of doing things when people might be watching.	0	1	2	3	4
15. Being embarrassed or looking stupid are among my worst fears.	0	1	2	3	4
16. I avoid speaking to anyone in authority.	0	1	2	3	4
17. Trembling or shaking in front of others is distressing to me.	0	1	2	3	4

Appendix L: Focus of Attention Questionnaire

1. During the photo task I was focusing on what I would say or do next.

1	2	3	4	5
(Not at all)				(Totally)

2. During the photo task I was focusing on the impression I was making on the other person.

1	2	3	4	5
(Not at all)				(Totally)

3. During the photo task I was focusing on my level of anxiety.

1	2	3	4	5
(Not at all)				(Totally)

4. During the photo task I was focusing on my internal bodily reactions (for example, heart rate).

1	2	3	4	5
(Not at all)				(Totally)

5. During the photo task I was focusing on past social failures.

1	2	3	4	5
(Not at all)				(Totally)

Appendix M: Beck Depression Inventory II

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 week, 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 an 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. .
3a 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.

Appendix N: Study 2 Lab Protocol

- Turn on hidden camera
- Informed Consent Participant (Confederate outside)
- Baseline (Bring participant into lab for one minute)
- Informed Consent Confederate
- Provide Picture Description Task Instructions
- Describe photo – back and forth
- Following the picture description session, the experimenter will say that the debriefing will take place individually, and that the participant will be taken to the other room where they will be debriefed.
- Take participant into the other room and leave confederate in the video camera room (turn off camera)
- Participants will complete a set of questionnaires
- Funneled debrief (i.e., from general to increasingly specific questions about awareness of hypotheses) to determine if he or she (1) was suspicious that the other participants was in fact a confederate, (2) noticed that the confederate displayed certain mannerisms throughout the session, or (3) thought that the purpose of the experiment was anything other than what the cover story indicated.
- At the end of the experiment participants will be informed that they were covertly video-taped throughout the session, the experimenter will also inform them that video footage will only be used for data analysis purposes. Following consent for the use of the video footage, participants will be debriefed on the hypotheses and purpose of the study.

Appendix O: Picture Description Task Instructions

"We are in the initial stage of creating working sets of photographs to serve as the stimuli for a future study. In order to figure out if they will work, we need you two to take turns describing them for 1-2 minutes. We've already run this with single people, but now we are interested in how easily people can describe the photographs to one another. You can discuss the visual aspects of the photo, or free associate and say whatever comes to mind (including what the photo brings to mind, what the individuals in the photos are thinking and feeling), or both. Understand? Cool, just let the other participant know when you feel you have adequately described the photo, and try your best to take approximately 1-2 minutes to describe each of them."

Appendix P: Example of Confederate Picture Description with Cued Target Mimicry Behaviours

There's three dogs around three people [*chin touch*]. There's a young boy and two elderly gentlemen, and it looks like they're almost doing some kind of archeological dig… ummm [*forehead touch*]…. but on an amateur level. Because it doesn't really make sense to have dogs around something like that. It's quite bright and sunny, and the three people are working under an umbrella. Well, the two elderly folks are working under the umbrella, and the kid looks like he's just kind of watching[*cheek touch*]. The whole scene feels fairly positive though, like the elderly folks are showing the kid how things are done. It feels almost old worldish, [*hair touch*] like in Italy or something.

STUDY 3 MATERIALS

Appendix Q: Consent Form

WILFRID LAURIER UNIVERSITY
INFORMED CONSENT STATEMENT/INFORMATION LETTER
Department of Psychology

Testing Photographic Stimuli (REB#4388)
Principal Investigator, Kayleigh Abbott
Supervisors, Dr. Nancy Kocovski and Dr. Sukhvinder Obhi

You are invited to participate in a research study. The purpose of this study is to test experimental photographic stimuli in pairs. The research is being conducted by Kayleigh Abbott, a doctoral student (email: abbo9240@mylaurier.ca), under the supervision of Dr. Nancy Kocovski (email: nkocovski@wlu.ca) at Wilfrid Laurier University and Dr. Sukhvinder S. Obhi (email: obhi@mcmaster.ca) at McMaster University.

INFORMATION

In this experiment we will be testing photographic stimuli previously used in a single person experiment. Some details of this study cannot be revealed at this time, but will be explained in a debrief at the end of the study.

The experiment will take place in a laboratory at the Wilfrid Laurier University (WLU) Waterloo campus. In total, approximately 80 participants from WLU will be recruited for the study. To participate in this study, you must have already completed the Wilfrid Laurier University's mass testing, which took place online.

At the start of the experiment, in lab, the photographic stimuli task will be described. Following the task description another participant will join and the task will be completed together, as a pair.

After the task is completed, you will be asked, individually, to provide some basic personal information (i.e. age and gender) in a questionnaire format and complete a few questionnaires in lab.

Once the questionnaires are completed, you will answer a few short questions and then will be debriefed. The entire study should take approximately 1 hour to complete.

RISKS

As a result of participating in this study you may experience feelings of discomfort and anxiety during the completion of the questionnaire and/or due to the experimental tasks, however these feelings are normal and should only be temporary. If these feelings persist or worsen, or you have any concerns, you may

contact the researcher or Wilfrid Laurier's Student Wellness Centre. The researcher, Kayleigh Abbott, can be reached by email abbo9240@mylaurier.ca. In addition, Wilfrid Laurier's Student Wellness Centre can be reached by phone (519) 884-0710 ext. 3146, by email (wellness@wlu.ca), and in person at the Student Services Building, second floor.

BENEFITS

Participation in this study will help us to advance the procedure surrounding the photographic stimuli task. The experimenter will elaborate on the benefits from the present study after it has been completed during the debrief.

COMPENSATION

For participating in this study you will be accredited with 1.0 PREP Credits. If you withdraw from the study prior to its completion or omit from answering certain questions, you will receive the same course credit as you would have for the completion of the entire study. Please note that an alternative way to earn credit is to complete a critical review of a research article (for more information about this option: http://www.wlu.ca/documents/50647/PREP.alt.assignment.pdf).

PARTICIPATION

Your participation in this study is voluntary; you may decline to participate without penalty. If you decide to participate, you may withdraw from the study at any time without penalty and without loss of benefits to which you are otherwise entitled. If you withdraw from the study before data collection is completed your data will be destroyed; however, your data cannot be withdrawn after data collection is complete because they are stored without identifiers. You have the right to omit any question(s)/procedure(s) you choose.

CONFIDENTIALITY

All data collected in this research will remain confidential, and your participation in this research will remain undisclosed. The principal investigator, Kayleigh Abbott, and the research advisors, Dr. Nancy Kocovski and Dr. S. S. Obhi, will be the only individuals with access to the data. All data will be stored in Dr. Kocovski's locked lab. Electronic data will be securely stored on password-protected computers and an external hard drive backup. Consent forms will be stored within a locked cabinet until they are scanned and securely stored as electronic files. Kayleigh Abbott will destroy the hardcopy documents by April 1, 2017 and Dr. Kocovski will destroy the electronic copies by April 1, 2023. Anonymous electronic data will be stored indefinitely. Any publications arising out of this research will not mention any personal details about participants. Only performance data will be shown and there will be absolutely no way, in which individual performance can be linked back to a particular participant. The results of this study may be published or presented to colleagues, however, all data will be presented in aggregate form.

FEEDBACK AND PUBLICATION

Feedback regarding this research will be posted on the psychology bulletin. The results of this research will also go on to be published in psychology or cognitive neuroscience journals. They may be included in Kayleigh Abbott's doctoral dissertation. All personal information about participants will be kept fully confidential. It is expected that feedback on this study will be available on or before April 1, 2017.

CONTACT

If you have any questions at any time about the study or the procedures, you may contact the researcher, Kayleigh Abbott, by e-mail abbo9240@mylaurier.ca. Alternatively, you may contact the research advisors, Dr. Nancy Kocovski by email nkocovski@wlu.ca and/or Dr. Sukhvinder S. Obhi by email obhi@mcmaster.ca. This study has been reviewed and approved by the Wilfrid Laurier University Research Ethics Board (REB #4388). If you feel you have not been treated according to the description in this form, or your rights as a participant in research have been violated during the course of this project, you may contact Dr. Robert Basso, Chair, University Research Ethics Board, Wilfrid Laurier University, (519) 884-1970, extension 4994, or rbasso@wlu.ca.

CONSENT

I have read and understand the above information. I have received a copy of this form. I agree to participate in this study.

Participant's name _____ Participant's ID_____

Participant's signature_____ Date_____

Investigator's signature_____ Date_____

Appendix R: Debriefing Form

WILFRID LAURIER UNIVERSITY
DEBRIEFING FORM
Testing Photographic Stimuli

Kayleigh Abbott, Dr. Nancy Kocovski, and Dr. Sukhvinder S. Obhi, Department of Psychology

The information obtained in this form is very important to read. Some **deception** and **concealment** was used in this study, in which the purpose and all of the relevant details of the research were not disclosed. Deception and concealment were necessary in order to maintain the integrity of the study's purpose and any research findings. In order to better understand our use of deception and concealment, **please take some time to carefully read the following information**.

It is recommended that you save a copy of this form for your records.

Based on social anxiety scores, which you had completed during mass testing, you were eligible to participate in this research study. These scores were based on answers that you had provided in the **Social Interaction Anxiety Scale (SIAS)** and **Social Phobia Inventory (SPIN)**. Those scoring 34 or greater on the SIAS and 30 or greater on the SPIN (indicating elevated social anxiety, but not necessarily diagnostic levels of social anxiety) were selected as eligible to participate in this **experimental research study**.

Furthermore, there was deception regarding the true **purpose of the study;** the study is investigating the role of **self-focused attention**, process of directing attention towards oneself, such as physiological arousal, emotions, or appearance, during a social situation (Clark & Wells, 1995), as a mediator in the relationship between **social anxiety**, excessive fear of negative evaluation in social and performance situations (Abbott & Rapee, 2004), and **behavioural mimicry**, unconscious process of changing one's own behaviour and/or mannerisms in order to match that of the interacting partner (Chartrand & Bargh, 1999). Throughout this study you were induced to believe that you were interacting with another participant, however that participant was a trained confederate trained to induce mimicry behaviour during the photographic stimuli task (see later descriptions). During the task self-focused attention was manipulated, participants were randomly assigned to either the increased self-focused attention condition (participants were asked to focus on their thoughts, feelings, and emotions, etc) or the decreased self-focused attention condition (participants were asked to focus on the other participants words and facial expression). Further, the photographic stimuli task also served as a mimicry paradigm, in which it was expected that you as the participant would pick up on a mimicry cue, face touching, and mimic this cue, by touching one's own face. Please see study overview below for further information. Furthermore, during the task you were video recorded in order to capture mimicry

behaviour. These **video recordings** will be coded by two blind coders to measure face touching. This data will be password protected, stored in a locked laboratory, and only associated with your generic participant code. There is a separate consent form for the use of the video. If you do not consent to its use, it will be deleted before you leave the lab.

Most people consider social interactions enjoyable, however, individuals suffering from social anxiety fear them. Social anxiety has been conceptualized as a fear that one is being negatively evaluated in social and performance situations (Abbott & Rapee, 2004). As a result, people with high social anxiety (HSA, associated with our group that received SIAS scores of 34 or greater) often avoid such anxiety-provoking situations and are also regarded as being less pleasant to interact with, than individuals with low social anxiety (LSA; Heerey & Kring, 2007). The exact properties of the unskilled behaviour in HSA people are largely unknown; one reason that has been proposed may be that some of the shortcomings are reflected in automatic, subtle behaviour patterns that are not easily observed.

Behavioural mimicry is one such automatic social behaviour. It refers to changing one's behaviour unintentionally in order to match that of the other person in a social interaction (Chartrand & Bargh, 1999). Individuals automatically mimic many different aspects of interaction partners, including but not limited to their facial expressions, emotions, and mannerisms. The capacity to successfully process and understand the behaviour of others has been found to have positive consequences on social interaction, such as increased liking and affiliation, increased ability to empathize, and the capacity to make communication more smooth and enjoyable (Wang & Hamilton, 2012). This relationship is bi-directional: being mimicked creates a stronger affiliation with the interaction partner, and individuals are more inclined to mimic a person they like better.

The present research uses a photographic stimuli task and mimicking confederate to investigate deficits in behavioural mimicry that have been proposed to underlie deficits in communication and affiliation amongst those with HSA. Further, this study aimed to delineate the mediating role of self-focused attention between the proposed relationship between elevated social anxiety and decreased behavioural mimicry. Therefore, the purpose of this research is to determine if by manipulating self-focused attention within socially anxious individuals do these individuals vary in the extent to which they unconsciously mimic observed actions.

Demographic information was collected to check for individual differences, we expect that individual differences such as age and income do not vary with the level of social anxiety and automatic mimicry. Scores on the depression questionnaire were collected in order to check for comorbidity, such that results on the behavioural mimicry response were not driven by level of depression but level of social anxiety. Scores on the “Inclusion of Others in the Self” will be correlated with scores of mimicry based on the coded “face touching” score. We expect that scores that indicate more overlap between the self and others will be highly and positively

correlated with high levels of behavioural mimicry, measured by more "face touching" mannerisms enacted by the participant. We also have included the "Big Five Inventory" to explore the relationship between personality variables and behavioural mimicry. Scores on the Focus of Attention Questionnaire served as a manipulation check to determine whether self-focused attention was successfully manipulated in the high and low self-focused attention conditions. Scores on the State Trait Anxiety Inventory and Subjective Units of Distress Scale are additional measures of social anxiety, included in order to determine if anxiety levels were also elevated on the day of the study, compared to mass testing social anxiety scores.

Participation in this study may have led to some feelings of discomfort, increased feelings of anxiety when completing the questionnaires and completing the "photographic stimuli task." However, these feelings are normal and should only be temporary. If they persist or worsen, or you have any concerns, you may contact the researchers or Wilfrid Laurier's Counseling Services (contact information provided below).

If you have any questions or comments regarding this study, or of your participation in this study, please contact the experimenters below. As well, a summary of the results will be posted on the psychology bulletin board by April 1, 2017. If you provided your email address on the consent form, the summary will be sent to you by April 1, 2017. You may also email the researcher if you would like a copy of this document.

Kayleigh Abbott	**Dr. Nancy Kocovski**	**Dr. Sukhvinder S. Obhi**
Department of Psychology Wilfrid Laurier University Email: abbo9240@mylaurier.ca Phone: 519-884-0710 ext. 2587 Lab: N2059	Department of Psychology Wilfrid Laurier University Email: nkocovski@wlu.ca Phone: 519-884-0710 ext. 3519 Office: N2025	Department of Psychology McMaster University Email: obhi@mcmaster.ca Phone: 905-525-9140 ext. 23030 Office: PC306

This study was reviewed and approved by the Research Ethics Board (REB #4388). If you feel your rights as a participant in research have been violated during the course of this project, you may contact Dr. Robert Basso, Chair, University Research Ethics Board, Wilfrid Laurier University, (519) 884-1970, extension 4994 or rbasso@wlu.ca.

If you are interested in further readings about this topic, you can visit the Anxiety Disorders section of Chapter 14 of your Introduction to Psychology textbook.

Weiten and McCann (2013), Psychology: Themes and variations, 3rd Canadian Edition, Nelson Publishing.

Student Wellness Centre
Wilfrid Laurier University
2nd Floor, Student Services Building
75 University Avenue West
Waterloo, Ontario, N2L 3C5
(519) 884 0710 x3146
http://legacy.wlu.ca/homepage.php?grp_id=14001
wellness@wlu.ca

Canadian Mental Health Association
Kitchener Branch
67 King Street East
Kitchener, ON N2G 2K4
Ph: (519) 744-7645
http://www.cmha.ca
http://www.cmhawrb.on.ca

Appendix S: Video Consent Form

WILFRID LAURIER UNIVERSITY
VIDEO FOOTAGE CONSENT STATEMENT/INFORMATION LETTER
Department of Psychology

Testing Photographic Stimuli (REB#4388)
Principal Investigator, Kayleigh Abbott
Supervisors, Dr. Nancy Kocovski and Dr. Sukhvinder Obhi

INFORMATION
During the "photographic stimuli task" you were video recorded. Video footage was obtained for the purpose of recording mimicry behaviour elicited by the confederate in the experiment, face touching or foot shaking. All video footage will be password protected and only be used for data analysis purposes.

RISKS
As a result of participating in this study you may experience feelings of discomfort and anxiety due to being video recorded, however these feelings are normal and should only be temporary. If these feelings persist or worsen, or you have any concerns, you may contact the researcher or Wilfrid Laurier's Student Wellness Centre. The researcher, Kayleigh Abbott, can be reached by email abbo9240@mylaurier.ca. In addition, Wilfrid Laurier's Student Wellness Centre can be reached by phone (519) 884-0710 ext. 3146, by email (wellness@wlu.ca), and in person at the Student Services Building, second floor.

BENEFITS
Participation in this study will help us investigate the relationship between social anxiety and behavioural mimicry, however, the experimenter will elaborate on the benefits from the present study during the debrief.

COMPENSATION
For participating in this study you will be accredited with 1.0 PREP Credits. If you choose to not consent to the use of your video footage, you will receive the same course credit as you would have for the completion of the study.

PARTICIPATION
Release of your video footage is voluntary; you may decline to release without penalty. If you choose to decline video footage release your video footage will be destroyed.

CONFIDENTIALITY
Video footage collected in this research will remain confidential, and your participation in this research will remain undisclosed. The principal investigator, Kayleigh Abbott, and the research advisors, Dr. Nancy Kocovski and Dr. S. S. Obhi, will be the only individuals with access to the footage. All video footage will be

securely stored on password-protected computers and an external hard drive backup. Video consent forms will be stored within a locked cabinet until they are scanned and securely stored as electronic files. Kayleigh Abbott will destroy the hardcopy documents by April 1, 2017 and Dr. Kocovski will destroy the electronic copies by April 1, 2023. Any publications arising out of this research will not mention any personal details about participants. Only performance data will be shown and there will be absolutely no way, in which individual performance can be linked back to a particular participant. The results of this study may be published or presented to colleagues, however, all data will be presented in aggregate form.

FEEDBACK AND PUBLICATION

Feedback regarding this research will be posted on the psychology bulletin. The results of this research will also go on to be published in psychology or cognitive neuroscience journals. They may be included in Kayleigh Abbott's doctoral dissertation. All personal information about participants will be kept fully confidential. It is expected that feedback on this study will be available on or before April 1, 2017.

CONTACT

If you have any questions at any time about the study or the procedures, you may contact the researcher, Kayleigh Abbott, by e-mail abbo9240@mylaurier.ca. Alternatively, you may contact the research advisors, Dr. Nancy Kocovski by email nkocovski@wlu.ca and/or Dr. Sukhvinder S. Obhi by email obhi@mcmaster.ca. This study has been reviewed and approved by the Wilfrid Laurier University Research Ethics Board (REB #4388). If you feel you have not been treated according to the description in this form, or your rights as a participant in research have been violated during the course of this project, you may contact Dr. Robert Basso, Chair, University Research Ethics Board, Wilfrid Laurier University, (519) 884-1970, extension 4994, or rbasso@wlu.ca.

CONSENT

I have read and understand the above information. I have received a copy of this form. I agree to allow the video footage to be saved under the consents terms.

Participant's signature_____ Date_____

Investigator's signature_____ Date_____

Appendix T: Study 3 Lab Protocol

- Turn on hidden camera
- Informed Consent Participant (Confederate outside)
- Assign Participant to SFA / OFA Condition
- Baseline (Bring participant into lab for one minute)
- Informed Consent Confederate
- Provide Picture Description Task Instructions
- Describe photo – back and forth
- Following the picture description session, the experimenter will say that the debriefing will take place individually, and that the participant will be taken to the other room where they will be debriefed.
- Take participant into the other room and leave confederate in the video camera room (turn off camera)
- Participants will complete a set of questionnaires
- Funneled debrief (i.e., from general to increasingly specific questions about awareness of hypotheses) to determine if he or she (1) was suspicious that the other participants was in fact a confederate, (2) noticed that the confederate displayed certain mannerisms throughout the session, or (3) thought that the purpose of the experiment was anything other than what the cover story indicated.
- At the end of the experiment participants will be informed that they were covertly video-taped throughout the session, the experimenter will also inform them that video footage will only be used for data analysis purposes. Following consent for the use of the video footage, participants will be debriefed on the hypotheses and purpose of the study.

Appendix U: Condition Manipulation Instructions

Self-Focused Attention Condition:

"During this conversation you are going to pay attention to your feelings, thoughts, actions, and body sensations."

"Write down a few words on this cue card to help remind yourself of your instructions during the conversation, you will get to keep this card throughout the task but do not share this information with the other participant."

Other-Focused Attention Condition:

"During this conversation you are going to pay attention to the other participant's words and facial expressions."

"Write down a few words on this cue card to help remind yourself of your instructions during the conversation, you will get to keep this card throughout the task but do not share this information with the other participant."