



# The Fear of Losing Control in Social Anxiety: An Experimental Approach

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## Abstract

**Background** Social anxiety disorder (SAD) is often conceptualized as arising from maladaptive cognitions. One cognitive domain that has received relatively little attention, despite endorsement from people struggling with social anxiety, is the belief that they may lose control over their speech/behaviour and/or their physical symptoms of anxiety. The present study aimed to evaluate the causal role of these beliefs on social anxiety symptoms in an analogue sample.

**Methods** Beliefs were manipulated using false feedback in undergraduate psychology students ( $N = 130$ ) to induce either high or low levels of beliefs about losing control. Participants then engaged in a social interaction task with a confederate.

**Results** The high beliefs about losing control (HLC) condition reported greater anxiety just before meeting the confederate than the low loss of control (LLC) condition. Further, HLC participants reported worse social performance and greater perceived failures of control than did those in the LLC condition during their interaction with a confederate.

**Conclusion** Results suggest beliefs about losing control are producing cognitive and behavioural changes which may in part explain differences in performance in social interactions. Beliefs about losing control appear to be relevant to the cognitive model of social anxiety. Future studies should consider whether these beliefs are malleable among individuals with SAD.

**Keywords** Losing control · Social anxiety · Cognitive distortions · Beliefs

## Introduction

Social anxiety disorder (SAD) is characterized by marked fear or anxiety across social situations and/or in contexts where being scrutinized is possible (American Psychiatric Association 2013). The prevalence of SAD is high (13%; Kessler et al. 2012) and has been associated with negative outcomes (Herres et al. 2019; Koyuncu et al. 2014; Kushner et al. 1990). The high prevalence combined with an often negative impact on both quality of life and daily functioning has underscored the importance of research into this historically understudied problem (Kushner et al. 1990; Alonso et al. 2004; Stein and Kean 2000). This has led to substantial increases in research examining the causes, maintaining factors and treatments for the disorder.

Broadly, social anxiety is thought to arise from a combination of maladaptive cognitions such as an attentional

bias towards internal sensations, excessive concern over the consequences of negative evaluation and negative beliefs regarding social competence (Clark and Wells 1995; Rapee and Heimberg 1997). These cognitive aspects of social anxiety are thought to be comprised of several domains including negative self-perception, high social cost, low perceived emotional control and perceived poor social skills (Hofmann 2007). Clark and Wells' (1995) model of SAD suggests that heightened self-focused attention leads individuals to form a distorted self-image which they erroneously assume represents how they are seen by others. This is exacerbated by *ex-consequentia* reasoning (e.g., feelings of losing control are perceived to mean that one has visibly lost control) and a false belief that the consequences of (perceived) poor social skills will be catastrophic. There is evidence to suggest that these cognitive biases do reflect some real deficits in social competence compared to non-anxious controls (Alden and Wallace 1995; Johns and Peters 2012; Weilage and Hope 1999); however, when individuals with social anxiety are placed in a context where they must perform socially, it has been found that they underestimate their

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social competence and overestimate the degree and nature of perceived consequences resulting from the negative evaluations of others (Moscovitch and Hofmann 2007; Stopa and Clark 1993). Taken together, these theories emphasize the role of beliefs about personal deficiencies, especially as evaluated by others, as key to social anxiety.

It has been proposed that negative beliefs about control (especially over emotions) represent a maintaining factor of SAD (Hofmann 2007). Negative beliefs about control are a common source of distress across anxiety and related disorders. Beliefs that losing control is dangerous or catastrophic have been highlighted in cognitive models of both panic (Clark 1986; Cloitre et al. 1992; Ottaviani and Beck 1987) and obsessive–compulsive disorders (Clark and Purdon 1993; Gagné and Radomsky 2017; Reuven-Magril et al. 2008; Sanavio 1988). Early work examining the domain of control in SAD explored the locus of control attributed to feared social situations. Cloitre et al. (1992) administered Levenson's (1973) locus of control scale to individuals with SAD and found, relative to non-anxious participants, people with SAD reported less internal control and ascribed greater control to powerful others, suggesting a perceived lack of control over their experiences. This implies that a disparity in beliefs related to control may be relevant in maintaining social anxiety. Leung and Heimberg (1996) found that lower ratings of internal control were associated with greater social interaction anxiety, and that greater attributions of control to powerful others were associated with greater fear of negative evaluation at post-treatment. Further, in non-clinical samples, greater perceived uncontrollability of social situations has been found to predict greater anxiety, especially in conjunction with a possibility of negative social consequences (Rapee 1997).

Correlational research suggests that individuals high in social anxiety believe they have little control in social situations, especially over their emotions, and that greater endorsement of these beliefs predicts greater trait anxiety above and beyond severity of social anxiety (De Castella et al. 2014). Spokas et al. (2009) found that participants high in social anxiety reported greater attempts to suppress their emotions, greater fear of emotional expression and a stronger belief that emotions ought to be kept under control relative to participants low in social anxiety. Hofmann (2005) found that the perceived controllability of reactive anxiety and emotions partially mediated the relationship between the perceived social cost of embarrassing social scenarios and social anxiety. Though these studies are non-experimental, together they suggest individuals with social anxiety may be highly preoccupied with maintaining control, especially when in potentially compromising social situations. It is not clear from these studies whether the source of participants' anxiety was the perceived loss(es) of control or due to a fear of their *observable* behavioural and physiological

responses (e.g., foolish behaviour/embarrassing physiological responses).

A perceived inability to control one's emotions, behaviour, reactions and perceived negative consequences of failing to maintain control, which together comprise negative beliefs about losing control, are commonly described phenomena among individuals who present for treatment of social anxiety. When asked about what they fear will happen in these social situations, individuals with social anxiety report commonly experienced, specific and detailed intrusive images of themselves behaving foolishly (Hackmann et al. 1998; Hofmann et al. 1995). These images tended to focus on accidentally saying or doing something perceived as deeply embarrassing (e.g., dropping objects, blushing uncontrollably), resulting in being perceived as foolish or incompetent by others. Notably, in these reported images, it was not the controllability of the symptoms themselves, but rather having those symptoms be *observed by others* which was the source of fear. Perhaps then, it is the concern that one might fail to maintain control which underlies social anxiety, especially when being observed or evaluated by others, even in the absence of perceived losses of control.

Gagné and Radomsky (2017) found that manipulating beliefs about losing control over one's thoughts led to OCD-like symptoms such as repeated checking in non-clinical participants. Participants were given bogus EEG feedback which they were told indicated poor or good ability to maintain control over their thoughts. They were then asked to complete a task which involved controlling images appearing on a computer screen. Individuals who were told they were at high risk of losing control engaged in significantly more checking behaviour. Such beliefs about control are therefore malleable and can have marked effects on behaviour in non-clinical populations.

To our knowledge, no study to date has experimentally manipulated beliefs about losing control in the context of social anxiety, making it difficult to draw conclusions about the direction of the relationship between these beliefs and the manifestation of symptoms. By experimentally manipulating beliefs about losing control, we aimed to understand whether beliefs about losing control are sufficient to induce cognitive and behavioural symptoms associated with social anxiety. Namely, would inducing negative beliefs about losing control induce anxiety, increase subjective loss of control, and reduce social competence during a 'getting to know you' task?

## Hypotheses

Based on previous findings, several predictions were made for the current study:

**Manipulation Check.** Participants manipulated to believe they are at high risk of losing control (HLC condition) would

report a greater belief that they would lose control over their actions than would participants manipulated to believe they are at low risk of losing control (LLC condition).

1. (a) Participants in the HLC condition would report greater anticipatory anxiety leading up to a ‘getting to know you’ task than those in the LLC condition.  
(b) Participants in the HLC condition would report greater anxiety in the ‘getting to know you’ task than those in the LLC condition.
2. (a) Participants in the HLC condition would report worse performance after the ‘getting to know you’ task relative to those in the LLC condition.  
(b) Participants in the HLC condition would provide self-report ratings of performance which would be significantly lower than the ratings of their performance provided by a confederate.
3. Participants in the HLC condition would report greater concerns about losing control over their behaviour, thoughts, emotions and physiology in the ‘getting to know you’ task than those in the LLC condition.
4. Participants in the HLC condition would report greater losses of control over their behaviour, emotions and physiological reactions than those in the LLC condition.

## Method

### Participants

Participants ( $N = 147$ ) were undergraduate students from Concordia University. The only inclusion criteria were the ability to read, write and speak English and that they did not know the confederate prior to their participation in the study. Eight participants were initially excluded as they had previously interacted with the confederate. An additional participant was excluded for providing a systematic response set, selecting exclusively low scores on all scales, including reverse-coded items. Finally, a further eight participants were excluded as they rated the feedback they received following the self-control task as completely unbelievable (credibility rating of zero; see below). The demographic characteristics of the sample are described in Table 1. Though the final sample ( $N = 130$ ) consisted predominantly of women (90.8%), there were no significant differences in gender between conditions [ $\chi^2(1, 130) = 0.24, p = 0.62$ ]. The mean age of participants was 22.3 ( $SD = 3.8$ ) years, with no significant differences in age between conditions [ $t(128) = 0.62, p = 0.54$ ].

**Table 1** Demographics by condition

Demographics	HLC	LLC
Age [ $M$ ( $SD$ )]	22.1 (3.3)	22.6 (4.3)
Gender (% women)	89.6	92.1
Ethnicity (%)		
Caucasian	61.2	65.1
Asian	18.0	14.3
Black	3.0	1.6
Other	17.9	19.0
Marital status (%)		
Single	92.5	85.7
Married/common law	4.5	14.3
Divorced/Separated	3.0	0.0
Education (%)		
Secondary school	16.4	17.5
College degree	47.8	50.8
Undergraduate degree	35.8	30.2
Graduate degree	0.0	1.6

HLC high beliefs about losing control, LLC low beliefs about losing control

## Measures

### Demographics

Participants were asked to report basic demographic information (e.g., age, sex, gender,<sup>1</sup> ethnicity, education level).

### Manipulation Check

Participants rated the degree to which they were concerned they might lose control over their verbal behaviour, emotions and thoughts. This single-item rating was given on a 0 to 100 scale (0 = not at all concerned; 100 = extremely concerned). To mask the purpose of this question, it was embedded in an ‘experiment feedback’ form which included a number of questions about the experiment and experimenter.

### Credibility Check

In order to assess the believability of the deception in this study, participants rated the degree to which they believed the feedback they received was accurate. Ratings were given on a scale from 0 to 100 (0 = I did not at all believe; 100 = I completely believed).

<sup>1</sup> Though both sex and gender were included in demographics, all participants reported their gender as matching their sex assigned at birth.

### Subjective Units of Distress Scale (SUDS; Wolpe 1969, 1988)

Participants were asked to rate their current anxiety from 0 (“I do not feel anxious at all”) to 100 (“I feel extremely anxious”) at baseline, just prior to and immediately following the ‘getting to know you’ task. To mask the true purpose of these SUDS ratings, participants were also asked to rate positively- and negatively-valenced mood items (e.g., happy, sad).

### Ratings About Performance During Social Interaction

The participant and confederate rated the participant’s performance during the ‘getting to know you’ task. Ratings were provided on a 23-item scale adapted by Stopa and Clark (1993). This measure was adapted to assess concordance between self-report and observed performance in social interactions. The measure consists of 16 positive (e.g., confident, relaxed) and 7 negative (e.g., nervous, uncomfortable) attributes, rated from 0 to 8 (“not at all characteristic” to “extremely characteristic”).

### Ratings of Concern Over Losing Control

Participants were asked to rate the degree to which they were concerned about losing control of their behaviour, thoughts, emotions and physical reactions (e.g., sweating, flushing) from 0 (“Not at all concerned”) to 100 (“Very concerned”) following the ‘getting to know you’ task.

### Ratings of Control

Following the ‘getting to know you’ task, participants were asked to report the degree to which they felt they lost control over their behaviour, emotions and physical reactions during the ‘getting to know you’ task on a visual analogue scale with anchors at 0 and 100 (0=I did not lose control at all; 100=I completely lost control).

### Social Phobia Inventory (SPIN; Connor et al. 2000)

The SPIN is a 17-item self-report scale assessing social anxiety. Items are rated according to how well they describe the individual from 0 (“Not at all”) to 4 (“Extremely”). Internal consistency in the present study was found to be excellent ( $\alpha=0.90$ ).

### Beliefs About Losing Control Inventory (BALCI; Radomsky and Gagné 2019)

The BALCI is a 21-item self-report measure assessing the degree to which people hold beliefs about losing control of their thoughts, behaviours, emotions and physiological

responses. Items are rated on a 5-point Likert-type scale from 0 (“Not at all”) to 5 (“Very much”) and includes items such as “I am afraid of losing control of my mind.” Internal consistency in the present study was found to be excellent ( $\alpha=0.94$ ).

### Depression Anxiety Stress Scales (DASS-21; Lovibond and Lovibond 1995)

The DASS-21 is a 21-item measure of general psychopathology (i.e., symptoms of depression, anxiety, and stress). Items are rated on a 4-point Likert-type scale based on frequency and severity from 0 (“Did not apply to me at all”) to 3 (“Applied to me very much, or most of the time”). Internal consistency in the present study was found to be excellent ( $\alpha=0.92$ ).

### Confederate

In order to help ensure consistency across trials, a single Caucasian male confederate was used for the entire study. Prior to data collection, to ensure consistency across participants the confederate received extensive training with both authors on how to engage with participants. During piloting, his behaviour was adjusted to maximise both believability and efficacy of the behavioural shift. The confederate was trained to initiate conversation, appearing warm and interested, then shift to a cooler and less interested demeanor as the task went on. This shift was included to increase the subjective anxiety experienced during the task. Further, this shift occurred following the participants’ initial conversation in order to potentially provide ambiguous evidence that participants may have said or done something inappropriate, potentially providing evidence they had indeed lost control.

### Procedure

This study was conducted at Concordia University in Montreal, Quebec. The research was conducted by an experimenter who was unaware of condition assignment prior to the manipulation. Participants were told they would be participating in a study examining the relationship between self-control and impression management. They were told that they would be expected to complete a measure of self-control over verbal behaviour and then that they would be expected spend some time interacting with an undergraduate lab member.

After providing informed consent, participants completed the demographics questionnaire and provided baseline SUDS rating. Participants were then asked to complete a task which was purported to assess their self-control. This ‘self-control’ task consisted of two texts of equal word count, from which the participant read aloud,

alternating between the texts at every word. In order to foster uncertainty about their performance, participants were told that people tend to over or underestimate their ability to maintain control, and that this was an objective measure of self-control. The experimenter appeared to score them in real time on a separate sheet of paper while timing them in order to increase the believability of the task.

After this ‘self-control’ task, the experimenter left the testing room to ‘score’ their performance. It was at this point that participants were randomly assigned to either the LLC or HLC condition. Participants received false feedback about their performance based on this random assignment. This feedback was adapted from Alcolado and Radomsky (2011) to reflect one’s ability to maintain control over verbal behaviour.

The experimenter re-entered with a diagram of a normal distribution, and briefly explained the concept of percentiles. Then, the participant was told they had either scored very high (85th to 90th percentile) which indicated they were unlikely to lose control when engaging in public speaking, or scored very low (25th to 30th percentile) which indicated they were likely to lose control when engaging in public speaking. In both cases, the experimenter used general examples to increase the believability and salience of the feedback (e.g., in the HLC condition “you can probably remember a time when you were nervous meeting someone new and had a thought pop into your head *that you accidentally blurted out*” versus in the LLC condition “you can probably remember a time when you were nervous meeting someone new and had a thought pop into your head *but decided not to say it*”). Participants then completed a second SUDS rating and the experimenter feedback form.

Next, participants took part in a ‘getting to know you’ task (i.e., social interaction) with an undergraduate volunteer from the lab. Participants were informed that this volunteer would be evaluating the impression they made and were encouraged to ‘get to know’ the volunteer. No further instructions were given and participants were not told how long the interaction would last. The confederate was unaware of condition assignment and was trained to exhibit standardized behaviour to all participants. The confederate began each interaction by being warm and friendly, introducing himself and asking the participant, “Tell me about yourself.” After approximately ten seconds, the confederate’s demeanor shifted to be colder and more disinterested, answering questions briefly and only asking questions which mirrored the questions asked by the participant. After three minutes, the experimenter re-entered, thanked the confederate and instructed him to exit and complete his evaluation of the participant. The participant then completed the self-report ratings of social performance, a final SUDS rating, rated their concern about losing control and rated the degree they felt

they lost control during the ‘getting to know you’ task and the remaining questionnaires (i.e., BALCI, SPIN, DASS-21).

Following the questionnaires, participants rated the credibility of the manipulation, were thoroughly debriefed and provided a second opportunity to give informed consent based on that debriefing.

## Results

### Data Screening

Prior to analyses, all outcome variables were assessed for outliers, non-normality and heteroscedasticity. One univariate outlier was identified among outcome variables, namely a single confederate-provided rating of performance was considered an outlier ( $|z|=3.69$ ). Upon inspection, there was no reason to believe this value was invalid, and given transformation or removal of outliers can distort the dataset, it was retained untransformed (Osborne and Overbay 2004). Based on absolute skewness less than three and absolute kurtosis less than ten, there was no evidence of non-normality in any outcome variables (Kline 2009). Further, variance was acceptably homoscedastic for all outcome variables (variance ratio between conditions  $<2$ ; Kline 2009). All data points were within acceptable limits of normality and homoscedasticity.

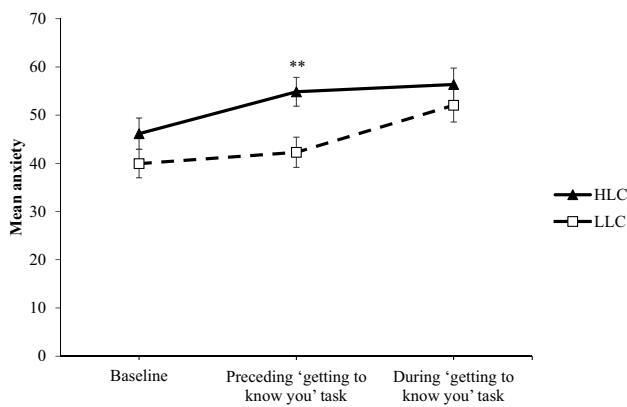
### General Psychopathology

To assess whether the conditions differed on general psychopathology, independent samples  $t$ -tests were conducted on SPIN and DASS scores. As expected from random assignment, the conditions did not differ on measures of trait social anxiety, as measured by the SPIN [ $t(128)=1.31, p=0.19, d=0.23$ ], pre-existing beliefs about losing control, as measured by the BALCI [ $t(128)=0.547, p=0.59, d=0.10$ ], nor on a general measure of depressive and anxious symptoms, as indicated by the DASS [ $t(128)=1.32, p=0.19, d=0.23$ ].

### Manipulation Check

To assess whether the manipulation was successful, an independent samples  $t$ -test was conducted on the manipulation check question. As expected, following the ‘self-control’ task, individuals in the HLC condition ( $M=48.99, SD=25.62$ ) reported significantly greater beliefs that they may lose control over their thoughts, emotions or behaviour than those in the LLC condition [ $M=29.68, SD=25.23; t(128)=4.33, p<0.001, d=0.76$ ].





**Fig. 1** Mean ratings of anxiety over time by condition. *HLC* high beliefs about losing control, *LLC* low beliefs about losing control.  $**p < 0.01$

**Table 2** Means and standard deviations of subjective ratings of anxiety

Anxiety	HLC		LLC		<i>t</i>	<i>d</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
Baseline	46.16	26.61	39.95	23.38	1.41	0.24
Preceding 'getting to know you' task	54.85	24.47	42.30	24.87	2.90**	0.51
During 'getting to know you' task	56.36	27.80	52.06	27.68	0.88	0.16

*HLC* high beliefs about losing control, *LLC* low beliefs about losing control

$**p < 0.01$

**Credibility Check**

An independent samples *t*-test confirmed there were no differences between the conditions on the credibility of the manipulation [ $t(128) = 0.12, p = 0.90$ ]. Overall, mean credibility was moderately high for the believability of the feedback ( $M = 56.66, SD = 29.08$ ).

**Confederate Behaviour**

Though, we did not include a specific manipulation check for confederate behaviour, using participant ID as proxy for time (participant ID were assigned sequentially) we conducted MANCOVA analysis on our outcome variables including participant ID as a covariate and found no evidence of an effect of participant ID on our outcomes of interest,  $F(9, 119) = 0.47, p = 0.89, \text{partial } \eta^2 = 0.03$ , suggesting no systematic differences in confederate behaviour over time.

**Self-reported Anxiety**

To assess anxiety in anticipation of and during the 'getting to know you' task, a series of independent samples *t*-tests were conducted (see Fig. 1; see Table 2 for means and standard

deviations). At baseline, the LLC and HLC groups did not differ significantly in anxiety [ $t(128) = 1.41, p = 0.16$ ]. As predicted in hypothesis 1a, after receiving feedback about their risk of losing control, but just before the 'getting to know you' task, individuals in the HLC condition reported significantly more subjective anxiety than those in the LLC condition [ $t(128) = 2.90, p = 0.004, d = 0.51$ ]. However, contrary to hypothesis 1b, following the 'getting know you' task, ratings of anxiety did not differ between the conditions ( $t(128) = 0.88, p = 0.38, d = 0.16$ ).

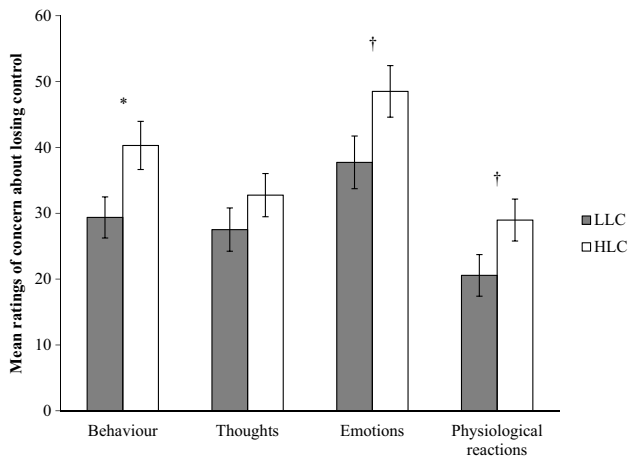
**Ratings of Performance**

To assess differences in perceived and observed social performance, a  $2 \times 2$  (rating source  $\times$  condition) repeated measures ANOVA was conducted on mean performance ratings.

As predicted, there was a significant main effect of condition on performance such that individuals in the HLC condition had worse performance in the 'getting to know you' task regardless of rating source [ $F(1, 128) = 4.19, p = 0.04, \text{partial } \eta^2 = 0.03$ ]. Further, a significant main effect of rating source was found such that observed performance was greater than self-reported performance [ $F(1, 128) = 41.49, p < 0.001, \text{partial } \eta^2 = 0.25$ ]. However, contrary to hypothesis 2b, there was no significant rating source  $\times$  condition interaction [ $F(1, 128) = 0.02, p = 0.90$ ] suggesting individuals in the HLC condition were no more likely to underestimate their performance than those in the LLC condition.

**Ratings of Concern Over Losing Control**

To assess whether participants differed in their concerns about losing control over their behaviour, thoughts, emotions and physiology in the 'getting to know you' task, a one-way multivariate ANOVA (MANOVA) was conducted to check for an overall effect of condition on concerns about losing control. There was a trend towards individuals in the HLC condition reporting greater concerns about losing control overall than those in the LLC condition [ $F(4,$

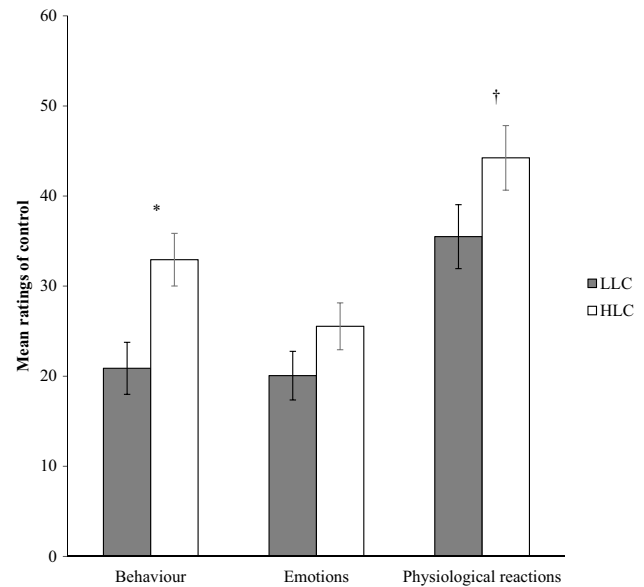


**Fig. 2** Mean ratings of amount of concern about losing control over different domains during the 'getting to know you' task by condition. *HLC* high beliefs about losing control, *LLC* low beliefs about losing control condition. \* $p < 0.05$  † $p < 0.10$

125) = 2.12,  $p = 0.08$ , partial  $\eta^2 = 0.06$ ]. Though these results were non-significant, a series of exploratory independent samples *t*-tests was conducted on participants' concerns about losing control over thoughts, behaviour, emotions and physiological reactions during the 'getting to know you' task (see Fig. 2). These results revealed small to moderate effect sizes such that individuals in the HLC condition reported greater concerns about losing control over their behaviour [ $t(128) = 2.26$ ,  $p = 0.03$ ,  $d = 0.40$ ], their physiological reactions [ $t(128) = 1.92$ ,  $p = 0.06$ ,  $d = 0.34$ ], their emotions [ $t(128) = 1.87$ ,  $p = 0.06$ ,  $d = 0.33$ ] and their thoughts [ $t(128) = 1.12$ ,  $p = 0.26$ ,  $d = 0.20$ ], suggesting changes in beliefs about losing control may have increased these concerns in the HLC condition. However, given the non-significant omnibus test, these results should be interpreted with caution.

### Ratings of Control

A one-way MANOVA was conducted to assess whether participants differed in the degree to which they perceived they lost control. The overall effect of condition was significant such that individuals in the HLC condition reported greater perceived losses of control in general than the LLC condition [ $F(3, 125) = 3.52$ ,  $p = 0.02$ , partial  $\eta^2 = 0.08$ ]. A series of follow-up independent samples *t*-tests were conducted on participants' perceived losses of control over their behaviour, emotions and physiological reactions during the 'getting to know you' task (see Fig. 3). Individuals in the HLC condition reported significantly greater perceived losses of control over their behaviour compared to those in the LLC condition [ $t(128) = 2.93$ ,  $p = 0.004$ ,  $d = 0.51$ ]. However, pairwise comparisons revealed no significant difference between



**Fig. 3** Mean ratings of the degree of perceived loss of control over different domains during the 'getting to know you' task by condition. *HLC* high beliefs about losing control, *LLC* low beliefs about losing control condition. \* $p < 0.05$  † $p < 0.1$

conditions on perceived losses of control over their physiological reactions [ $t(128) = 1.73$ ,  $p = 0.09$ ,  $d = 0.30$ ], or their emotions [ $t(128) = 1.46$ ,  $p = 0.15$ ,  $d = 0.26$ ].

### Discussion

The present study aimed to assess whether experimentally manipulating beliefs about losing control would have an effect on social anxiety and associated constructs. As expected, individuals in the HLC condition reported greater anticipatory anxiety just before meeting the confederate. There was no difference in anxiety during the task itself. Social performance differed significantly across conditions such that those in the HLC condition reported worse performance than the LLC condition. Participants, regardless of condition, consistently underestimated their social performance compared to observer ratings. Further, there was a trend towards greater concern over losing control in the HLC condition compared to the LLC condition, with follow-up analysis revealing that this difference was largest for losses of control over behaviour. Finally, the HLC condition reported greater perceived losses of control over their behaviour, and to a lesser extent, greater perceived losses of control over their physiology.

Taken together, these results support the hypothesis that beliefs about losing control may play a causal role in the experience of social anxiety. Individuals who were told they were at risk of losing control experienced greater anxiety

immediately before meeting someone for the first time. This is consistent with the cognitive model of social anxiety, which argues the activation of negative beliefs such as these preceding a social situation leads to anxiety (Clark and Wells 1995; Rapee and Heimberg 1997). Further, our results are in line with previous research which has shown anticipatory anxiety is higher among more socially anxious individuals, especially when they have been primed for poor control over internal states, even when no deficits in control are observed (Stevens et al. 2011). Taken together, this suggests negative beliefs about losing control may relate to or perhaps underlie this anticipatory anxiety among individuals who are socially anxious.

The stressful nature of the task also appeared to have led participants to consistently underestimate their social performance regardless of beliefs about control. Though there is considerable evidence for negative self-biases among highly socially anxious individuals (e.g., Mansell and Clark 1999), there is also evidence to suggest that when exposed to a high-stakes social situation (e.g., when performance standards are presented as highly elevated), people tend to underestimate their performance, independent of social anxiety. Moscovitch and Hofmann (2007) found that when they compared participants' ratings of performance to an observer's rating in a high-pressure social situation, both highly socially anxious individuals and non-anxious controls underestimated themselves. This effect was not found if the situation was neutral or low pressure. Therefore, it is reasonable to conclude that this doubt and underestimation was due in part to the task itself.

Interestingly, this negatively biased self-perception did not account for overall differences in performance. That is, independent of this tendency to underestimate one's ability, differences in social performance were found between the HLC and LLC conditions such that the LLC condition was rated as more socially capable both by self- and confederate-report. Previous research has highlighted that performance deficits, both observed and perceived, depend in part on the nature of the task (Alden and Wallace 1995; Thompson and Rapee 2002; Voncken and Bögels 2008). For example, Voncken and Bögels (2008) found that in social interactions individuals with SAD had both observable and self-reported performance deficits, but not in speeches. Further, Thompson and Rapee (2002) found that individuals high in social anxiety struggled most in unstructured social interactions, however, the causal mechanism of their deficits was not clear. The results of the present study are consistent with these findings and suggest that beliefs about losing control may produce some of the behavioural changes or deficits observed in such social situations.

Given the manipulation of beliefs about losing over verbal behaviour, it seems likely that individuals in the HLC condition may well have engaged in compensatory efforts

to avoid losing control, although this was not assessed in the current study. Moscovitch (2009) proposes individuals with SAD engage in safety behaviours to conceal perceived self-flaws in social contexts (e.g., incomplete control over social behaviour). These strategies, especially those relying on avoidance, have been associated with reduced social performance in social interaction tasks (Plasencia et al. 2011; Rowa et al. 2015). Given the observed differences in social performance across the conditions, a future study should examine the relationship between beliefs about losing control and safety behaviours in SAD.

Another way in which these beliefs may explain these behavioural differences relates to participants' ratings of concern over losing control and degree of perceived loss of control. Previous research in control and social anxiety argue that perceived control over emotions is highly important in social anxiety, and that failing to maintain control over emotions is seen as dangerous (Hofmann 2005; Spokas et al. 2009). In the present study, participants reported a trend towards greater concern over losing control across all domains. This suggests that individuals in the HLC condition were more preoccupied with their control over themselves and may indicate greater attention towards controlling their internal states and their emotions. An examination of the effect sizes observed suggest a moderate degree of concern about losing control over behaviour, emotions and physiology in the HLC condition relative to the LLC condition.

Interestingly, although the HLC condition perceived a greater degree of loss of control, it was only perceived losses of control over behaviour which differed significantly between conditions. Given that the HLC and LLC conditions did not differ in the degree to which they perceived losses of control over their emotions, it may be that it is less about controlling emotions themselves, and more about how those failures of control translate into observable behaviour. This aligns with cognitive models of social anxiety, which argue that individuals with social anxiety fear *appearing* nervous or anxious (i.e., appearing out of control over their anxiety), rather than the actual control over the emotion itself. It would be expected, then, that this preoccupation with observable, *external symptoms* of these emotional states (i.e., nervous behaviour, visible physiological arousal), especially ones which are perceived as uncontrollable (e.g., blushing, sweating), would further increase salience of those symptoms of anxiety. This increased preoccupation with control would, in turn, increase attention towards these external symptoms, increasing the salience of any perceived 'slip-ups' (e.g., nervous laughter) which could be misinterpreted as losses of control. Still, the small magnitude of the difference in effect sizes between domains of concern (i.e., behaviour, emotions, physical reactions) suggests that further study is



needed to understand the substantive differences in these concerns.

An alternative explanation of these concerns about losing control relates not to observable anxiety, but perceived social failure. For example, it may be that participants in the HLC condition were anxious because their loss control was tied to the possibility that they might fail to make a desirable first impression, as proposed by Schlenker and Leary (1982). The present study did not aim to assess perceived ability in this way, making it impossible to disentangle given the results above. However, it remains an interesting direction for a future study, perhaps by asking participants the degree to which they feel they will be able to make a good impression immediately following the manipulation.

The precise relationship between this concern about losing control, the perception of having lost control and the feared consequences (i.e., negative evaluation) could benefit from further study. Future research should examine this relationship in more detail; for example, would changing the description of how noticeable these ‘losses’ of control are to others result in less selective attention and therefore reduce distress?

Together with the observed behavioural differences and greater anticipatory anxiety, these results support the notion that beliefs about losing control are relevant in causing or maintaining state social anxiety, although additional research is needed to assess the precise nature of the relationship.

### Limitations and Future Directions

In addition to increasing the sample size to increase power in future replications of the current study, there remain limitations to be considered. Although this study supports the relationship between beliefs about losing control and social anxiety, the use of a more stressful social interaction (i.e., a disinterested confederate) may have led to more anxiety in the LLC condition during the social interaction, possibly attenuating the effects of manipulation and explaining the lack of difference in anxiety following the task. Despite this, the HLC condition still reported significantly greater concern about losing control and perceived greater losses of control during the task, suggesting a shift towards self-focused attention as seen in social anxiety. Alternatively, given the use of an analogue sample, the confederates behaviour may not have been interpreted as rejection, therefore failing to increase anxiety. Instead, it is possible that the confederate’s behaviour was (accurately) interpreted as rude, leading to feelings of irritation. It is unclear how irritation would interact with beliefs about losing control, but it may be that their irritation would shift focus of attention towards the confederate and away from their internal states, partially explaining the lack of difference observed between groups. Therefore, replicating these results using a more naturalistic

interaction would enhance the generalizability of these results, and would help clarify the relationship between these beliefs and anxiety during social interactions.

Although these participants were intended to be a non-clinical analogue to individuals with social anxiety disorder, they may not exactly reflect clinical populations. However, the use of analogue samples is common practice, and given that most symptoms continuous rather than discrete, it likely captures real variance within the target pathology (Stopa and Clark 2001). Future studies should aim to replicate these results among individuals with SAD in order to understand how beliefs about losing control may function differentially among highly socially anxious individuals. Related to generalizability, it is worth noting that the sample consisted predominantly of women, all of whom were interacting with a male confederate. Given that maintaining control over one’s emotions may have different meaning based on one’s gender (e.g., being dismissed as emotional, being perceived as weak; Brody and Hall 2008) these effects may influence behavioural and emotional responses to feedback. As a result, caution should be taken when generalizing these results to the broader population.

Individuals in the HLC condition reported slightly more baseline anxiety than those in the LLC condition. Therefore, it is possible that some of the observed effect may relate to individual differences between the conditions. Given the use of random assignment, and the fact that participants did not differ on ratings of psychopathology (i.e., SPIN, DASS), this seems relatively unlikely. However, it must be noted that these measures were administered at the end of the study and some of the difference observed may be an artifact of the manipulation itself. Although this choice was made with the goal of minimizing demand effects on the manipulation, it remains conceivable that some of the effect observed relates to group differences. Baseline measures would help quell such concerns in a future study. Still, the value of random assignment is an aggregate effect through replication, and any study employing this strategy cannot claim equivalent groups. Therefore, we can only encourage further replication to test this effect.

Further, given research showing that individual differences in social anxiety influences response to experimental manipulation (e.g., Papageorgiou and Wells 2002) future research should aim to replicate these results accounting for individual differences. In particular, baseline social anxiety would present an interesting moderating variable on the relationship between negative (or positive) false-feedback about beliefs about losing control and social anxiety. Alternatively, replicating these results with a clinical sample would inform the effects of these beliefs among individuals with SAD (e.g., are they more likely to reject positive feedback about their self-control due to existing negative beliefs about losing control?).

Additionally, participants were given both behavioural (e.g., saying the wrong thing) and physiological (e.g., sweating uncontrollably) examples of losing control. This may have resulted in a general induction of fear of losing control, which would explain the anxiety leading up to the ‘getting to know you’ task but may not be specific to social anxiety. However, given control was presented as an important skill which helped to avoid appearing foolish or anxious and that it was suggested that failures to maintain control were observable, it seems likely that this anxiety was tied to the upcoming interaction.

Still, given the high comorbidity of SAD with other anxiety disorders (Kessler et al. 2005) and the perceived importance of control in anxiety disorders more generally (Rapee et al. 1996), a future direction would be an experiment which manipulates the *consequences* of losing control in order to understand how these beliefs may function differentially across disorders.

## Summary

A preoccupation with control has been suggested as a characteristic of individuals living with SAD (e.g., Clark and Wells 1995; Hofmann 2007), but the specific role of beliefs about *losing control* has received relatively little attention. Previously, evidence that these beliefs play an important role in SAD has been largely anecdotal or correlational (e.g., Spokas et al. 2009). The present study provides preliminary evidence that manipulating these beliefs in a non-clinical population may produce behavioural and cognitive symptoms similar to those seen in SAD. Follow-up research is needed to better clarify the extent and nature of the role of these beliefs in the cognitive model of SAD as well as the way in which these beliefs are unique to symptoms related to SAD. Should this work prove to be fruitful, it may yield valuable information about targeting beliefs about losing control in the clinic.

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## Compliance with Ethical Standards

**Conflict of Interest** Kenneth Kelly-Turner and Adam S. Radomsky declared that they have no conflict of interest.

**Informed Consent** Informed consent was obtained from all individual participants included in the study.

**Ethics Approval** This study was conducted in compliance with the Canadian Tri-Council Standards of Ethical Conduct for Research Involving Humans. It received approval from the Concordia University Human Research Ethics Committee (reference # 30009859).

**Animal Rights** This article does not contain any studies with animals performed by any of the authors.

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