

The Moderating Effects of Reported Pre-Pandemic Social Anxiety, Symptom Impairment, and
Current Stressors on Mental Health and Affiliative Adjustment During the First Wave of the
COVID-19 Pandemic

by

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Author's Declaration

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

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Abstract

It has been well-established within existing literature that individuals with social anxiety fear negative evaluation and exposure of self-perceived flaws to others. However, the unique impacts of pre-existing social anxiety on well-being and interpersonal outcomes within the stressful context of the pandemic are currently unknown. On the one hand, preventive measures and social norms introduced by COVID-19 (e.g., mask-wearing, physical distancing, increased reliance on digital communication) may lower social threat perceptions for individuals with high pre-pandemic levels of social anxiety by offering more opportunities to control their self-presentation. Alternatively, distancing and use of preventive measures may exacerbate social anxiety symptoms by forming barriers to meaningful social connection and increasing loneliness. After reviewing relevant literatures to develop hypotheses for the present study, we conducted an online study of 488 North American community participants, which was completed during the first wave of the pandemic in May 2020. We used multiple linear regression to analyze whether retrospective reports of pre-pandemic social anxiety symptoms predicted current coronavirus anxiety, loneliness, fears of negative evaluation, use of preventive measures, and affiliative outcomes, and whether pre-pandemic functional impairment and recent COVID-related stressors moderated these relations. Results highlighted the negative effects of pre-pandemic social anxiety on current mental health functioning, especially for participants with higher pre-pandemic functional impairment and greater exposure to COVID-related stressors. Although participants with higher pre-pandemic social anxiety reported currently feeling lonelier and more fearful of negative evaluation, they also endorsed greater efforts to affiliate with others. Thus, socially anxious individuals may have heightened desire for social support within the isolating context of the pandemic, in which COVID-related social restrictions enable greater avoidance of

social evaluation but may also mask the enduring impairment associated with pre-pandemic social anxiety.

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Table of Contents

Author's Declaration	ii
Abstract	iii
Acknowledgements	v
List of Figures	vii
List of Tables.....	viii
General Introduction	1
Review of Relevant Existing Literature	3
Social anxiety	3
Overestimation of social threat	4
Self-concealment via social safety behaviours	5
Deficits in positive emotional responding to affiliation	8
Online communication and social anxiety	10
The effects of social anxiety on loneliness and isolation.....	12
Introduction to the Present Study	15
Review of Emerging Research.....	15
Potential impacts of the COVID-19 pandemic context on pre-existing social anxiety	17
Potential moderating role of pre-existing functional impairment	18
Potential moderating role of COVID-related stressors	19
Study hypotheses	20
Method	23
Participants.....	23
Measures	24
Data preparation and data analytic plan.....	29
Results	31
Descriptive statistics and sample characteristics	31
Coronavirus anxiety	32
Loneliness	34
Frequency of use of preventive measures	35
Change in fear of negative evaluation	37
Affiliative behaviours	38
Discussion	44
Summary and implications of findings	44
Potential explanations for unexpected, heightened affiliation.....	48
Limitations	52
Clinical implications	54
Future directions	56
Concluding remarks	57
References	58
Appendix.....	73
Measure of Affiliative Behaviours.....	73

List of Figures

Figure 1. The Moderating Effects of Pre-Pandemic Impairment and COVID-Related Stressors on the Relationship Between Pre-Pandemic Social Anxiety and Coronavirus Anxiety

List of Tables

Table 1. Sample Demographic Characteristics

Table 2. Frequencies of Preventive Measures and Types of Affiliative Behaviours in Sample

Table 3. Descriptive Statistics for Study Variables

Table 4. Spearman Bivariate Correlations Among Study Variables

Table 5. Hierarchical Linear Regression Predicting Coronavirus Anxiety

Table 6. Hierarchical Linear Regression Predicting Loneliness

Table 7. Hierarchical Linear Regression Predicting Frequency of Use of Preventive Measures

Table 8. Hierarchical Linear Regression Predicting Change in Fear of Negative Evaluation

Table 9. Hierarchical Linear Regression Predicting Affiliative Frequency and Social Connection Composite Measure

Table 10. Hierarchical Linear Regression Predicting Emotional Response to Affiliative Behaviours

General Introduction

It has long been understood that deep and meaningful social connections are instrumental to well-being (e.g., Baumeister & Leary, 1995). Developing and maintaining strong social connections through affiliating with others may be especially important—but also highly challenging—in the face of the COVID-19 pandemic, which has resulted in the introduction of restrictive public health measures such as self-isolation and distancing to prevent disease transmission. While these preventive measures promote physical health and safety, they may pose additional barriers for individuals with high levels of social anxiety who typically have trouble facilitating connections with others due to impairment arising from intense fears of negative evaluation and avoidance of social threat. Additionally, individual differences in COVID-specific stressors and pre-existing social anxiety-related impairment may further exacerbate socially anxious individuals' difficulties with affiliation and seeking of social support.

The present study aims to understand the impact of pre-pandemic social anxiety on affiliative adjustment and social well-being in the context of the first wave of the COVID-19 pandemic, a period when many people were still adapting to the relatively novel and uncertain social contexts and stressors arising from the pandemic. While multiple studies have reported rising levels of anxiety and depression in the general population stemming from the COVID-19 pandemic (e.g., Gallagher et al., 2020; Loades et al., 2020), it remains unknown how individuals who experienced elevated social anxiety *prior* to the pandemic were affected, especially given the isolating nature of the preventive efforts to curb the spread of COVID-19 introduced during the pandemic's first wave. For socially anxious individuals, pandemic-related restrictions—in addition to already existing social fears—may have blocked adequate social connection and support. Alternatively, socially anxious individuals who struggled significantly before the

COVID-19 pandemic may have felt relieved by pandemic-related social restrictions, which may have lowered fears of negative evaluation and improved their willingness to seek out the support and companionship they desired without having to confront their typically feared situations.

Several research questions and objectives arose from our considerations of socially anxious individuals in the novel social context of the pandemic. Specifically, we wondered whether higher pre-pandemic social anxiety predicted greater levels of coronavirus-related anxiety and loneliness during the first wave. We also wondered whether and how the use of COVID-related preventive measures such as masks and distancing impacted participants' fears of negative social evaluation, particularly if such measures were being used as a form of social avoidance. Would socially anxious individuals' evaluative fears improve or worsen during the pandemic's first wave? How would their pre-pandemic levels of social anxiety influence their use of social support and emotional responses to affiliative behaviours (e.g., reaching out to others, interacting with the goal of social connection) during this unique time? Finally, how would the effects of pre-pandemic social anxiety on these various outcomes be affected by pre-pandemic social anxiety-related functional impairment and current COVID-related stressors?

While the research questions aimed to address social anxiety in the novel context of the COVID-19 pandemic, the psychological mechanisms underlying social fear and anxiety have been well-studied for decades and could provide useful insights into how socially anxious individuals might be expected to behave within this unique context (e.g., Wong, Gordon, & Heimberg, 2014). Moreover, emerging studies of anxiety during the first wave of the COVID-19 pandemic might also be informative. Thus, we expected the well-established literature on social anxiety and the emerging literature on anxiety during COVID-19 to inform our hypotheses for the current study. Below, we conduct an in-depth review of the relevant existing literatures

before introducing the hypotheses for the present study. Through the synthesis of established findings and emerging COVID-specific research, we have advanced specific hypotheses in response to our research questions about the mental health and affiliative adjustment of socially anxious individuals during the first wave of the pandemic; then, we detail the study method, results, and implications.

Review of Relevant Existing Literature

Social anxiety

Although clinical models of social anxiety disorder (SAD) focus on social anxiety as a discrete pathological condition (American Psychiatric Association, 2013), research has shown that social anxiety can be reliably conceptualized as a dimensional construct that varies along a severity continuum and is normally distributed within the population (Ruscio, 2010). Leary and Kowalski (1995) established the “self-presentation model” of social anxiety, whereby socially anxious individuals’ worries stem from doubt about whether they will be able to make a desired impression. Clark and Wells (1995) similarly emphasized the desire of socially anxious individuals to not only make a favourable impression on others, but also to prevent feared consequences such as social rejection and criticism. Indeed, a core problem in social anxiety has long been conceptualized as an over-sensitivity to social threat, compounded by the belief that others have unreasonably high social expectations to be met (Rapee & Heimberg, 1997).

Hofmann (2007) agrees that socially anxious individuals perceive high social standards from themselves and others, experience a strong desire to meet those standards, and doubt their own ability to do so; however, he adds that socially anxious individuals additionally overestimate the probability and cost of their feared negative outcomes. Drawing from these classic cognitive models, Moscovitch (2009) conceptualized the core fear in social anxiety as exposure of

perceived self-flaws, or characteristics that one views as being deficient to perceived societal expectations—otherwise referred to as fears of negative self-portrayal. Within this framework, perceived social threat arises from the nature of each individual’s self-perceived flaws and beliefs surrounding whether they will be successful at concealing such characteristics from public exposure.

As a result, socially anxious individuals tend to either avoid and withdraw from social situations entirely, or when faced by potential evaluation, rely on maladaptive self-protective strategies to conceal these self-perceived flaws that could be scrutinized by others (Moscovitch et al., 2013). Frequent use of avoidance and concealment strategies diminishes socially anxious individuals’ social functioning and impairs positive connections with others, often leading to impoverished social lives and chronic feelings of loneliness and isolation (Alden, Regamball, & Placencia, 2014; Gilboa-Schechtman et al., 2014; Kashdan et al., 2011; Rowa et al., 2015; Placencia et al., 2016).

Overestimation of social threat

A substantial body of research suggests that socially anxious individuals hold interpretive biases and demonstrate selective information processing biases for threat-related information, construing ambiguous or even neutral social situations as threatening and dangerous (Kuckertz & Amir, 2014), whereas non-anxious controls typically engage in strategies to reappraise ambiguous situations as positive. Moreover, socially anxious individuals appraise their own behaviour in a manner that greatly exaggerates their shortcomings and minimizes their success (Alden & Wallace, 1995; Norton & Hope, 2001; Rapee & Lim, 1992; Stopa & Clark, 1993). In a study involving a public speech task, participants were assigned to one of three conditions: high standards, low standards, or ambiguous standards. Compared to non-clinical controls, socially

anxious participants performed objectively worse in all three conditions; however, they rated their own performance as worse only in the ambiguous and high standard conditions (Moscovitch & Hofmann, 2007). This suggests that social anxiety is not simply characterized by broad distortions in self-perception, but that the social standards and availability of information within a particular social context play a large role.

Self-concealment via social safety behaviours

In attempts to prevent feared outcomes of negative evaluation and social rejection, socially anxious individuals often rely excessively on the use of safety behaviours (Salkovskis, 1991). Clark and Wells' (1995) model points towards safety behaviours as a maintaining factor of social anxiety. They enable socially anxious individuals to attribute success in social situations to their performed safety behaviours; in this way, socially anxious individuals' fears are exacerbated, and the safety behaviours are ultimately counterproductive, despite providing a false sense of safety and protection. Additionally, reliance on safety behaviours requires socially anxious individuals to engage in self-focused attention and continuously monitor their performance, which has been shown to elevate feelings of anxiety and drive overestimations of poor performance (McManus et al., 2008).

Moscovitch (2009) conceptualized safety behaviours as self-protection and self-concealment strategies that are employed to mitigate fears of exposing self-perceived flaws to others. Indeed, individuals with SAD tend to have elevated self-portrayal fears and demonstrate greater use of safety behaviours despite the relative ineffectiveness of these behaviours at relieving anxiety and distress (Moscovitch et al., 2013) and even detrimental impacts on social interactions. Safety behaviours may allow individuals with SAD to feel protected in the moment, but ultimately erode social performance and work against goals of self-concealment. In a study

where participants completed a speech performance task, the objective performance of those with SAD was poorer than that of both anxious and healthy control. Importantly, self-reported safety behaviour use mediated the relationship between SAD and observers' objective ratings of speech performance (Rowa et al., 2015).

Safety behaviours have been found to impede processes intended to promote relational functioning in conversational settings, such as likeability and authenticity. In a study where participants completed a semi-structured interaction task with a confederate, not only did those with SAD engage in significantly more self-concealment behaviours, but self-concealment and safety behaviours also negatively predicted confederate ratings of the participant's likeability, far above and beyond the contribution of SAD symptoms (Dabas et al., under review). Plasencia et al. (2016) found that when participants with SAD were assigned to reduce their use of safety behaviours, conversation partners rated them as having greater levels of self-authenticity—encompassing self-disclosure, responsiveness to others, and genuine emotional expression—compared to participants with SAD who continued to employ their safety behaviours. Thus, safety behaviours are detrimental not only by increasing socially anxious individuals' self-focused attention and anxiety, but also by negatively impacting how they are perceived by others and creating barriers to meaningful social connection.

Additionally, not all safety behaviours are created equal, and different subtypes of safety behaviours may be harmful in various ways. Clark and Wells (1995) proposed two distinct subtypes of SAD-related safety behaviours: impression management and avoidance. Impression management strategies are employed to tightly control one's impression on others by enhancing self-presentation, such as feigning friendliness or using rehearsed phrases in conversation. Their use allows socially anxious individuals to distract others from any self-perceived flaws by

creating a favourable façade that may appear warm and agreeable, perhaps even excessively so. Thus, impression management strategies often come at the cost of authentic, genuine self-disclosure and deep social connection by creating a veneer of “innocuous sociability” (Plasencia, Alden, & Taylor, 2011) and keeping others at arm’s length.

On the other hand, avoidance strategies function to reduce one’s involvement in a social situation; for example, by overtly avoiding eye contact or limiting self-disclosure. Like impression management strategies, the underlying motivation of avoidance strategies is often to draw attention away from the self. However, the use of avoidance safety behaviours might have a particularly negative impact on the individuals with SAD who use them, and have been shown to be negatively associated with a conversation partner’s desire for future interaction (Plasencia, Alden, & Taylor, 2011). For example, one study found that socially anxious participants who used avoidance strategies perceived themselves as looking more anxious and enjoying the conversation less, and reported less desire to pursue further conversation with the same interaction partner in the future (Gray, Beierl, & Clark, 2019). Avoidance safety behaviours also elicit critical reactions from others: partners rated socially anxious research participants as appearing more anxious and less likeable, and objective assessors rated participants lower on positivity when avoidance safety behaviours were being used (Gray et al., 2019; see also Rowa et al., 2015). Therefore, although safety behaviours may be viewed by socially anxious individuals as a viable option for concealing self-perceived flaws from others, they may be more harmful than protective by reinforcing the belief that the individual is unable to cope without relying on safety behaviours, and by continually eroding the quality of social interaction.

Self-concealment and safety behaviours may provide particularly relevant insight into how socially anxious individuals have been coping during the pandemic due to the concealing

nature of many preventive measures; for example, wearing a mask, interacting with others from a physical distance, or communicating digitally rather than in-person. COVID-19 preventive measures may mimic avoidance safety behaviours by allowing socially anxious people to reduce their involvement in social situations, but perhaps without the usual negative interpersonal consequences.

Deficits in positive emotional responding to affiliation

Socially anxious individuals are consistently preoccupied with avoiding perceived threat and concealing self-perceived flaws, resulting in an inability to attend to positive social cues and potentially rewarding aspects of social situations—effects that have been termed “positivity deficits” (Gilboa-Schechtman, Shachar, & Sahar, 2014).

The associations between social anxiety and hedonic deficits are well-established (Gilboa-Schechtman, Shachar, & Sahar, 2014; Kashdan, 2002), and are not attributable to covariance with other internalizing conditions, such as depression or other forms of anxiety (Kashdan, 2004). Additionally, they have been found to be unique to social anxiety in the face of social interactions rather than performance situations, suggesting that interaction fears and avoidance behaviours interfere with initiation of positive social encounters and development of close relationships. Kashdan (2011) proposed that positivity deficits arise from socially anxious individuals’ excessive reliance on maladaptive self-regulatory strategies, such as safety behaviours, when trying to avoid social rejection. Over-use of such strategies results in the depletion of valuable resources required to attend to positive experiences and extract potentially rewarding components from them.

Positivity deficits in socially anxious individuals are concerning because positive emotions are a crucial component of social fulfillment. Positive interpersonal processes facilitate

the satisfying social experiences needed for meaningful, high-quality relationships, and are defined as social situations in which positive emotions—and not merely positive context or intentions—are central to the interaction (Algoe, 2019). Furthermore, positive interpersonal processes rely on shared emotion experienced and reciprocated by everyone present in a social interaction. These positive emotions can take on different forms, such as amusement (e.g., shared laughter), joy (e.g., sharing good news), and gratitude. Additionally, different types of positive emotion can lead to different social consequences; for example, it has been found that while the eight positive emotions of amusement, awe, contentment, gratitude, interest, joy, love, and pride all shared the common trait of high positive valence, some of these emotions had varying core relational themes—prototypical “scripts” and narratives of emotional experience, such as what occurred to elicit the emotion and what it felt like to experience the emotion—as well as differing expressive displays, such as laughing, Duchenne vs. non-Duchenne smiling, or touch (Campos et al., 2013).

Emerging research has begun to identify important targets for positivity deficits in socially anxious individuals. In a study where high socially anxious individuals were paired with unfamiliar, low socially anxious partners in a 45-minute conversation task, dyadic analyses revealed affiliative interpersonal goals, as opposed to impression management goals, drove positive outcomes for both participants and conversation partners; furthermore, it was found that such affiliative interpersonal goals contributed to positive outcomes by increasing participants’ perceptions of curiosity and authenticity (Barber et al., 2021). Indeed, curiosity has been found to play a key role in facilitating positive subjective experiences and personal growth opportunities (Kashdan et al., 2004). Curiosity has also been conceptualized as a key component in memory and learning processes by promoting exploration of new information that is then encoded to form

the basis for future information seeking in a continuous cycle (Gruber & Ranganath, 2019). Certainly, further research is needed to clarify mechanisms of social pleasure and reward in high socially anxious individuals; for example, safety behaviour reduction may also be a fruitful avenue for enhancing social reward by pivoting socially anxious individuals' attentional resources away from self-monitoring and concealment, and redirecting them towards more productive aspects, such as curiosity, authenticity, and seeking positive information to promote the encoding and ongoing pursuit of social reward.

In light of these established positivity deficits, it is unclear whether the COVID-19 pandemic and its associated restrictions have improved or exacerbated the poor quality of social interaction for socially anxious individuals. On the one hand, the pandemic may have isolated socially anxious individuals even further from already scarce opportunities for social positivity and reward, serving as an additional barrier to the formation of the deep and meaningful connections instrumental towards well-being (Baumeister & Leary, 1995). Alternatively, socially anxious individuals who struggled significantly before the pandemic may feel relieved and comforted by COVID-related social restrictions, which might improve their willingness to seek out and access the social support they need without needing to confront the typical kinds of social situations they would normally fear and avoid.

Online communication and social anxiety

Due to socially anxious individuals' need to self-conceal in the face of criticism and rejection, it may be easy to imagine them frequently opting to communicate online due to the higher level of concealment virtual forms of communication can offer. However, in a recent study by Doorley and Kashdan (2020) using ecological momentary assessment (EMA) and daily reconstruction method (DRM), there was no significant association between social anxiety and

participants' preferences for digital (over face-to-face) communication. Social anxiety was associated with less positive and more negative emotions, regardless of the communication medium. Thus, it is possible that online communication does not necessarily provide a source of emotional safety for socially anxious individuals, and that they instead show emotional dampening across digital communication platforms. However, Doorley and Kashdan's (2020) study was not without limitations; participants were not asked about their perceptions towards a certain social interaction, but only how they felt overall towards online communication. Additionally, participants were not asked about their expectations of online communication, for example, whether they believed that it would protect them from negative evaluation, or whether they had a preference for asynchronous or synchronous formats.

Synchronous modes of online communication, such as through video chats and calls (e.g., Zoom), have become increasingly popular throughout the COVID-19 pandemic, and the impacts of these modes of communication on socially anxious individuals are deserving of further research and consideration. A study of visual attention patterns during the online video-mediated interaction found that compared to low socially anxious participants, high socially anxious participants experienced greater levels of state anxiety and tended to fixate longer on non-face areas of the screen during a presentation task and more on the confederate's image during an introductory conversation (Azriel et al., 2020), despite past research suggesting that socially anxious individuals are more likely to engage in self-focused attention during interactions (e.g., Mellings & Alden, 2000; Vassilopoulos, 2008). These findings suggest that self-focused attention may present differently in virtual contexts, and that socially anxious individuals may cope with online communication differently from in-person interactions while continuing to experience high levels of anxiety in both contexts. For instance, socially anxious individuals may

still be monitoring themselves via self-focused attention, but when interacting online may be instead drawn to the facial expressions of their interaction partner to obtain cues and feedback about how they are being received; meanwhile, during an online presentation, socially anxious individuals may seek to avoid others' faces due to the challenges with simultaneously processing others' expressions and calibrating their performance accordingly. Further research is needed to examine the nuanced differences in socially anxious individuals' behaviour across in-person vs. virtual social contexts.

The effects of social anxiety on loneliness and isolation

Excessive evaluative fears, self-concealment, and positivity deficits each contribute to persistent loneliness and isolation in socially anxious individuals (Alden, Regamball, & Plasencia, 2014), and it is unclear whether the isolating nature of the pandemic would improve or exacerbate these negative effects. Compared to other mental health symptoms, such as depression or paranoia, social anxiety has been found to have unique longitudinal effects on loneliness, as those experiencing high levels of social anxiety are the most likely to avoid the types of social contact that could reduce loneliness and promote social support; in fact, although earlier loneliness positively predicted future states of social anxiety, paranoia, and depression, only earlier social anxiety significantly predicted future loneliness (Lim et al., 2016). Thus, it is possible that during the pandemic, socially anxious individuals may be particularly prone to feelings of loneliness, especially as the pandemic has continued into the long-term.

Especially concerning is the enduring impact of social anxiety on loneliness even in the face of attempts to manage and regulate emotions. A study of individuals with SAD and healthy controls showed that those with SAD engaged in lower levels of cognitive reappraisal, an adaptive method for reframing emotional experiences, and higher levels of expressive

suppression, a maladaptive method for avoiding difficult emotions (O'Day et al., 2019). Additionally, emotion regulation was shown to moderate the relationship between social anxiety and loneliness. At low levels of cognitive reappraisal and high levels of expressive suppression, social anxiety positively predicted loneliness. Unexpectedly, however, at high levels of cognitive reappraisal and low levels of expressive suppression, the positive relationship between social anxiety and loneliness was even stronger. These findings suggest that high socially anxious individuals may not benefit from emotion regulation strategies, such as cognitive reappraisal, until their social anxiety has been lowered to more manageable levels or until their negative core beliefs common to those with internalizing symptoms have been further addressed. Thus, during the pandemic, socially anxious individuals could be resorting to maladaptive and unproductive coping strategies to handle their emotions and feelings of loneliness arising from extended isolation. Paired with a lack of social support under even regular circumstances, socially anxious individuals may be at high risk for mental health challenges during the pandemic.

However, certain past research also challenges the relationship between social anxiety and loneliness, and the extent to which they overlap. Using exploratory and confirmatory factor analyses, Fung, Paterson, & Alden (2017) revealed a three-factor model of social anxiety, loneliness, and depression, suggesting that the three constructs are best conceptualized as related, yet distinct. Therefore, although social anxiety and loneliness may appear alike in that they are maintained by similar interpersonal and intrapersonal processes, they may also be unique and reflect different aspects of social difficulties. For example, although the safety behaviours associated with social anxiety may arise from a fear of being negatively evaluated by others (as described above), they may also perpetuate loneliness by lowering the expectations of positive social experiences and connection (Cacioppo & Hawkley, 2009). Given this model of partial

independence between social anxiety and loneliness, it is also possible that socially anxious individuals may develop or respond to loneliness in unrelated ways during the pandemic.

Loneliness has been thought to develop when there is a discrepancy between the desire for and actuality of an individual's social relationships (Peplau & Perlman, 1982). Unlike those with an asocial orientation, socially anxious individuals do desire social fulfillment but are inhibited by their fears of negative evaluation and positivity deficits in seeking out these interactions, differing from normative shyness and introversion (Heiser et al., 2009). Therefore, the relationship between loneliness and social anxiety may also depend on socially anxious individuals' perceptions and expectations for their social circles. While the pandemic may lead to objectively greater levels of social isolation, it could potentially lower the expectations for social relationships, thereby minimizing the perceived discrepancy between desire and reality. It is important to draw from existing research to consider the different ways that social anxiety and loneliness may interact in the novel context of the pandemic.

Introduction to the Present Study

Review of Emerging Research

Anxiety in the general population during the COVID-19 pandemic

Although preventive measures such as social distancing have been proven effective in slowing the spread of disease (Fong et al., 2020; Glass et al., 2006), they have significantly disrupted our daily lives and drastically altered our social landscapes. Adjusting to these changes while coping with the high levels of additional stress caused by the pandemic has negatively impacted mental and emotional health amongst the general population by heightening levels of loneliness (e.g., Banerjee & Rai, 2020; Galea et al., 2020; Killgore et al., 2020), increasing fears of infection (e.g., Ahorsu et al., 2020; Lee, 2020), and elevating symptoms of anxiety and depression (e.g., Knopf et al., 2020). A growing number of studies has also reported rising levels of anxiety and depression caused by a combination of social, cultural, economic, and health concerns arising from the pandemic (e.g., Dozois, 2020; Elton-Marshall et al., 2020; Gallagher, Zvolensky, Long, Rogers, & Garey, 2020; Loades et al., 2020).

Anxiety amongst those with pre-existing symptoms during the COVID-19 pandemic

There has been a common perception that individuals with pre-existing symptoms of anxiety who struggled before the pandemic have been the most vulnerable during COVID-19, with little empirical evidence to support this claim. Much of the research from early stages of the pandemic has addressed anxiety in the general population arising as a result of the pandemic; for example, worries about the dangerousness of COVID-19, traumatic stress symptoms associated with direct or vicarious exposure to the virus, and COVID-related compulsive checking and reassurance seeking (Taylor et al., 2020a; Taylor et al., 2020b). Comparatively, there has been

less focus in the literature on the effects of pre-existing anxiety symptoms on pandemic-related mental health outcomes.

One of few studies to address this issue surveyed individuals with pre-existing mental health difficulties on their adjustment to the pandemic (Asmundson et al., 2020), and found that those with pre-existing diagnoses of anxiety-related or mood disorders have experienced higher levels of coronavirus-related stress compared to healthy controls. Furthermore, those with anxiety-related disorders reported greater fears about danger and contamination, socioeconomic consequences, xenophobia, and traumatic stress symptoms. However, while such individuals endorsed greater efforts to utilize active coping strategies for managing their distress arising from isolation measures (e.g., setting a schedule or routine, spending time on hobbies, playing video games), they reported no significant differences in the perceived helpfulness of their strategies compared to individuals with no current mental health diagnoses.

In another study on those with pre-existing mental health concerns, it was found that within a sample of postsecondary students (Hamza et al., 2020), those with pre-existing depressive and anxious symptoms one year prior to the pandemic showed similar or improved mental health during the pandemic, potentially due to the decreased academic demands placed on students in the early months of COVID-19 when the study was conducted. However, despite this perceived maintenance and improvement in mental health in those with pre-existing symptoms, they continued to show a main effect of higher levels of stress, loneliness, and depression, suggesting that those with pre-existing symptoms continue to struggle despite perceptions of positive change relative to before the pandemic.

Potential impacts of the COVID-19 pandemic context on pre-existing social anxiety

While the specific effects of the pandemic context on socially anxious individuals remain unknown, we can draw upon existing research for insight into the potential impact of certain aspects of COVID-related restrictions on socially anxious individuals, such as online communication, physical distancing, and isolation and loneliness.

Communication in virtual contexts

New norms and expectations that have arisen for social interaction during the pandemic may provide a socially acceptable context for restricting their social encounters to those with whom they feel most comfortable and in ways that enable them to exert more control over their self-presentation, for example via asynchronous or text-based communication rather than having to engage in synchronous or in-person interactions. However, while communicating online may be perceived as less threatening, socially anxious individuals continue to self-monitor and employ safety behaviours when doing so, such as by concealing visual aspects of themselves or controlling the release of personal information and the amount of time they have for crafting a response (Kamalou et al., 2019).

Physical distancing

In the context of physical distancing, a recent study found that individuals with SAD had biased distance estimation and tended to perceive strangers to be physically closer than they really were, but that this underestimation did not occur with familiar others, suggesting that greater physical distance may reduce perceptions of social threat for socially anxious individuals (Givon-Benjio et al., 2020). Another study using immersive virtual reality technology found participants with higher levels of social anxiety approached computer-generated avatars in a virtual setting more slowly and kept a larger distance (Rinck et al., 2010). It is possible that

socially anxious individuals feel that physical distancing measures during the pandemic help keep others at a safe distance not only to prevent the spread of disease, but also from becoming too socially close. Additionally, they may have greater uncertainty about others' perceptions of an appropriate distance, leading them to exercise extra caution in their approach to further avoid negative judgment.

Increased ambiguity in social interactions

Interpersonal processes during the pandemic may be inherently more ambiguous. The use of masks makes facial expressions more difficult to interpret and emotions confusing to differentiate (Carbon, 2020; Saint & Moscovitch, 2021). Communicating from a physical distance may make social cues less obvious and more difficult to perceive. Meanwhile, asynchronous digital communication may increase ambiguity without in-the-moment feedback, and even synchronous digital communication may be impacted by time lags in internet connection and the reduced dimensionality of the interaction.

Potential moderating role of pre-existing functional impairment

Already-anxious individuals may be inhibited by pre-existing functional impairment—generated by evaluative fears, self-concealment, positivity deficits, and loneliness (as reviewed above)—which may constrain their ability to manage symptoms effectively during the pandemic. It has been consistently demonstrated that higher levels of social anxiety symptoms confer a significantly elevated risk of negative self-perception, fears of negative evaluation in social situations, high levels of interpersonal distress and avoidance, and functional impairment across a variety of life domains (Alden & Taylor, 2004; Clark & Wells, 1995; Hofmann, 2007; Moscovitch, 2009; Rapee & Heimberg, 1997). Socially anxious individuals exhibit such

impairment—particularly in the areas of work/ studies and social life—independent of depression or comorbid anxiety disorders (Aderka et al., 2012).

Those high in functional impairment experience social anxiety as disabling and interfering, which in turn deteriorates quality of life; additionally, it has been found that social anxiety symptoms accounted for significant variance in disability and impairment after controlling for depression (Hambrick et al., 2004), suggesting that social anxiety is uniquely disabling and not just as a function of high comorbidity with depression. A longitudinal study found that long-term disability was highest in those with social anxiety disorder or multiple anxiety disorders, with anxiety arousal and avoidance behaviour leading to more long-term disability (Hendriks et al., 2016). Thus, in examining symptoms of social anxiety, it is also important to consider the impact of functional impairment and the extent to which symptoms severity affects individuals' ability to function and cope across multiple domains.

Potential moderating role of COVID-related stressors

It is also possible that the nature of the pandemic context limits the effectiveness of the coping strategies that already-anxious individuals have within their coping repertoire. To this end, everyone's adjustment during the COVID-19 pandemic is impacted by the unique encounters that person has had with specific COVID-related stressors such as contracting the illness, caring for dependents, or losing employment. A recent study of American adults found that those who believed they had contracted the coronavirus, received a confirmed diagnosis of COVID-19, or knew someone who died from COVID-19 reported higher levels of stress, elevated symptoms of anxiety and depression, and greater levels of functional impairment (Gallagher, Zvolensky, Long, Rogers, & Garey, 2020). Another study on a Canadian sample found that COVID-related stressors such as social isolation, challenges associated with obtaining

basic necessities, unemployment, and frequent exposure to daily news about the coronavirus had strong negative effects on mental health (Dozois, 2020). Therefore, exposure to COVID-related stressors, whether direct or vicarious, may amplify feelings of distress and anxiety and make it even more difficult for those with pre-existing symptoms to cope.

Study hypotheses

As emphasized above, the unique impacts of pre-existing social anxiety on mental health and interpersonal outcomes during the COVID-19 pandemic remain unknown. Furthermore, little is understood about how pre-existing functional impairment and current COVID-related stressors may moderate the relations between longstanding symptoms of social anxiety and current functioning. The present study aimed to address these gaps in knowledge by surveying a large sample of community participants from the United States and Canada in late May of 2020, at which point the United States had approximately 20,000 new cases per day and had just exceeded 100,000 total COVID-related deaths, while Canada was reporting approximately 900 new cases per day and had exceeded 6,000 total deaths (World Health Organization, 2020). At the time of data collection, states and provinces in both countries were beginning the process of lifting stay-at-home orders that had been in place since March and April.

We conducted a correlational study to determine the unique impact of retrospectively reported levels of pre-pandemic social anxiety on key indicators of mental health and interpersonal adjustment during the first wave of the pandemic. Furthermore, we sought to understand whether and how the relations between longstanding symptoms of social anxiety and current functioning may be moderated by levels of reported levels of pre-pandemic functional impairment and current COVID-related stressors. Our outcomes of interest included coronavirus-

related anxiety, use of preventive measures, loneliness, FNE, and frequency of affiliative behaviours, as well as the degree of pleasure derived from any affiliative efforts.

Our overarching prediction was that pre-pandemic symptoms of social anxiety would be associated with poorer mental health and interpersonal outcomes during the pandemic.

Specifically, we advanced four sets of hypotheses.

We hypothesized that higher levels of pre-pandemic social anxiety would be associated with:

1. ***Greater current levels of coronavirus-related anxiety and loneliness.*** This hypothesis is in line with past research demonstrating co-morbidities between social anxiety and other forms of anxiety, as well as existing literature establishing a reliable relationship between social anxiety and loneliness.
2. ***Greater use of COVID-related preventive measures as well as decreases in current FNE during the unique pandemic context.*** We predicted that individuals with higher pre-pandemic social anxiety would report greater use of COVID-related preventive measures and, in turn, decreases in current fears of negative evaluation during the unique pandemic context. Due to the conveniently concealing nature of many COVID-related preventive measures, such as physical distancing, mask-wearing, and digital communication, high socially anxious individuals may co-opt these measures as methods to not only prevent the spread of the virus, but to protect themselves from social evaluation and hide any self-perceived flaws arising from their fears of negative self-portrayal.
3. ***Decreased social support-seeking and less engagement in affiliative behaviours, as well as reduced feelings of social pleasure and connection within the pandemic context.*** We

expected that pre-existing social anxiety would be associated with decreased social support-seeking and less engagement in affiliative behaviours, as well as reduced feelings of social pleasure within the pandemic context. Socially anxious individuals' established positivity deficits and pessimism towards any potentially rewarding aspects of social situations, coupled with a significant drop in social opportunities to pursue during the pandemic, may pose a barrier to affiliation and further encourage avoidance and other maladaptive coping strategies uncondusive to healthy experiences of social pleasure and connection.

4. The effects in hypotheses 1-3 would be amplified by both greater pre-pandemic levels of social anxiety-related impairment and greater reported COVID-related stressors.

Finally, we hypothesized that the relations between higher pre-pandemic social anxiety and poorer mental health and interpersonal outcomes would be exacerbated by both pre-existing levels of functional impairment and greater reported exposure to COVID-related stressors. Individuals with pre-existing impairment, especially across multiple domains, experience social anxiety as interfering in their lives and likely have fewer mental and emotional resources available to cope with other stressors, such as any additional stressors directly resulting from the pandemic.

Method

The preregistered plan for our study procedures can be accessed at https://osf.io/rjhgx/?view_only=026eb6dfe59d4703b3047402448c7082. This study has also now been published (Ho & Moscovitch, 2021).

Participants

Using Amazon Mechanical Turk (MTurk), we aimed to recruit 800 participants from the United States and Canada to target a final sample size of 735 participants. Overall, we collected a total of 793 participant responses, of which 771 (97.3%) were from the United States, 21 (2.7%) were from Canada, and 1 was unspecified.¹ Data collection occurred during a single day on May 28, 2020. Users who had completed at least 100 human intelligence tasks (HITs) with an approval rating of at least 90% were invited to participate in an online survey about “Coping with anxiety during the COVID-19 outbreak,” in which they provided demographic information and completed randomized measures of pre-pandemic anxiety symptoms and functional impairment over the past year as well as measures of current exposure to COVID-related stressors, coronavirus-related anxiety symptoms, use of pandemic-related preventive measures, engagement in and emotional responses to affiliation with others, current feelings of loneliness, and perceived changes in current fears of negative evaluation. A total of 41 participants were excluded due to failure to correctly answer at least 80% of the validity questions (e.g., ‘Please choose “very characteristic of me”’), 180 participants were excluded due to being identified as bots through examination of response patterns and text-based responses, 70 participants were excluded because they indicated that their responses were not accurate and wished for their data

¹ Following exclusion of unusable data (described below), the final sample consisted of 470 participants from the US (96.3%) and 18 participants from Canada (3.7%), comparable to the proportions from our initially recruited sample prior to exclusions. Results of regression models did not differ when Canadian participants were included or excluded; thus, all results are reported based on the full sample without excluding Canadian participants.

to not be included in the analyses, and 14 participants who acted as pilot participants were also removed, as they had completed the study at a different timepoint in advance of the actual study administration to test that our methods and procedures were functioning as intended. The final sample consisted of 488 participants. Details regarding the demographic characteristics of the sample can be found in Table 1. We targeted a sample size of 735 based on conservative *a priori* power analyses indicating this sample size would provide power greater than 0.80 to detect small to medium associations (r 's > 0.20) at alpha of .05. Post-hoc power analyses demonstrated that for our planned regression analyses involving a maximum of seven predictor variables, our final sample provided power ranging from 0.85 to 1.00 at alpha of .05, given effect sizes (Cohen's f^2 values) ranging between 0.03 and 1.19 across analyses.

As noted in our preregistered plan, we also collected additional questionnaire data related to other types of anxiety symptoms (including obsessive-compulsive, generalized anxiety, and health anxiety) that were not relevant for the present study. After completing the 90-minute survey, participants were debriefed and remunerated US \$3.50 for their participation. All participants provided informed consent online by clicking an option indicating their agreement to participate in the research study. This study was approved by the University of Waterloo's Office of Research Ethics (#42089).

Measures

Retrospective reports of pre-pandemic social anxiety symptoms. The Social Interaction Anxiety Scale (SIAS; Mattick & Clarke, 1998) was used to retrospectively assess pre-pandemic social anxiety. Participants were asked to rate the items as applicable to them “in the year prior to the COVID-19 outbreak.” The SIAS has good test-retest reliability, convergent validity, and

Table 1
Sample Demographic Characteristics

Variable	Participants, <i>n</i> (%)
Country	
USA	470 (96.3%)
Canada	18 (3.7%)
Age	
18-24	56 (11.5%)
25-39	274 (56.1%)
40-59	128 (26.2%)
60+	46 (9.4%)
Gender	
Female	234 (48.0%)
Male	249 (51.0%)
Non-binary	3 (0.6%)
Other	2 (0.4%)
Ethnicity	
White	292 (59.8%)
Black	92 (18.9%)
Asian	60 (12.3%)
Hispanic Latino	18 (3.7%)
Non-Hispanic Latino	3 (0.6%)
Native American	3 (0.6%)
Multiracial	15 (3.1%)
Other	6 (1.2%)
Income	
< \$20,000	94 (19.3%)
\$20-49,999	162 (33.2%)
\$50-74,999	114 (23.4%)
\$75-99,999	73 (15.0%)
\$100-149,999	34 (7.0%)
>\$150,000	11 (2.3%)
Education	
Graduated high school or high school grade equivalent	33 (6.8%)
Part college or university	56 (11.5%)
Graduated 2 year college or university	43 (8.8%)
Graduated 4 year college or university	228 (46.7%)
Part graduate/ professional school	33 (6.8%)
Completed graduate/ professional school	95 (19.5%)
Relationship status	
Married or cohabiting	300 (61.5%)
Committed relationship	53 (10.9%)
Dating	16 (3.3%)
Not dating or married/cohabiting	119 (24.4%)

internal consistency, and can distinguish between individuals with and without social anxiety disorder (Mattick & Clarke, 1998). Because the four reverse-scored items of the scale have been shown to compromise validity, while the remaining straightforward items have demonstrated excellent internal consistency across a variety of samples (for example, $\alpha = .95$ in an MTurk sample; Rodebaugh, Woods, & Heimberg, 2007; Rodebaugh et al., 2011), only straightforward items were included in creating a final sum score for the SIAS.² Internal consistency of our sample was strong at $\alpha = .97$.

Retrospective reports of pre-pandemic functional impairment from social anxiety. The Sheehan Disability Scale (SDS; Sheehan, 1996) is a three-item instrument that assesses functional impairment in three domains: work/ school, social, and family life. The total sum score on the SDS has previously been shown to have an internal consistency $\alpha = .89$ in a sample of 1001 individuals in a primary care setting with over 80% of individuals with a diagnosed mental disorder having an elevated score (Leon et al., 1997). Participants retrospectively rated the extent to which each domain was impaired by their concerns about social evaluation “in the year prior to the COVID-19 outbreak” on a visual analog-scale from 1 (*not at all*) to 10 (*extremely*). For participants who indicated that they had not worked or studied at all over the past year for reasons unrelated to social evaluation concerns, their rating for the work/school domain was imputed by calculating the mean of their ratings for the social life and family life domains. Internal consistency of the SDS in our sample was $\alpha = .91$.

COVID-related stressors. The “stressful experiences” section of the Coronavirus Stressor Survey (CSS; McLean & Cloitre, 2020) probes whether participants themselves or people close to them have been exposed to any of the following six experiences: becoming ill from possible or

² We replicated the results of our models using the SIAS with reverse-coded items retained. Thus, results are reported with the reverse-scored items removed, consistent with Rodebaugh et al.’s (2011) recommendations.

certain exposure to coronavirus; being hospitalized from exposure to coronavirus; having a job that requires possible exposure to coronavirus; losing a job or income due to the pandemic; experiencing increased responsibilities at home; and experiencing difficulties accessing food, medication or other necessities during the pandemic. Participants indicated whether each experience has happened to them (assigned a score of 2), someone close to them (assigned a score of 1), or not at all (assigned a score of 0), and from these a sum score was created. Internal consistency of the CSS in our sample when scored in this way was $\alpha = .66$.

Current coronavirus anxiety. The Coronavirus Anxiety Scale (CAS; Lee, 2020) instructs participants to endorse how often they have experienced any of the following five COVID-related worries or bodily symptoms of anxiety over the last 2 weeks on a Likert scale ranging from 0 (*not at all*) to 4 (*nearly every day over the last 2 weeks*). Items are summed to create a total score. The scale was developed as a brief mental health screener to classify between adults as having (90% sensitivity) or not having (85% specificity) dysfunctional levels of anxiety (Lee, 2020). Internal consistency of the sum-scored items in our sample was excellent, $\alpha = .93$.

Current loneliness. The Three-Item Loneliness Scale asks participants how often they feel that they lack companionship, feel left out, and feel isolated from others on a scale from 1 (*hardly ever*) to 3 (*often*), and has previously demonstrated an internal consistency of $\alpha = .72$ (Hughes et al. 1999). Internal consistency was $\alpha = .83$ in our sample.

Current use of preventive measures. Participants were asked to rate the frequency at which they used specific COVID-19 preventive measures (listed in Table 2) over the past week on a scale of 0 (*never*) to 4 (*all the time*). The final item, “stocking up on food and other items,” was excluded from analysis due to having 61.43% of missing values. The scale demonstrated strong internal consistency, $\alpha = .90$.

Change in fear of negative evaluation. The Brief Fear of Negative Evaluation Scale (BFNE; Leary, 1983) is a 12-item, condensed version of the Fear of Negative Evaluation Scale (Watson & Friend, 1969) that is highly correlated with the full-length version ($r = .96$) and has demonstrated an internal consistency of $\alpha = .90$ (Leary, 1983). To assess how participants' fear of negative evaluation may have changed since the start of the pandemic, we adapted the scale by asking participants to indicate their agreement with each statement “over the last week, as a result of social distancing” on a scale of 1 (*significantly less than before*) to 7 (*significantly more than before*), which was then rescaled to range from -3 to 3 for data analysis, with 0 representing no change. The adapted measure demonstrated good internal consistency in our sample ($\alpha = .81$).

Current affiliative behaviours compliant with COVID-related restrictions. Participants rated various author-constructed items reflecting different ways they may have tried to connect with others over the prior week during the COVID-19 pandemic that were considered safe, distanced, and compliant with COVID-related restrictions. As listed in Table 2, items included various forms of digital communication, as well as distanced in-person activities such as visiting others while maintaining sufficient physical distance. Participants rated their past-week frequency of use, their level of experienced social connection when used, and the extent to which they experienced a positive emotional response to each COVID-compliant affiliative behaviour on a scale of 0 (less) to 4 (more). Frequency of affiliative behaviours and social connection from affiliative behaviours were highly correlated, $p = .87$, and thus were averaged into to create a composite score, which we labeled “affiliative frequency and connection.” This measure demonstrated excellent internal consistency, $\alpha = .93$. Emotional response to affiliation also demonstrated good internal consistency, $\alpha = .79$.

Table 2*Frequencies of Preventive Measures and Types of Affiliative Behaviours in Sample (n = 488)*

	Never	Once in a while	Some of the time	Most of the time	All of the time
Preventive measures					
Staying at home	6 (1.2%)	23 (4.7%)	58 (11.9%)	244 (50.0%)	157 (32.2%)
Physical distancing	8 (1.6%)	23 (4.7%)	63 (12.9%)	144 (29.5%)	250 (51.2%)
Wearing masks/ gloves	47 (9.6%)	38 (7.8%)	80 (16.4%)	113 (23.2%)	210 (43.0%)
Handwashing	1 (0.2%)	17 (3.5%)	50 (10.2%)	141 (28.9%)	279 (57.2%)
Cleaning	8 (1.6%)	63 (12.9%)	148 (30.3%)	167 (34.2%)	102 (20.9%)
Types of affiliative behaviours					
Text messaging	29 (5.9%)	54 (11.1%)	159 (32.6%)	139 (28.5%)	107 (21.9%)
Posting on social media	92 (18.9%)	119 (24.4%)	127 (26.0%)	95 (19.5%)	55 (11.3%)
One-on-one video calls	121 (24.8%)	117 (24.0%)	132 (27.0%)	80 (16.4%)	38 (7.8%)
One-on-one phone calls	39 (8.0%)	102 (20.9%)	164 (33.6%)	123 (25.2%)	60 (12.3%)
Group calls	160 (32.8%)	116 (23.8%)	113 (23.2%)	79 (16.2%)	20 (4.1%)
Writing/ mailing letters	276 (56.6%)	69 (14.1%)	62 (12.7%)	63 (12.9%)	18 (3.7%)
Hosting live streams	202 (62.1%)	39 (8.0%)	61 (12.5%)	56 (11.5%)	29 (5.9%)
Watching live streams	165 (33.8%)	99 (20.3%)	110 (22.5%)	88 (18.0%)	26 (5.3%)
Multi-player video games	221 (45.3%)	59 (12.1%)	90 (18.4%)	90 (18.4%)	28 (5.7%)
Physically distanced visits	177 (36.3%)	136 (27.9%)	81 (16.6%)	67 (13.7%)	27 (5.5%)
Visiting unexposed others	238 (48.8%)	84 (17.2%)	93 (19.1%)	51 (10.5%)	22 (4.5%)
Activities with others in household	81 (16.6%)	60 (12.3%)	141 (28.9%)	139 (28.5%)	67 (13.7%)

Data preparation and data analytic plan

Data were screened to determine whether they met the assumptions of normality; methods included visually examining the distribution of scores in histograms and the normal Q-Q plot, inspecting the standard error of skewness and kurtosis, and inspecting the data for discontinuous and extreme outliers.

All variables were screened for extreme skewness (>3) and kurtosis (>10) as recommended by Kline (2008). Histograms and normal Q-Q plots were visually examined. No key variables showed significant univariate violations of normality. Univariate outliers were defined as any datapoint exceeding 3 standard deviations from the mean (Kline, 2008), and multivariate outliers were identified by Mahalanobis distance. All outlying data points were examined, deemed plausible, and retained in subsequent analyses.

We then examined the extent and pattern of missing data. Little's MCAR tests showed that all missing data were missing completely at random (MCAR). The frequency of missing data never exceeded 5% for any variable; thus, missing scale scores were replaced using expectation-maximization. The assumption of homoscedasticity was examined and deemed met in all cases based on bivariate scatterplots reflecting associations between independent and dependent variables.

Data were analyzed in IBM SPSS Statistics 26 (2019) using multiple linear regression to determine whether pre-pandemic social anxiety symptoms predicted current outcomes of interest, and whether pre-pandemic functional impairment and recent COVID-related stressors moderated these relations. Predictor variables were centred based on their respective grand means and entered hierarchically, with pre-pandemic social anxiety, pre-pandemic functional impairment, and COVID-related stressors entered on the first three steps, respectively, all two-way interaction terms entered on the fourth step, and the three-way interaction term entered on the fifth step. The conditional effects of pre-pandemic social anxiety on current outcomes at varying levels of pre-pandemic impairment and COVID-related stressors were probed using the PROCESS macro (Hayes, 2013). All collinearity statistics were within acceptable range (VIF < 4, tolerance > .20; Hair et al., 1995).

Results

Descriptive statistics and sample characteristics

Means and standard deviations for measures used in the present study appear in Table 3.

Correlations between all independent and dependent variables can be found in Table 4.

Table 3
Descriptive Statistics for Study Variables

Variable	Mean	SD	Min	Max	Possible range
1. Pre-pandemic social anxiety (SIAS)	25.86	19.28	0	68	0 – 68
2. Pre-pandemic functional impairment (SDS)	9.56	8.58	0	30	0 – 30
3. COVID-related stressors (CSS)	4.51	3.40	0	13	0 – 18
4. Coronavirus anxiety (CAS)	3.75	4.80	3	20	0 – 20
5. Frequency of preventive measures	20.13	3.38	8	25	5 – 25
6. Affiliative frequency and connection	31.19	9.60	12	56.5	12 – 60
7. Emotional response to affiliation	4.53	6.81	-19	24	-24 – 24
8. Δ fear of negative evaluation (BFNE)	-0.37	10.15	-36	36	-36 – 36
9. Loneliness (3-Item Loneliness Scale)	5.27	1.90	3	9	3 – 9

Table 4
Spearman Bivariate Correlations Among Study Variables

	1	2	3	4	5	6	7	8	9
1. Pre-pandemic social anxiety (SIAS)	1								
2. Pre-pandemic impairment (SDS)	.66*	1							
3. COVID-related stressors (CSS)	.21**	.20**	1						
4. Coronavirus anxiety (CAS)	.58**	.58**	.42**	1					
5. Frequency of preventive measures	-.13**	-.10*	-.01	.00	1				
6. Affiliative frequency and connection	.33**	.46**	.31**	.48**	.15**	1			
7. Emotional response to affiliation	.03	.05	.19**	.11*	.25**	.53**	1		
8. Δ fear of negative evaluation (BFNE)	.50**	.40**	.24**	.43**	-.08	.28**	.06	1	
9. Loneliness (3-Item Loneliness Scale)	.53**	.46**	.20**	.54**	-.03	.18**	-.04	.40**	1

* Correlations $p < .05$

**Correlations $p < .01$

SIAS = Social Interaction Anxiety Scale, SDS = Sheehan Disability Scale, CSS = Coronavirus Stressor Survey, CAS = Coronavirus Anxiety Scale, BFNE = Brief Fear of Negative Evaluation Scale

Coronavirus anxiety

We hypothesized that pre-pandemic social anxiety symptoms would predict greater coronavirus anxiety and that moderators would heighten the strength of the association. See Table 5 for multiple linear regression results. In the first step of the model, there was a positive main effect of social anxiety, $B = 0.15$, $SE = 0.01$, $\beta = .60$, $t(486) = 16.42$, $p < .001$, that accounted for 36% of the variance in coronavirus anxiety, $R^2 = .36$, $F(1, 486) = 270.34$, $p < .001$. There was also a positive main effect of pre-pandemic impairment when added in the second step, $B = 0.21$, $SE = 0.03$, $\beta = .38$, $t(485) = 8.45$, $p < .001$, which explained significant additional variance in coronavirus anxiety, $\Delta R^2 = .08$, $F(1, 485) = 70.86$, $p < .001$. In the third step, the positive main effect of COVID-related stressors ($B = 0.38$, $SE = 0.05$, $\beta = .27$, $t(484) = 8.24$, $p < .001$) explained an additional 7% of variance in coronavirus anxiety, $\Delta R^2 = .07$, $F(1, 484) = 68.09$, $p < .001$, while main effects remained significant for both pre-pandemic social anxiety ($B = 0.08$, $SE = 0.01$, $\beta = .31$, $t(484) = 7.35$, $p < .001$) and impairment ($B = 0.20$, $SE = 0.02$, $\beta = .35$, $t(484) = 8.26$, $p < .001$).

The moderating effects of pre-pandemic impairment and COVID-related stressors contributed an additional 4% of variance when entered on the fourth step, $\Delta R^2 = .04$, $F(3, 481) = 14.64$, $p < .001$. The two-way interaction of social anxiety x impairment was significant, $B = 0.00$, $SE = 0.00$, $\beta = .14$, $t(481) = 4.32$, $p < .001$, as was the two-way interaction between SA x stressors, $B = 0.02$, $SE = 0.00$, $\beta = .21$, $t(481) = 4.81$, $p < .001$, as was the two-way interaction between impairment x stressors, $B = -0.02$, $SE = 0.01$, $\beta = -.12$, $t(481) = 2.62$, $p = .009$.

The inclusion of the three-way interaction between social anxiety, impairment, and stressors in the final step of the model explained an additional 1% of variance in coronavirus

Table 5
Hierarchical Linear Regression Predicting Coronavirus Anxiety

Step	IV	<i>B</i>	<i>SE B</i>	<i>p</i> value	<i>F</i> change	ΔR^2
1	(Constant)	3.75	0.17	< .001		
	SA	0.15	0.01	< .001	270.34***	.36
2	(Constant)	3.76	0.16	< .001		
	SA	0.09	0.01	< .001		
	Impairment	0.21	0.03	< .001	70.86***	.08
3	(Constant)	3.75	0.15	< .001		
	SA	0.08	0.01	< .001		
	Impairment	0.20	0.02	< .001		
	Stressors	0.38	0.05	< .001	68.09***	.07
4	(Constant)	3.19	0.18	< .001		
	SA	0.08	0.01	< .001		
	Impairment	0.17	0.02	< .001		
	Stressors	0.48	0.05	< .001		
	SA x impairment	0.00	0.00	.001		
	SA x stressors	0.01	0.00	.001		
	Impairment x stressors	-0.02	0.01	.009	14.64***	.04
5	(Constant)	3.21	0.18	< .001		
	SA	0.08	0.01	< .001		
	Impairment	0.18	0.02	< .001		
	Stressors	0.57	0.06	< .001		
	SA x impairment	0.00	0.00	< .001		
	SA x stressors	0.02	0.00	< .001		
	Impairment x stressors	-0.01	0.01	.077		
	SA x impairment x stressors	0.00	0.00	.018	5.62*	.01

Note: Predictor variables were centred at their means; * $p < .05$, ** $p < .01$, *** $p < .001$. SA = retrospective ratings of pre-pandemic social anxiety, impairment = retrospective ratings of pre-pandemic functional impairment, stressors = COVID-related stressors.

anxiety, $\Delta R^2 = .01$, $F(1, 481) = 5.62$, $p = .018$. The three-way interaction between social anxiety x impairment x stressors significantly predicted coronavirus anxiety, $B = 0.00$, $SE = .000$, $\beta = -.10$, $t(480) = 2.37$, $p = .018$. Specifically, social anxiety had a significant positive conditional effect on coronavirus anxiety when either impairment or stressors were high. As shown in Figure

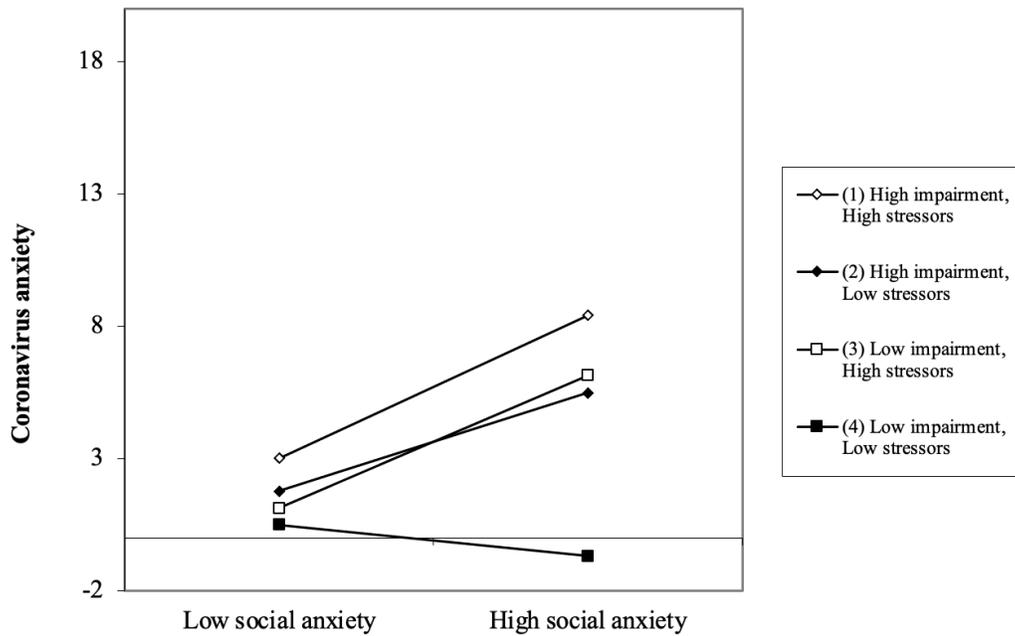


Figure 1. The moderating effects of pre-pandemic impairment and COVID-related stressors on the relationship between pre-pandemic social anxiety and coronavirus anxiety.

1, the magnitude of the positive conditional effect was greatest when impairment and stressors were both high, $B = 0.15$, $SE = 0.02$, $t(480) = 7.25$, $p < .001$, followed by the conditional effect at low impairment and high stressors, $B = 0.12$, $SE = 0.02$, $t(480) = 6.42$, $p < .001$, and at high impairment and low stressors, $B = 0.09$, $SE = 0.02$, $t(480) = 4.74$, $p < .001$. There was no association between pre-pandemic social anxiety symptoms and current levels of coronavirus anxiety when both impairment and stressors were low, $B = -0.02$, $SE = 0.02$, $t(480) = 1.29$, $p = .198$.

Loneliness

We hypothesized that social anxiety would predict increased levels of current loneliness, and that this relationship would be further strengthened by impairment and stressors. As expected, social anxiety significantly predicted increased loneliness when entered in the first step

Table 6
Hierarchical Linear Regression Predicting Loneliness

Step	IV	<i>B</i>	<i>SE B</i>	<i>p</i> value	<i>F</i> change	ΔR^2
1	(Constant)	5.27	0.07	< .001		
	SA	0.05	0.00	< .001	171.28***	.26
2	(Constant)	5.27	0.07	< .001		
	SA	0.04	0.01	< .001		
	Impairment	0.04	0.01	.001	14.56***	.02
3	(Constant)	5.27	0.07	< .001		
	SA	0.04	0.01	< .001		
	Impairment	0.04	0.01	< .001		
	Stressors	0.04	0.02	.071	3.28	.01
4	(Constant)	5.20	0.09	< .001		
	SA	0.04	0.01	< .001		
	Impairment	0.04	0.01	.002		
	Stressors	0.04	0.02	.093		
	SA x impairment	0.00	0.00	.180		
	SA x stressors	0.00	0.00	.797		
	Impairment x stressors	0.00	0.00	.678	0.61	.00
5	(Constant)	5.21	0.09	< .001		
	SA	0.04	0.01	< .001		
	Impairment	0.04	0.01	< .001		
	Stressors	0.06	0.03	.035		
	SA x impairment	0.00	0.00	.163		
	SA x stressors	0.00	0.00	.910		
	Impairment x stressors	0.00	0.01	.997		
	SA x impairment x stressors	0.00	0.00	.200	1.65	.00

Note: Predictor variables were centred at their means; * $p < .05$, ** $p < .01$, *** $p < .001$. SA = retrospective ratings of pre-pandemic social anxiety, impairment = retrospective ratings of pre-pandemic functional impairment, stressors = COVID-related stressors.

of the model, $B = 0.05$, $SE = 0.00$, $\beta = .51$, $t(486) = 13.09$, $p < .001$, and accounted for 26% of variance, $R^2 = .26$, $F(1, 486) = 171.28$, $p < .001$ (see Table 6). Impairment entered on the second step also had a positive main effect on loneliness, $B = 0.04$, $SE = 0.01$, $\beta = .19$, $t(485) = 3.79$, $p < .001$, and explained an additional 2% of unique variance, $\Delta R^2 = .02$, $F(1, 485) = 14.56$, p

< .001. Entering COVID-related stressors as a predictor on the third step did not contribute significantly to the model, $\Delta R^2 = .01$, $F(1, 484) = 3.28$, $p = .071$. Additionally, there were no significant interaction effects, nor did they explain additional variance in subsequent steps, indicating that the relationship between social anxiety and loneliness was not moderated by either impairment or stressors.

Frequency of use of preventive measures

We hypothesized that social anxiety would predict greater use of preventive measures and that these effects would be moderated by impairment and COVID-related stressors. Entering pre-pandemic social anxiety in the first step of the model explained only 1% of variance in preventive measures, $R^2 = .01$, $F(1, 486) = 5.81$, $p = .02$ (see Table 7), and contrary to our hypothesis, greater social anxiety predicted less frequent use of preventive measures, $B = -0.02$, $SE = 0.01$, $\beta = -.11$, $t(486) = 2.41$, $p = .016$. When pre-pandemic impairment was entered on the second step, there was no significant additional variance explained, nor when COVID-related stressors was entered on the third step, , and the main effect of social anxiety was no longer significant in these steps. However, the two-way moderating effects of impairment and stressors entered on the fourth step contributed significantly to the model, $\Delta R^2 = .05$, $F(1, 481) = 7.88$, $p < .001$. The two-way interaction between social anxiety x impairment was significant, $B = 0.00$, $SE = 0.00$, $\beta = .18$, $t(481) = 3.78$, $p < .001$, as was the two-way interaction between social anxiety x stressors, $B = 0.01$, $SE = 0.00$, $\beta = .18$, $t(481) = 2.92$, $p = .004$. When simple slopes were probed, there was a significant negative conditional effect of SA on use of preventive measures at low impairment ($B = -0.04$, $SE = 0.01$, $\beta = -.25$, $t(481) = 3.41$, $p < .001$), but no conditional association at high impairment ($B = 0.02$, $SE = 0.01$, $\beta = .08$, $t(481) = 1.55$, $p = .122$). There was also a significant negative conditional effect of pre-pandemic social anxiety on use

Table 7
Hierarchical Linear Regression Predicting Use of Preventive Measures

Step	IV	<i>B</i>	<i>SE B</i>	<i>p</i> value	<i>F</i> change	ΔR^2
1	(Constant)	20.13	0.15	< .001		
	SA	-0.02	0.01	.016	5.81*	.01
2	(Constant)	20.13	0.15	< .001		
	SA	-0.02	0.01	.086		
	Impairment	0.00	0.03	.881	0.02	.00
3	(Constant)	20.13	0.15	< .001		
	SA	-0.02	0.01	.074		
	Impairment	0.00	0.03	.830		
	Stressors	0.04	0.05	.451	0.57	.00
4	(Constant)	19.74	0.19	< .001		
	SA	-0.01	0.01	.293		
	Impairment	-0.03	0.03	.158		
	Stressors	0.02	0.05	.654		
	SA x impairment	0.00	0.00	< .001		
	SA x stressors	0.01	0.00	.004		
	Impairment x stressors	-0.03	0.01	< .001	7.88**	.05
5	(Constant)	19.74	0.19	< .001		
	SA	-0.01	0.01	.298		
	Impairment	-0.04	0.03	.153		
	Stressors	0.01	0.07	.820		
	SA x impairment	0.00	0.00	< .001		
	SA x stressors	0.00	0.00	.004		
	Impairment x stressors	-0.03	0.01	< .001		
	SA x impairment x stressors	0.00	0.00	.824	0.05	.00

Note: Predictor variables were centred at their means; * $p < .05$, ** $p < .01$, *** $p < .001$. SA = retrospective ratings of pre-pandemic social anxiety, impairment = retrospective ratings of pre-pandemic functional impairment, stressors = COVID-related stressors.

of preventive measures at low stressors ($B = -0.04$, $SE = 0.02$, $\beta = -.25$, $t(481) = 2.95$, $p = .003$), but not at high stressors ($B = 0.02$, $SE = 0.02$, $\beta = .12$, $t(481) = 1.37$, $p = .172$).

Change in fear of negative evaluation

We hypothesized that pre-pandemic social anxiety would predict a decrease in current FNE. Contrary to our hypothesis, in the regression model predicting change in FNE since the start of the pandemic (see Table 8), entering social anxiety on the first step resulted in a significant positive main effect such that greater pre-pandemic SA predicted an increase in fear of negative evaluation during the pandemic, $B = 0.21$, $SE = 0.02$, $\beta = .39$, $t(486) = 9.44$, $p < .001$, accounting for 16% of variance, $R^2 = .16$, $F(1, 486) = 89.17$, $p < .001$. Including impairment as a predictor on the second step explained a marginally significant amount of additional variance in change in FNE, $\Delta R^2 = .01$, $F(1, 485) = 3.97$, $p = .047$, with impairment also predicting increased FNE, $B = 0.13$, $SE = 0.07$, $\beta = .11$, $t(485) = 1.99$, $p = .047$, and the main effect of social anxiety remaining significant, $B = 0.17$, $SE = 0.03$, $\beta = .32$, $t(485) = 5.85$, $p < .001$. When stressors were entered on the third step, there was no significant change to the model. Further, contrary to hypotheses, impairment and COVID-related stressors did not moderate the relationship between pre-pandemic SA and changes in FNE.

Affiliative behaviours

Affiliative frequency and connection

We anticipated the composite score of affiliative frequency and social connection to decrease as pre-pandemic social anxiety symptoms increased. Contrary to expectations, social anxiety had a positive main effect on affiliative frequency and social connection in the first step, $B = 0.19$, $SE = 0.02$, $\beta = .39$, $t(486) = 9.21$, $p < .001$, and explained 14.7% of unique variance, $R^2 = .15$, $F(1, 486) = 84.72$, $p < .001$ (see Table 9). When entered on the second step, impairment significantly explained an additional 12.4% of variance, $\Delta R^2 = .12$, $F(1, 485) = 82.89$, $p < .001$, and had an unexpected positive main effect on affiliative frequency and

Table 8*Hierarchical Linear Regression Predicting Change in Fear of Negative Evaluation*

Step	IV	<i>B</i>	<i>SE B</i>	<i>p</i> value	<i>F</i> change	ΔR^2
1	(Constant)	-0.37	0.42	.378		
	SA	0.21	0.02	< .001	89.17***	.16
2	(Constant)	-0.37	0.42	.383		
	SA	0.17	0.03	< .001		
	Impairment	0.13	0.07	.047	3.97*	.01
3	(Constant)	-0.38	0.42	.383		
	SA	0.17	0.03	< .001		
	Impairment	0.13	0.07	.049		
	Stressors	0.16	0.13	.901	0.90	.00
4	(Constant)	-0.99	0.52	.059		
	SA	0.18	0.03	< .001		
	Impairment	0.10	0.07	.187		
	Stressors	-0.02	0.13	.877		
	SA x impairment	0.00	0.00	.116		
	SA x stressors	0.02	0.01	.072		
	Impairment x stressors	-0.02	0.02	.419	2.15	.01
5	(Constant)	-0.96	0.52	.067		
	SA	0.17	0.03	< .001		
	Impairment	0.11	0.07	.120		
	Stressors	0.12	0.16	.447		
	SA x impairment	0.01	0.00	.104		
	SA x stressors	0.02	0.01	.105		
	Impairment x stressors	-0.01	0.02	.753		
	SA x impairment x stressors	0.00	0.00	.138	2.21	.00

Note: Predictor variables were centred at their means; * $p < .05$, ** $p < .01$, *** $p < .001$. SA = retrospective ratings of pre-pandemic social anxiety, impairment = retrospective ratings of pre-pandemic functional impairment, stressors = COVID-related stressors.

Table 9

Hierarchical Linear Regression Predicting Affiliative Frequency and Social Connection Composite Measure

Step	IV	<i>B</i>	<i>SE B</i>	<i>p</i> value	<i>F</i> change	ΔR^2
1	(Constant)	31.19	0.40	< .001		
	SA	0.19	0.02	< .001	84.72***	.15
2	(Constant)	31.18	0.37	< .001		
	SA	0.04	0.03	.117		
	Impairment	0.49	0.06	< .001	82.89***	.12
3	(Constant)	31.18	0.36	< .001		
	SA	0.03	0.03	.309		
	Impairment	0.50	0.06	< .001		
	Stressors	0.60	0.11	< .001	30.70***	.04
4	(Constant)	29.29	0.41	< .001		
	SA	0.05	0.02	.030		
	Impairment	0.37	0.05	< .001		
	Stressors	0.56	0.10	< .001		
	SA x impairment	0.02	0.00	< .001		
	SA x stressors	0.03	0.01	< .001		
	Impairment x stressors	-0.05	0.02	< .001	25.16***	.09
5	(Constant)	29.26	0.41	< .001		
	SA	0.05	0.02	.033		
	Impairment	0.37	0.06	< .001		
	Stressors	0.56	0.13	< .001		
	SA x impairment	0.02	0.00	< .001		
	SA x stressors	0.03	0.01	< .001		
	Impairment x stressors	-0.05	0.02	.014		
	SA x impairment x stressors	0.00	0.00	< .001	0.51	.00

Note: Predictor variables were centred at their means; * $p < .05$, ** $p < .01$, *** $p < .001$. SA = retrospective ratings of pre-pandemic social anxiety, impairment = retrospective ratings of pre-pandemic functional impairment, stressors = COVID-related stressors.

connection, $B = 0.49$, $SE = 0.06$, $\beta = .47$, $t(485) = 9.10$, $p < .001$, and the main effect of social anxiety was surprisingly no longer significant, $B = 0.03$, $SE = 0.03$, $\beta = .05$, $t(485) = 1.01$, $p = .309$. When entered on the third step, stressors contributed significantly to the model, $\Delta R^2 = .04$, $F(1, 484) = 30.70$, $p < .001$, and also had a surprising positive main effect on affiliative

frequency and connection, $B = 0.60$, $SE = 0.11$, $\beta = .21$, $t(484) = 5.54$, $p < .001$. After stressors were included, impairment continued to have a positive main effect, $B = 0.50$, $SE = 0.06$, $\beta = .44$, $t(484) = 8.85$, $p < .001$, and the main effect of SA remained non-significant, $B = 0.03$, $SE = 0.03$, $\beta = .05$, $t(485) = 1.01$, $p = .309$.

The moderating effects of impairment and COVID-related stressors explained an additional 9.3% of unique variance, $\Delta R^2 = .09$, $F(3, 481) = 25.16$, $p < .001$. The two-way interaction between pre-pandemic SA x impairment was significant, $B = 0.02$, $SE = 0.00$, $\beta = .28$, $t(481) = 7.48$, $p < .001$, as was the two-way interaction between pre-pandemic SA x stressors, $B = 0.03$, $SE = 0.02$, $\beta = .23$, $t(481) = 4.52$, $p < .001$. Probing of simple slopes revealed that SA had a significant negative conditional effect on affiliative frequency and connection at low levels of impairment, $B = -0.10$, $SE = 0.03$, $\beta = -.19$, $t(481) = 3.33$, $p < .001$, but a significant positive conditional effect at high levels of impairment, $B = 0.20$, $SE = 0.03$, $\beta = .40$, $t(481) = 6.12$, $p < .001$. SA had a negative conditional effect on affiliative frequency and connection at low stressors that neared significance, $B = -0.06$, $SE = 0.03$, $\beta = -.12$, $t(481) = 1.88$, $p = .06$, but a positive conditional effect at high stressors, $B = 0.16$, $SE = 0.04$, $\beta = .33$, $t(481) = 4.59$, $p < .001$. When entered on the final fifth step, the three-way interaction between social anxiety, impairment, and stressors failed to reach the required statistical threshold for explaining significant unique variance, $\Delta R^2 = .001$, $F(1, 480) = 0.51$, $p = .476$.

Emotional response to affiliation

We hypothesized that pre-pandemic social anxiety would predict a more negative emotional response to affiliation. Contrary to our hypothesis, the main effect of social anxiety in the first step was non-significant (see Table 10). However, there was a small, positive effect of

Table 10*Hierarchical Linear Regression Predicting Emotional Response to Affiliative Behaviours*

Step	IV	<i>B</i>	<i>SE B</i>	<i>p</i> value	<i>F</i> change	ΔR^2
1	(Constant)	4.53	0.31	< .001		
	SA	0.02	0.02	.319	1.00	.00
2	(Constant)	4.53	0.31	< .001		
	SA	-0.01	0.02	.553		
	Impairment	0.09	0.05	.06	3.58	.01
3	(Constant)	4.53	0.30	< .001		
	SA	-0.02	0.02	.310		
	Impairment	0.07	0.05	.117		
	Stressors	0.36	0.09	< .001	15.28***	.02
4	(Constant)	2.99	0.36	< .001		
	SA	-0.00	0.02	.964		
	Impairment	-0.02	0.05	.623		
	Stressors	0.29	0.09	< .001		
	SA x impairment	0.01	0.00	< .001		
	SA x stressors	0.02	0.01	.010		
	Impairment x stressors	-0.04	0.01	.011	19.91***	.11
5	(Constant)	2.99	0.36	< .001		
	SA	-0.00	0.02	.953		
	Impairment	-0.02	0.05	.669		
	Stressors	0.31	0.11	.000		
	SA x impairment	0.01	0.00	< .001		
	SA x stressors	0.02	0.01	.012		
	Impairment x stressors	-0.04	0.02	.021		
	SA x impairment x stressors	0.00	0.00	.740	0.11	0.00

Note: Predictor variables were centred at their means; * $p < .05$, ** $p < .01$, *** $p < .001$. SA = retrospective ratings of pre-pandemic social anxiety, impairment = retrospective ratings of pre-pandemic functional impairment, stressors = COVID-related stressors.

impairment on the second step that approached significance, $B = 0.09$, $SE = 0.05$, $\beta = .11$, $t(485) = 1.89$, $p = .06$, which explained 1% unique variance in emotional response, $\Delta R^2 = .01$, $F(1, 485) = 3.58$, $p = .059$. There was also a small but significant positive main effect of stressors when entered in the third step, $B = 0.36$, $SE = 0.09$, $\beta = .18$, $t(484) = 3.91$, $p < .001$, which also

contributed significantly to the model, $\Delta R^2 = .02$, $F(1, 484) = 15.28$, $p < .001$. When the moderating effects of impairment and COVID-related stressors were entered in the fourth step, an additional 11% of variance was explained, $\Delta R^2 = .11$, $F(3, 481) = 19.91$, $p < .001$. Impairment significantly moderated the relationship between SA and emotional response in the social anxiety x impairment interaction, $B = 0.01$, $SE = 0.00$, $\beta = .33$, $t(481) = 7.39$, $p < .001$, as did stressors in the two-way interaction between social anxiety x stressors, $B = 0.02$, $SE = 0.01$, $\beta = .16$, $t(481) = 2.58$, $p = .010$. Probing of simple slopes revealed a surprising cross-over interaction: at low impairment, higher levels of SA were associated with less positive emotional responses to affiliation ($B = -0.13$, $SE = 0.03$, $t(481) = \beta = -.35$, $t(481) = 5.09$, $p < .001$); meanwhile, at high impairment, social anxiety positively predicted positive emotional responses to affiliation ($B = 0.20$, $SE = 0.03$, $\beta = .40$, $t(481) = 6.12$, $p < .001$). Including the three-way interaction in the fifth step did not contribute significantly to the final model.

Discussion

The present study examined the effects of pre-existing social anxiety symptoms on mental health and interpersonal outcomes during the pandemic, as well as the potential moderating roles of pre-existing functional impairment and COVID-related stressors. Results partially supported hypotheses and emphasize several unique challenges that the COVID-19 pandemic has posed for individuals with reported pre-pandemic social anxiety.

Summary and implications of findings

As hypothesized, higher levels of pre-existing social anxiety predicted greater current levels of coronavirus anxiety, especially when pre-existing impairment and COVID-related stressors were high, with the final model explaining a large amount (55.5%) of the variance overall. These findings are consistent with recent research showing that individuals with a pre-existing anxiety-related diagnosis have been more negatively impacted by COVID-19-related stress than healthy controls (Asmundson et al., 2020). Since individuals with high levels of impairment experience social anxiety as interfering in various life domains (Aderka et al., 2012), they may be ill-equipped to cope with the additional stress of the pandemic.

In support of our hypothesis regarding loneliness and interpersonal outcomes, increased retrospective pre-pandemic SA predicted increased feelings of current loneliness, with pre-pandemic impairment independently explaining a significant, though small amount of incremental variance. These findings are consistent with evidence from prior research showing that social anxiety, when compared to other mental health symptoms such as depression and paranoia, has unique longitudinal effects on loneliness (Lim et al., 2016). It is reasonable to imagine that those experiencing higher and more impairing levels of social anxiety are more likely to avoid the types of situations that would provide increased opportunities for social

contact that could reduce loneliness. Greater exposure to COVID-related stressors may have also marginally contributed to increased loneliness by forcing people to self-quarantine and experience more resulting isolation.

Contrary to our hypothesis on the use of preventive measures, pre-pandemic social anxiety predicted less use of preventive measures, such as social distancing or mask-wearing, especially at lower levels of impairment; however, these effect sizes were small, with only 4.6% of variance explained by the final model. In fact, there was restricted variance overall, with most participants near ceiling in their reported frequency of preventive measures use, perhaps due to data collection occurring at a time during the pandemic when rate of transmission was high, lockdown rules were still in place in certain locations, and scientific knowledge about how the disease spreads was more rudimentary than it is currently. Additionally, at this early stage of the pandemic, there may have been large variability in people's attitudes towards preventive measures, as many of these measures had not yet been considered normative and in certain places, were politicized. The large amount of missing data for the "stocking up on household items" item of the scale may suggest the inconsistency of this behaviour in the general population despite earlier narratives of stocking up being a common response to the pandemic, especially given evidence that stocking up or panic buying is a sporadic behaviour catalyzed by threats of lockdown (Taylor, 2021). It is also possible this item was difficult for participants to quantify as "stocking up" and "household items" were not clearly defined.

Despite the lower use of preventive measures amongst socially anxious individuals, pre-pandemic levels of social anxiety predicted heightened fears of negative evaluation since the start of the pandemic, with a medium effect size and no reliable contributions from impairment or stressors. The association between pre-pandemic social anxiety and current fears of negative

evaluation may be attributable to the high degree of conceptual and psychometric overlap between the two constructs, though the collinearity statistics raised no concerns before proceeding with the regression model. Indeed, these increases in fears of negative evaluation are in line with maintenance models of social anxiety (e.g., Clark & Wells, 1995; Rapee & Heimberg, 1997; Wong & Rapee, 2016), which suggest that avoidance and lack of learning opportunities to disprove feared outcomes (reinforced by social distancing and lockdown measures) would have the potential to exacerbate such symptoms. A scarcity of opportunities for genuine, authentic social interaction during the pandemic may have increased the perceived importance of each individual social interaction, with socially anxious individuals experiencing evaluative concerns with greater intensity during each social encounter. It is also possible that heightened fears of negative evaluation may be related to confronting novel socially threatening situations that have only arisen because of the pandemic. For example, socially anxious individuals may fear others' ridicule criticism or rejection if their behaviour fails to comply with pandemic-specific norms (e.g., failing to wear a mask when it is required or wearing a mask when it is unexpected, or providing others with too much or too little physical distance)—situations which would not have elicited evaluative concerns in the past. The fact that fears of negative evaluation have increased rather than decreased among those with higher levels of pre-existing vulnerabilities suggest that the core symptoms of social anxiety have not been abated by pandemic-related social restrictions, and is in line with classic cumulative risk hypotheses wherein a variety of risk factors, both environmental and individual, exhibit additive or interactive and synergistic consequences on key outcomes (Rutter, 1979; Sameroff, 2000).

In contrast to our hypothesis on the affiliative behaviours of socially anxious individuals during the pandemic, higher levels of social anxiety, greater impairment, and more COVID-

related stressors each independently predicted *greater* affiliative efforts during the pandemic. Moreover, the three variables interacted with one another such that high socially anxious individuals whose symptoms caused the greatest functional impairment reported engaging the most frequently in affiliative behaviours during the pandemic, particularly if they had experienced more COVID-related stressors. High levels of loneliness during the pandemic could be driving socially anxious individuals to affiliate more with others, with the potential rewards of social connection (in the face of isolation and loneliness from COVID-19) outweighing the risks of negative evaluation, particularly if affiliation is occurring exclusively with close, familiar others who are seen as socially “safe,” as discussed in more detail below. This trade-off may be unique to the pandemic context, given previous research demonstrating socially anxious individuals’ tendency to avoid and withdraw from social opportunities to connect with others (Heeren & McNally, 2018; Kirk, Meyer, Whisman, Deacon, & Arch, 2019). Social anxiety and loneliness have also been associated with a greater frequency of problematic social media use (O’Day & Heimberg, 2021), providing a potential explanation as to why socially anxious individuals may be affiliating more often using methods compliant with COVID-related restrictions if many of their interactions are online. Furthermore, social interactions during the pandemic may inherently offer greater opportunities for self-concealment to counter socially anxious individuals’ intensified evaluative concerns, emboldening them to pursue more social opportunities.

Our results also showed that the degree of affiliation-derived enjoyment experienced by participants with higher levels of social anxiety depended on their degree of impairment: individuals with higher pre-existing social anxiety who were more impaired experienced *more* positive emotional responses to affiliation, whereas those who were not as impaired by their

social anxiety reported significantly less positive reactions towards affiliation. Additionally, pre-pandemic social anxiety did not significantly predict emotional responses to affiliation among those who had experienced a greater number of COVID-related stressors, and in fact predicted more negative emotional responses to affiliation among those who had experienced fewer COVID-related stressors. It is unclear whether highly impaired, socially anxious participants truly experienced genuine social pleasure, or only perceived pandemic-specific affiliative behaviours as positive due to conferring greater levels of social safety relative to the pre-pandemic in-person interactions that would be appraised as more threatening (Moscovitch, 2009) and therefore less pleasurable (Gilboa-Schechtman et al., 2014; Kashdan, 2004). Furthermore, it is unclear why those burdened by fewer COVID-related stressors reported experiencing affiliation during the pandemic as more distressing and less enjoyable. One possibility is that those who experienced fewer COVID-related stressors had greater opportunities to initiate social connection with others and found initiation to be anxiety-inducing, while those who experienced more COVID-related stressors viewed affiliation as a supportive and helpful way to cope with their stress and emotions.

Potential explanations for unexpected, heightened affiliation

Why have socially anxious individuals been affiliating more during the pandemic, with marginal benefits for emotional response and negative consequences for evaluative fears and loneliness? Below, we explore several potential explanations.

Greater control over self-presentation

The nature of social interactions during the pandemic may inherently offer greater opportunities for self-protection by lowering the typical costs of self-concealment and emboldening socially anxious individuals to pursue more social opportunities than they typically

would, even in the presence of intensified evaluative concerns. Even though fears of negative evaluation have persisted during the pandemic, it is possible that socially anxious individuals feel that physical distancing measures help keep others at a safer social distance, thereby promoting greater affiliative attempts. There is clear support in the existing literature for the idea that greater physical distance may reduce perceptions of social threat for socially anxious individuals (Azriel, Lazarov, Segal, & Bar-Haim, 2020; Givon-Benjio, Oren-Yagoda, Aderka, & Okon-Singer, 2020; Kamalou et al., 2019; Rinck et al., 2010). They may be inconspicuously co-opting newly introduced social norms—such as communicating online, interacting from a physical distance, or conversing from behind a mask—as self-regulatory strategies, allowing them to remain concealed while conforming to societal expectations. These pandemic-specific norms for interaction and communication may help to facilitate increased affiliation for those with higher levels of pre-existing impairment who would likely rely the most on safety behaviours.

From an approach-avoidance standpoint, while it may appear that socially anxious individuals are engaging in more approach behaviours, their affiliative attempts may be best characterized as “cautious approach,” or behavioural inhibition induced by the detection of goal conflict—in this case, social connection vs. self-concealment—as opposed to pure approach towards appetitive stimuli and active pursuit of reward (Corr, 2013). A “cautious approach” towards affiliation could partially explain the continued negative mental health outcomes in socially anxious individuals, despite self-reported increases in positivity. Highly impaired, socially anxious participants may not be experiencing genuine social pleasure and reward. Instead, they may be conflating true positive emotion with the perceived advantages of pandemic-specific affiliation; namely, that affiliative contexts during the pandemic confer greater levels of social safety relative to pre-pandemic in-person interactions that were appraised

as more threatening and exposing (Moscovitch, 2009), and therefore less pleasurable (Gilboa-Schechtman, Shachar, & Sahar, 2014; Kashdan, 2004). This also fits with Kashdan et al.'s (2011) conceptualization that socially anxious individuals' tendency to rely on maladaptive self-regulatory strategies depletes valuable resources for fully attending to social pleasure.

Affiliation as a means for emotion regulation

At the same time, high socially anxious individuals may be using affiliation as a form of interpersonal emotion regulation during the pandemic, reflecting a need to fulfill self-preservative, self-regulatory goals—such as decreasing negative affect or coping with COVID-related stressors—rather than to pursue social enjoyment and pleasure. Zaki & Williams (2013) conceptualize interpersonal emotion regulation as pursuit of a regulatory goal in the context of a live social interaction. They elaborate that although interpersonal regulation can only occur in social contexts, individuals may pursue regulatory goals for either intrinsic or extrinsic purposes (with the intent of influencing the self or the other, respectively), and that they may be achieved in either a response-dependent or response-independent manner. Consistent with the view that people commonly seek out the company of others under stressful circumstances (Rimé, 2009; Schachter, 1959), socially anxious individuals may be relying on others to reduce negative affect, engaging in intrinsic, response-dependent interpersonal emotion regulation. However, socially anxious individuals' negative mental health outcomes indicate that they may be doing a poor job of regulating their emotions despite their best efforts of reaching out to others. This could potentially be explained by two identified key dimensions of interpersonal emotion regulation: the *tendency* to seek out others in response to emotional events, and *efficacy* at managing emotions after doing so (Williams, Morelli, Ong, & Zaki, 2018). Socially anxious individuals

may have a higher tendency to affiliate during the pandemic, without the ability to subsequently regulate their fears and negative affect in an efficacious manner.

Role of close relationships

Another reason socially anxious individuals may be affiliating more frequently than expected is by selectively interacting with people with whom they feel closest and most comfortable, thus reducing perceptions of social threat by resorting to familiar relationships. Indeed, the closeness and quality of relationships are crucial factors of the benefits they can provide (e.g., Blieszner, 2014; Demir & Weitekamp, 2007). However, though affiliating and connecting with others comes with interpersonal and emotional benefits, maladaptive over-reliance on particular close others—also referred to as “safety people” (Hofmann, 2014)—can be unproductive for high socially anxious individuals by eroding their beliefs that they would be capable of independently navigating unfamiliar social situations. It is unclear if socially anxious individuals have been intentionally affiliating with certain close others and “safety people,” or whether their proximity to close others has been a natural product of restricted social circles during the pandemic.

There is some evidence to suggest that socially anxious individuals have a self-protective communication style even in close relationships (Cuming & Rapee, 2010). Due to their fears of rejection and criticism, socially anxious individuals tend to engage in less self-disclosure, an essential component of fostering interpersonal intimacy. It is natural that socially anxious individuals would perceive their closest friends and relatives as non-threatening and rate these affiliative experiences more positively during the pandemic, but they may continue to display inhibition and self-protection in the context of these close relationships that blocks them from experiencing the full potential of social reward to overcome their interpersonal difficulties, such

as fears of negative evaluation and feelings of loneliness. We did not collect data on the specific targets of their affiliative efforts nor on participants' perceived purpose of such efforts, but the increase in reported attempts to connect more with others during the pandemic may represent a "cry for help" that reflects a greater current need for support among those with higher and more impairing pre-pandemic symptoms of social anxiety. This may have been particularly true during a time when lockdown prevented many people from accessing the normal medical and psychiatric treatment services they may have needed. Thus, further exploring not only who socially anxious individuals have been interacting with, but also the quality of the relationships with these people and the specific contexts of the interactions would help determine whether socially anxious individuals have been affiliating in adaptive ways during the pandemic.

Limitations

Several limitations of our research should be noted. Pre-pandemic social anxiety symptoms and functional impairment were assessed retrospectively. This could have resulted in potential cognitive biases including selective memory for negative events and emotions. If those who retrospectively reported high levels of social anxiety were not as anxious as they recalled, the association between social anxiety and increased frequency of affiliative behaviours may have been inflated. Conversely, it is possible that some may have underestimated their pre-pandemic symptoms of social anxiety, especially if they viewed circumstances with COVID-19 as being relatively stressful; this type of underestimation in pre-pandemic symptoms would suggest that socially anxious individuals are doing relatively worse during the pandemic than was being reported. However, even with these potential limitations, retrospective ratings continued to be valuable in our study in that they provided insight into people's self-perceptions

and self-comparisons of their current coping, which would also play an important role in their actual ability to cope and benefit from social support.

An additional limitation concerns how we operationalized stressors. In the present study, COVID-related stressors experienced directly by participants were assigned a higher score than stressors affecting close others in participants' lives. However, recent studies found that participants were more likely to feel anxious when someone close to them was at high risk for contracting COVID-19 relative to those who were themselves at high risk, perhaps due to increased perceived control over their own situations (Dozois, 2020; Elton-Marshall et al., 2020). Future research should consider whether to weigh the impact of stress for self vs. others in ways that take into consideration these recent findings, especially when studying the long-term effects of COVID-related stress.

Given that COVID-19 has differentially impacted demographic groups (e.g., Abedi et al., 2020; Mahajan & Larkins-Pettigrew, 2020), additional research is needed to understand how these variables may play a role in our examined outcomes. We opted not to explore the impact of demographic variables in the present study due to concerns about power; for example, the number of older participants was too small to investigate because the sampling was not conducted with such aims in mind. Future studies should also focus on socially anxious individuals' relationships with the specific targets of their affiliative efforts, the goals behind their engagement in affiliative behaviors, and how these may have shifted longitudinally.

Indeed, given the cross-sectional, correlational nature of the study, we were unable to take into account the rapidly evolving COVID-19 context over a longer period of time or incorporate a longitudinal design that would allow for repeated measurement of key constructs over time and enable us to draw conclusions about directional effects and causality. Furthermore,

since we analyzed each outcome separately with hierarchical regression analyses, future studies may benefit from analyses using a structural equation modeling (SEM) framework to better account for any correlations between various predictors and outcomes. Though there were relatively few missing data overall in the present study, a SEM approach would also eliminate the need for imputation of missing values.

Finally, our study focused primarily on affiliative behaviors that were compliant with COVID-related restrictions; future research may fruitfully include a broader assessment of changes in social contact across varying levels of compliance, especially as widespread vaccinations continue and lead to increased variability in the use of public health guidelines. Furthermore, our study relied solely on self-report questionnaires, which may be inherently biased. Future studies could include other-report measures, or employ ecological momentary assessment (EMA) or day reconstruction method (DRM) as more precise and accurate measures of participants' engagement in various affiliative behaviours and their emotional responses as they occur throughout the study period.

Clinical implications

The conceptualization of pandemic-imposed restrictions as a factor that may maintain social avoidance and anxiety has not been widely addressed; however, a recent quasi-experimental study of 99 socially anxious students did find that in the academic years preceding the pandemic, high socially anxious students generally tended to experience symptom decreases from the start to the end of the term, but that students' levels of social anxiety remained uniquely high and unchanged during the 2019 – 2020 academic year (Arad et al., 2021). Authors interpreted these findings as consistent with cognitive-behavioural models of social anxiety wherein exposure to social situations allows for the learning of new information about social

situations, aiding a reduction in anxiety (Heimberg, 2002; Turk et al., 2008), arguing that the nature of the pandemic context during the 2019-2020 academic year may have prevented such exposure from happening naturally, resulting in persistent social anxiety symptoms within the student population throughout the year. These results underscore the importance of exposure to social situations as a key mechanism of fear reduction (Moscovitch et al., 2009). Indeed, therapists implementing cognitive-behavioural interventions for SAD during the ongoing COVID-19 pandemic need to help socially anxious individuals engage in effective, yet physically safe exposure exercises to facilitate corrective information about feared social situations.

Moving forward, the use of masks may also have important implications for the treatment of SAD. Despite their benefits of preventing disease transmission, masks have also been identified as barriers to the interpretation of social and emotional feedback, potentially heightening the ambiguity of social cues which socially anxious individuals are then more likely to interpret negatively (Saint & Moscovitch, 2021). However, masks may also be viewed favourably by socially anxious individuals as a way to conceal self-perceived flaws or physical signs of anxiety, even after when disease transmission is no longer a concern. Thus, future clinical research should investigate the extent to which socially anxious individuals are relying on masks as maladaptive safety behaviours, and whether mask use would be a valuable target for intervention in the treatment of SAD.

Individuals with SAD could also experience treatment ambivalence if they do not perceive their symptoms as interfering in the face of pandemic-related restrictions, as suggested by our findings of increased affiliation despite continued consequences of loneliness and fears of negative evaluation amongst high socially anxious participants with high levels of pre-pandemic

impairment. The importance of such self-awareness and motivation is highlighted by a study showing that clinicians perceived that CBT was most effective for socially anxious clients when such clients were willing to experiment with new ways of thinking and behaving, accept the rationale for CBT, take responsibility for change, and feel motivated to engage in treatment (Frei & Peters, 2012). To this end, motivational interviewing (MI) could be a tool to engage socially anxious individuals in therapy, especially those with a high level of ambivalence due to low perceived impairment during the pandemic or fear of judgment for seeking treatment (Buckner, 2009; Romano et al., 2021; Westra & Dozois, 2006). MI techniques may be useful for engaging socially anxious clients in pondering the importance of addressing their symptoms of social anxiety for when pandemic-related restrictions ease.

Future directions

The nature and context of the COVID-19 pandemic has been constantly evolving since early 2020. As of this writing in June 2021, both the United States and Canada are in the process of rolling out wide-scale vaccination programs, with an increasing number of areas easing COVID-related restrictions, particularly in the United States where a larger proportion of the population has been fully vaccinated.

Empirical testing of competing explanations for our unexpected results remains an important target for continued research; indeed, we are now in the process of conducting a one-year follow-up study in June 2021 to test specific hypotheses arising from the present findings as to why high socially anxious individuals may have been affiliating more than expected during the first wave, as well as to continue investigating the affiliative behaviours of high socially anxious individuals in the evolving context of the pandemic. However, future studies should not only focus on the longitudinal effects of the pandemic itself on socially anxious individuals, but

also on the impact of society's gradual return to "pre-pandemic" social expectations and the continual shifting of norms, along with their broader, longer-term clinical implications. For instance, will socially anxious individuals continue to resort to preventive measures introduced during the pandemic as a means of concealing themselves and hiding self-perceived flaws? How will their perceptions of social safety and threat evolve? Will they continue to exhibit patterns of increased affiliation, and if so, what are the specific motives or goals driving these affiliative efforts, and are they adaptive? These are just a few examples of research questions that may soon need to be taken into consideration.

Concluding remarks

Although socially anxious individuals reported that they have been engaging in more affiliative behaviours during the first wave of the COVID-19 pandemic, their increased levels of anxiety, loneliness, and fear of negative evaluation suggest that they continue to experience significant functional impairment despite the "safe cover" of pandemic-related restrictions. Our results suggest that highly impaired socially anxious individuals were as lonely and fearful as ever during the first wave of the pandemic—if not even more so than before—bringing into question the true efficacy of their affiliative behaviours in fulfilling their social needs. They made increased efforts to connect with others, perhaps signalling a greater need for social support. Future research is required to continue to track the outcomes of this vulnerable group as the pandemic and its effects evolve and the post-pandemic era begins to understand the factors that may promote and inhibit treatment seeking, access, and utilization.

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Appendix: Measure of Affiliative Behaviours

Please answer the following questions as they apply to you *over the past week of the COVID-19 outbreak*. In what ways are you trying to connect with others right now? Please select all that apply and rate the frequency of each, as well as the level of social connection you feel with each.

Frequency

- 0 = Never
- 1 = Once in a while
- 2 = Some of the time
- 3 = Most of the time
- 4 = All the time

Social connection

- 0 = Not at all connected
- 1 = A little connected
- 2 = Moderately connected
- 3 = Very connected
- 4 = Extremely connected

Emotional response

- 0 = High dislike/distress
- 1 = Some dislike/distress
- 2 = Neutral
- 3 = Some enjoyment/reward
- 4 = High enjoyment/reward

	Frequency	Social connection	Emotional response
1 Text messaging	0 1 2 3 4	0 1 2 3 4	0 1 2 3 4
2 Posting on social media platforms, e.g. Facebook, Twitter, Instagram	0 1 2 3 4	0 1 2 3 4	0 1 2 3 4
3 One-on-one video calls, e.g. FaceTime or Skype	0 1 2 3 4	0 1 2 3 4	0 1 2 3 4
4 One-on-one phone or voice calls	0 1 2 3 4	0 1 2 3 4	0 1 2 3 4
5 Group calls with more than one other person, e.g. over Zoom or Google Hangouts	0 1 2 3 4	0 1 2 3 4	0 1 2 3 4
6 Writing and mailing letters	0 1 2 3 4	0 1 2 3 4	0 1 2 3 4
7 Hosting live streams, e.g. Instagram Live, Facebook Live	0 1 2 3 4	0 1 2 3 4	0 1 2 3 4
8 Watching others' live streams, e.g. Instagram Live, Facebook Live	0 1 2 3 4	0 1 2 3 4	0 1 2 3 4
9 Playing multi-player video games	0 1 2 3 4	0 1 2 3 4	0 1 2 3 4
10 Visiting others while maintaining sufficient physical distance	0 1 2 3 4	0 1 2 3 4	0 1 2 3 4
11 Visiting close others known to be unexposed	0 1 2 3 4	0 1 2 3 4	0 1 2 3 4
12 Doing activities with members in the same household, e.g. playing board games, completing a jigsaw puzzle, sharing a meal	0 1 2 3 4	0 1 2 3 4	0 1 2 3 4
13 Other (please state): _____	0 1 2 3 4	0 1 2 3 4	0 1 2 3 4