



# Social anxiety disorder is Associated with Vaccination attitude, stress, and coping responses during COVID-19

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## Abstract

**Background** Individuals with Social Anxiety Disorder (SAD) may be at a higher risk for negative outcomes during the COVID-19 pandemic due to isolation that is both characteristic of the disorder and also potentially exacerbated by quarantine and public health restrictions. Accordingly, we evaluated emotional and behavioral responses to stress during COVID-19 and attitudes towards COVID-19 vaccine adoption in socially anxious versus non-socially anxious adults.

**Methods** Participants (N=84) were young adults between 18 and 24 years of age who completed a diagnostic interview and self-report measures assessing stress, anxiety and coping responses during COVID-19. Welch's *t*-tests assessed group differences on mental health outcomes between the SAD versus non-SAD group, and Pearson's  $\chi^2$  test evaluated COVID-19 vaccination status by group. Lastly, logistic regression examined whether SAD predicted positive COVID-19 vaccination attitude.

**Results** Results indicated the SAD group demonstrated significantly elevated rates of anxiety and depression as compared to individuals without SAD and had significantly increased rates of engagement in safety behaviors as well as maladaptive coping mechanisms in response to COVID-19 stress. Individuals with SAD were significantly more likely to receive or plan to receive the COVID-19 vaccine.

**Conclusions** The current study provides evidence that social anxiety may be a significant factor associated with the impact of COVID-19 as well as attitudes with vaccine compliance.

**Keywords** Social anxiety disorder · COVID-19 · Vaccination

## Introduction

Social anxiety disorder (SAD) is a debilitating disorder, marked by the persistent fear of at least one social interaction or performance situation (American Psychiatric Association, 2013). In addition to being one of the most prevalent anxiety disorders, with approximately 12% of adults meeting diagnostic criteria during their lifetime (Kessler et al., 2005), SAD also carries a significant functional burden in the interpersonal domain (Tonge et al., 2020). Moreover, socially anxious adults report increased rates of isolation as well as decreased reports of feelings of belongingness (Meltzer et al., 2013; Meuret et al., 2016). Given that

isolation itself may serve as a significant maintenance factor in SAD (e.g., Teo et al., 2013), the presence of increased quarantine requirements and concurrent isolation during COVID-19 may be particularly pernicious in this diagnostic group. Indeed, recent work by Goodman and colleagues (2021) with community adults has indicated that although individuals with SAD report higher levels of loneliness and isolation in general, this population also reports higher positive affect and lower negative affect when socializing with others; suggesting that if affected adults experience isolation, this may be particularly harmful. Results regarding rate of self-isolation in SAD are mixed; Goodman and colleagues (2021) reported that individuals with and without SAD were equally likely to be with others when prompted, while Asmundson and colleagues (2020) reported that when compared to those without a mental health disorder, those with anxiety-related (including social anxiety) and mood disorders were more likely to self-isolate and report more stressors related to self-isolation. Taken together, given the

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increased rates of self-isolation occurring globally during the pandemic (regardless of clinical disorders) due to social distancing regulations, those with social anxiety were likely to experience periods of increased isolation during this time. However, it is important to note that the rate of isolation may have differed throughout the course of the pandemic. Collectively, therefore, this work suggests that adults with SAD may be at particularly high risk for negative social and emotional responses during the COVID-19 pandemic as compared to non-socially anxious peers. Yet, given the nascent nature of work in this area, empirical characterization of the impact of COVID-19 on socially anxious adults is sparse, particularly with regard to mental health and public health outcomes. Further, to our knowledge, social anxiety severity has yet to be evaluated as a potentially important factor in public health-related decisions during COVID-19, such as vaccination hesitancy or vaccine adoption. Accordingly, the present study sought to characterize overall functional impairment and emotional and behavioral responses (i.e., anxiety, depression) among adults with and without SAD during the COVID-19 pandemic, as well as coping methods in response to stress (e.g., engagement in safety behaviors) and attitudes towards COVID-19 vaccination.

The COVID-19 pandemic has impacted mental health globally. In a U.S. sample, increased stress levels during this time were related to increased generalized anxiety, health anxiety, and depression, and experiences related to the contraction of COVID-19 produced higher odds for developing a diagnosis for these disorders (Gallagher et al., 2020). Furthermore, individuals diagnosed with an anxiety disorder prior to the pandemic were found to have more negative behavioral outcomes (e.g., greater self-isolation) due to COVID-19 stress as compared to controls (Asmundson et al., 2020). Although a growing body of work has focused on anxiety in the midst of COVID-19 in general, research regarding the impact of COVID-19 specifically on socially anxious individuals remains scarce. One notable exception to this is a recent study by Ho & Moscovitch (2021), which evaluated the influence of pre-pandemic social anxiety symptoms (as retrospectively reported) on various domains thought to be affected by COVID-19 in individuals from the USA and Canada. Results indicated that higher levels of retrospective social anxiety symptoms predicted higher levels of COVID-19 related anxiety and increased feelings of loneliness, especially when faced with higher COVID-19 related stressors (e.g., becoming ill, losing income, difficulties accessing food). An additional study by [BLINDED FOR REVIEW] followed-up a cohort of individuals who were diagnosed with SAD as adolescents (diagnoses were made between 2014 and 2016), to investigate overall functioning and quality of life during COVID-19 in 2021. Results indicated that symptoms of social anxiety increased

during COVID-19, whereas functional impairment as a result of SAD paradoxically decreased; suggesting that the impact of COVID-19 on individuals with SAD may manifest in nuanced and complex ways that may heterogeneously impact health and stress responses.

As is the case with the research probing the impact of COVID-19 on mental health in individuals diagnosed with SAD, work evaluating compliance to COVID-19 preventative guidelines (e.g., social distancing, mask wearing), functioning, and attitudes towards vaccination among socially anxious individuals is also limited. A core characteristic of social anxiety that may prove useful in understanding social compliance is the fear of negative evaluation, which has been appreciated for some time now (Winton et al., 1995). Specifically, a longitudinal study by Teachman & Allen (2007) found that a lack of perceived social acceptance in early adolescence (ages 13–15) later predicted self-reported social anxiety and fear of negative evaluation (ages 17–18). Thus, fear of negative evaluation is learned within a crucial developmental stage and remains in affected college-aged young adults (along with the addition of public self-consciousness; Kocovski & Endler 2000). We theorized that due to fear of negative evaluation, socially anxious young adults may engage in social compliance with preventative guidelines, including receiving the COVID-19 vaccination. Specifically, with increased recommendations to vaccinate, along with vaccination efforts among universities, socially anxious young adults may view an “unvaccinated status” as going against the social norm (and thus lessens the chance of positive social acceptance among peers). Relatedly, recent work by Ho & Moscovitch (2021) indicated that pre-pandemic social anxiety was related to lower use of preventative measures, such as mask wearing and social distancing; however, the authors note that this may be due to the time and location (i.e., USA and Canada) of data collection when social distancing and mask-wearing guidelines were not consistent nor imposed unilaterally and knowledge of COVID-19 transmission was in its infancy. Another study including various self-reported mental health diagnoses (e.g., generalized anxiety, panic disorder, and agoraphobia, obsessive compulsive disorder, depression), Quittkat and colleagues (2020) found that in Germany from April to May of 2020, socially anxious individuals engaged in hand disinfecting more frequently as compared to November 2019. These results may also be influenced by the time and location of data collection, such that in the case of Ho & Moscovitch (2021) mask wearing may have been limited due to a lack of universal mask mandates, thus potentially putting those who opted to wear a mask in a position of increased attention; whereas in Quittkat et al., (2020) increased hand-washing had been recommended by the Center for Disease Control and Prevention (CDC) as a safety precaution at that

time. Relatedly, a study conducted in Germany by Bendau et al., (2021) found that COVID-19 related anxiety, not general unspecific anxiety symptoms or depressive symptoms, was related to vaccine acceptance while a study by Kejriwa and Shen (2021) found a significant positive association between vaccine hesitancy and negative affect (e.g., worry, anxiety sadness, stress). Taken together, although disparate in their findings, these initial results suggest that social anxiety may play a distinct role in exacerbating health-related behaviors and compliance with COVID-19 restrictions. However, the investigation of social anxiety as a potential contributor to COVID-19 health-relevant behaviors such as adoption of the COVID-19 vaccine remains unestablished.

Given the overall unknown impact of social anxiety on COVID-19 vaccination attitudes and the rapidly shifting climate regarding COVID-19 vaccination in the U.S., the characterization of relationships between social anxiety and patterns of COVID-19 vaccination adoption may prove to be important in the development and dissemination of public health messages for individuals at high risk for adverse outcomes during quarantine. Furthermore, in light of prior work indicating that isolation leads to increased mental health difficulties and that individuals with SAD may be at a unique risk to have amplified impacts of isolation on anxiety and stress levels (Goodman et al., 2021; Meltzer et al., 2013; Teo et al., 2013), characterization of emotional and behavioral responses (e.g., anxiety, depression, coping responses) among individuals with SAD during the COVID-19 pandemic may prove to be important to future work seeking to mitigate adverse physical and mental health sequelae among this diagnostic group. Accordingly, the aims of the present study were: (1) to characterize anxiety, depression, and coping responses to stress during COVID-19, and (2) to determine attitudes toward receiving the COVID-19 vaccine among adults with SAD. In line with previous, albeit limited, work that has suggested that individuals with high social anxiety have poorer outcomes in terms of anxiety and mental health difficulties as a result of COVID-19 (BLINDED FOR REVIEW; Ho & Moscovitch 2021; Quittkat et al., 2020), we hypothesized that adults who meet diagnostic criteria for SAD will demonstrate significantly enhanced responses to stress, as indicated by higher self-reported use of maladaptive coping responses to stress (e.g., patterns of involuntary disengagement; safety behaviors) and higher reports of anxiety and depression, as compared to peers without SAD. Additionally, given prior work suggesting that high social anxiety may have an impact on COVID-19 public health guideline compliance (e.g., Ho & Moscovitch 2021; Quittkat et al., 2020), we hypothesize that adults who meet diagnostic criteria for SAD will demonstrate higher rates of social compliance (based on core fears of negative evaluation that are characteristic of the

disorder), as evidenced by self-reported positive attitudes towards receiving the COVID-19 vaccine as compared to those who do not meet diagnostic criteria for SAD.

## Method

### Participants

All procedures in the present study were reviewed and approved by the institutional review board (IRB) at [MASKED FOR REVIEW]. Additionally, all individuals provided informed consent prior to participating. Participants in the present study included 103 young adults enrolled at a southeastern university between the ages of 18 and 24 ( $M_{age} = 19.5$ ,  $SD = 1.47$ ). Participants were recruited via the university's undergraduate participant research pool. A breakdown of demographics for participants by group is provided in Table 1.

### Procedure

Data were collected from participants at two time points during the spring of 2021. The first time point occurred within the first three months of the calendar year (January–March of 2021). The second time point occurred one month thereafter. At each measurement point, participants were asked to complete a semi-structured interview (ADIS-5; see below) with a trained clinician regarding their diagnostic functioning as well as to fill out various self-report measures. Of the 103 participants, 84 fully completed both time points. Thus, the final sample consisted of 84 participants. As determined by power analysis using G\*Power (version

**Table 1** Demographic breakdown of participants in SAD vs. no SAD groups

	SAD	No SAD
<b>Sex (%)</b>		
Male	25 (n=5)	27 (n=17)
Female	75 (n=15)	73 (n=47)
<b>Age (mean)</b>	19.46	19.54
<b>Race (%)</b>		
White	80 (n=16)	67 (n=42)
Black	5 (n=1)	8 (n=5)
Asian	10 (n=2)	15 (n=10)
Other	5 (n=1)	10 (n=7)

Note: Groups were not significantly different based on sociodemographic factors

3.0.10), a sample size of 84 provided 80% power to detect an effect size of 0.8 for vaccine attitude and differences in stress responses to COVID-19 under 5% type I error control. To reflect a more stable representation of behavioral responses during COVID-19, scores on all dependent variables of interest were averaged rather than assessed as two separate time points. It should be noted that at the time data were collected for time point one, the public health guidelines regarding COVID-19 in Virginia included social distancing and mask-wearing in public places due to the high incidence and spread of COVID-19. At time point two, the same guidelines were in place; however, the COVID-19 vaccine began to become available to the public at this time.

## Measures

### Zoom interview

**Anxiety Disorders Interview Schedule for DSM-5 (ADIS-5;** Brown & Barlow 2014). The ADIS-5 is used to assess anxiety and related disorders in adults. Given that the primary aims of the present study were to characterize responses to COVID-19 in individuals with elevated social anxiety and to reduce burden on participants, only the SAD module of the ADIS-5 was administered via HIPAA-compliant Zoom. Following administration of the ADIS-5, a trained and research-reliable clinician, supervised by a licensed clinical psychologist, assigned a clinical severity rating (CSR) to the participants. CSRs are assigned on a 9-point scale (0–8), such that a CSR of 4 and above indicates diagnostic presence of SAD. All interviews were video recorded and approximately 25% ( $n = 50$ ) of the diagnostic interviews across both time points were reviewed by a second clinician. Inter-rater agreement on the CSR score was high (i.e., each rater provided a CSR within one point of each other) such that agreement was 94% between independent coders. CSRs were used as the primary measure of social anxiety in the present study as they represent both the severity of social anxiety with regard to highly rated distress due to symptoms, but also the functional impairment that the social anxiety suggests. Based on averaged CSRs from the ADIS-5 across the two time points, a total of 20 participants met diagnostic criteria for SAD, while 63 did not meet criteria for SAD. Only the SAD module was administered during this brief interview. Therefore, participants in the “no SAD” group only represent the absence of SAD, not the presence or absence of other diagnoses.

### Self-report measures

**COVID-19 Vaccination Attitude.** The COVID-19 vaccine became available during February of 2021 in the geographic vicinity of this study; however, the vaccine had not been widely available to all individuals, with a priority placed on healthcare workers and high-risk individuals. As such, participants were asked to answer questions regarding their willingness to receive the COVID-19 vaccine in the future. First, participants were asked if they had already received at least their first dose of the COVID-19 vaccine. If participants answered “yes”, they provided information regarding when their first dose was administered and when their second dose was scheduled to be administered. If participants answered “no” to receiving their first dose of the COVID-19 vaccine, the following question was presented: “Do you intend to get the vaccine once it is available to you?”. COVID-19 vaccination attitude was considered “positive” (coded as 1) if participants had received at least one dose of the COVID-19 vaccine or had indicated that they intended to receive the COVID-19 vaccine as soon as it was available. In contrast, attitude was considered “negative” (coded as 0) if the participant had not indicated receiving at least one dose of the COVID-19 vaccine and they indicated that they were not intending on receiving the COVID-19 vaccine when it became available to them. COVID-19 vaccination attitude was only collected at time point two via self-report measures to avoid desirability bias.

**Fear of Illness and Virus Evaluation (FIVE; Ehrenreich-May, in preparation).** The FIVE is a 35-item measure that assesses fears surrounding contamination and illness, fears regarding social distancing, behaviors related to illness and virus fears, as well as the impact of these fears on the participant’s life. For questions assessing fears about social distancing and contamination and illness, participants were asked to rate how often they felt afraid or worried about each item over the last week (e.g., “I am afraid I will have to go to the hospital because of a bad illness or virus”; “I am afraid I will not be able to celebrate good things [e.g., wedding, birthday, etc.] because of a bad illness or virus”). on a scale ranging from 1 (“I am not afraid of this at all”) to 4 (“I am afraid of this all of the time”). For items regarding behaviors related to illness and virus fears, participants were asked to rate how often they had engaged in certain behaviors over the last week (e.g., “I avoid touching things [e.g., phone, door knobs]”) on a scale ranging from 1 (“I have not done this in the last week”) to 4 (“I did this all the time last week”). Lastly, for questions assessing the impact of illness or virus fears, participants were asked to indicate how true each statement was on a 1 (“Not true of me at all”) to 4 (“Definitely true”) scale. The FIVE has demonstrated adequate to excellent internal consistency in at least

two recent studies with Cronbach's alphas ranging from 0.70 to 0.91 (BLINDED FOR REVIEW; Cottin et al., 2021) the FIVE showed acceptable to good internal consistency across subscales and both time points ( $\alpha=0.70-0.90$ ) in the present study. Greater scores on the FIVE indicate worse functioning.

**Response to Stress Questionnaire for COVID-19 (RSQ;** Connor-Smith et al., 2000; Coiro et al. 2021). The RSQ is a 57-item questionnaire that assesses coping and involuntary stress responses. Both the original RSQ (Connor-Smith et al., 2000) and the modified (Coiro et al. 2021) COVID-19 versions include a checklist of specific stressful situations where participants are asked to rate the frequency of the stressors. Instructions are as follows: "This is a list of things about COVID-19 that many people find stressful or a problem to deal with. Please circle the number indicating how stressful the following things have been for you in the past 6 months". Following this, participants are asked about coping styles and stress responses (e.g., "I try not to feel anything", "I wish that I were stronger and less sensitive so that things would be different", "I tell myself that I can get through this, or that I will be okay") specific to the stressful parts of COVID-19 that they had indicated above. Most items on the RSQ are on a 4-point scale ranging from "Not at all" to "Very", while other items are open-ended and ask for a description of participants' coping techniques. The RSQ has five total subscales including primary control coping, secondary control coping, disengagement coping, involuntary engagement, and involuntary disengagement.

These subscales capture stress responses and coping such that *coping* is considered automatic and voluntary, while *stress responses* are involuntary; moreover, they are characterized by the amount of engagement (Connor-Smith et al., 2000). For the current study, each subscale was summed separately. The RSQ has shown good psychometric properties ( $\alpha=0.73-0.92$  across subscales) and demonstrated acceptable to excellent internal consistency ( $\alpha=0.76-0.94$ ) in the present study across the subscales, with the exception of the Primary Coping subscale at time point one ( $\alpha=0.67$ ), the Secondary Coping subscale at time point one ( $\alpha=0.65$ ), and the Disengagement Coping subscale at both time points ( $\alpha=0.61-0.63$ ). As a result, these subscales possessed questionable internal consistency and should be evaluated with caution.

**Subtle Avoidance and Frequency Examination (SAFE;** Cuming et al., 2009). The SAFE is a 32-item questionnaire that assesses safety-seeking behaviors involved in the maintenance of social anxiety. Specifically, the SAFE assesses safety behaviors within the following domains: inhibitive and/or restrictive behaviors; active behaviors to allow oneself to present "well"; and behaviors to hide physical symptoms. Participants were asked to rate the extent to which they would engage in safety behaviors (e.g., "speak softly"; "try to keep a tight control over your behavior"; "avoid eye contact") if they were in a social situation on a 5-point scale ranging from *Never* to *Always*. The SAFE has shown excellent psychometric properties (Cuming et al., 2009), and demonstrated good to excellent internal

**Table 2** Descriptive statistics for all variables across groups and results of Welch's *t*-tests

	SAD		No SAD		<i>t</i> -value	Cohen's <i>d</i>
	Mean	SD	Mean	SD		
<b>FIVE</b>						
Contamination	21.28	4.53	15.71	4.80	-4.71***	-1.17
Social Distancing	21.73	5.64	16.81	4.57	-3.55***	-1.02
Behaviors Related to Illness	35.83	5.22	32.99	6.31	-2.01	-0.47
Impact	4.80	1.55	3.29	1.16	-4.00**	-1.19
<b>RSQ</b>						
Primary Control Coping	13.33	2.64	13.50	3.53	0.24	0.05
Secondary Control Coping	23.35	3.76	23.53	4.52	0.18	0.04
Disengagement Coping	11.58	3.09	9.87	2.27	-2.28*	-0.69
Stress Involuntary Disengagement	30.28	9.41	21.08	6.36	-3.70**	-1.18
Stress Involuntary Engagement	25.10	7.38	18.59	4.81	-4.08***	-1.28
<b>SAFE</b>						
Inhibition/Restriction	20.65	7.01	12.66	7.49	-4.37***	-1.08
Present Well	22.58	9.45	10.89	7.90	-5.00***	-1.41
Hiding Physical Behaviors	8.20	5.43	3.55	3.93	-3.55**	-1.07
<b>DASS-21</b>						
Depression	8.82	5.90	4.02	3.34	-3.74**	-1.18
Anxiety	8.25	4.27	3.29	3.17	-4.80***	-1.42
Stress	9.95	4.14	5.87	3.43	-4.00***	-1.13

Note: Averaged scores over time point one and time point two; \* indicates significance at  $p < .05$ ; \*\* indicates significance at  $p < .01$ ; \*\*\* indicates significance at  $p < .001$ . *t*-value derived from Welch's *t*-tests

consistency in the present study across both time points ( $\alpha = 0.85\text{--}0.92$ ).

**Depression Anxiety and Stress Scale-21 item version (DASS-21; Lovibond & Lovibond 1995).** The DASS-21 is a shortened version of the original DASS that assesses current levels of depression, anxiety, and stress. In the present study, participants were asked to rate how much each statement applied to them over the past week on a 0 (“Did not apply for me at all”) to 3 (“Applied to me very much, or most of the time”). The DASS-21 has consistently shown good psychometric properties across cultures (e.g., Bibi et al., 2020), and demonstrated good to excellent internal consistency across domains ( $\alpha = 0.78\text{--}0.91$ ) in the present study. Higher scores on the DASS-21 represent higher levels of depression, anxiety, and/or stress, respectively.

## Data Analytic Plan

Welch’s *t*-tests for comparing unequal sample sizes (Delacre et al., 2017) were run between groups to test the hypothesis that individuals with SAD would demonstrate enhanced responses to stress as compared to non-socially anxious individuals<sup>1</sup>. Additionally, a Pearson’s  $\chi^2$  test was carried out in order to test the hypothesis that individuals with SAD are more likely to have a positive attitude toward COVID-19 vaccination.

Lastly, logistic regression analyses were conducted to assess whether SAD predicted positive COVID-19 vaccination attitude group membership.

## Results

Descriptions of all interviews and measures used in the present study are included below, and descriptive statistics for each measure are provided in Table 2. Of note, data collection was monitored continuously as the study progressed. No outliers with regard to timing of completion of measures (i.e., spent more time completing questionnaires than two standard deviations above or below the average completion time as tested prior to data collection) or random responding was present.

<sup>1</sup> It should be noted that a total of four participants had a change in SAD diagnostic status across time points. In order to assess whether these participants impacted the pattern of results, all analyses were also conducted with these participants removed. However, the pattern of results remained the same. Therefore, all participants were retained.

## Responses to stress and coping strategies during COVID-19

Welch’s *t*-tests were conducted to test the hypothesis that individuals who met diagnostic criteria for SAD will demonstrate significantly enhanced responses to stress (as indicated by higher self-reported stress response, fear, and behavioral measures) as compared to individuals who do not meet diagnostic criteria for SAD. Results from these analyses are presented below by outcome measure and displayed in Table 2. Overall, results demonstrated that there was a significant difference between self-reported levels of select subdomains (i.e., all subscales except Behaviors Related to Illness) of the FIVE for individuals who met criteria for SAD as compared to those who did not. Across all domains that emerged as significantly different between groups (i.e., Fear of Contamination, Social Distancing, Impact of Illness), the SAD group reported significantly poorer functioning as compared to the non-SAD group.

Regarding the RSQ, there was a significant difference between self-reported levels of, Stress Involuntary Engagement and Stress Involuntary Disengagement for individuals who met criteria for SAD as compared to those who did not; suggesting an increased use of maladaptive coping mechanisms (i.e., involuntary responses rather than controlled coping responses) in response to COVID-19 stress for individuals with SAD as compared to non-socially anxious individuals. Additionally, there was a significant difference between self-reported Disengagement Coping for individuals with SAD as compared to those who did not meet for SAD; although this result should be interpreted with caution given the internal consistency of the Disengagement subscale in the present study. Lastly, regarding the SAFE, individuals who met criteria for SAD demonstrated significantly different self-reports of engagement in safety behaviors as measured across all subscales. Lastly, results indicated that individuals in the SAD group demonstrated significantly poorer functioning across all domains of the DASS-21 as compared to the non-SAD group.

## COVID-19 vaccination Compliance/Attitude

Pearson’s  $\chi^2$  test was also performed to evaluate COVID-19 vaccination attitude in individuals who meet diagnostic criteria for SAD as compared to those who do not. Results revealed a statistically significant association between SAD and positive COVID-19 vaccination attitude  $\chi(1) = 3.61$ ,  $p = .042$ . Indeed, the frequency of responses indicated that 100% of individuals ( $N = 20$ ) who met criteria for SAD reported positive attitudes towards receiving the COVID-19 vaccine whereas, the frequency of responses for those

without SAD that reported positive attitudes towards COVID-19 vaccination was 84% ( $N=53$ ).

Logistic regression analyses were also carried out to assess the significance of SAD as a potential predictor of COVID-19 vaccination attitude group membership. In this set of analyses, an odds ratio of less than 1.00 indicates that individuals with SAD were less likely to be being grouped as positive for COVID-19 vaccine attitude. Conversely, an odds ratio greater than 1.00 indicates that individuals with higher levels of social anxiety were more likely to be grouped as having a positive COVID-19 vaccine attitude. Results revealed that SAD had an odds ratio of 2.20 ( $b=0.79$ ; CI: [1.09, 4.41]) that was significant at the  $p<.05$  level, suggesting that SAD is associated with a higher likelihood of having a positive attitude toward COVID-19 vaccination.

## Discussion

The present study aimed to characterize emotional and behavioral responses to stress among young adults with SAD during COVID-19 and to determine attitudes toward receiving the COVID-19 vaccine during the time when it became increasingly available to the public. Given that isolation is associated with worse mental health outcomes and that individuals with SAD experience more isolation in general (Goodman et al., 2021; Meltzer et al., 2013; Meuret et al., 2016; Teo et al., 2013), isolation experiences during COVID-19 may be particularly harmful to socially anxious individuals. Therefore, we hypothesized that young adults with social anxiety would demonstrate significantly enhanced responses to stress as compared to their non-socially anxious peers. Results largely supported our hypothesis, such that individuals who met diagnostic criteria for SAD provided decreased self-reports of functioning with regard to anxiety surrounding illness responses, depression and stress, as well as engagement in more safety behaviors (e.g., presenting well) in response to anxiety and involuntary responses to stress as compared to individuals who did not meet criteria for SAD.

Results from the Fear of Illness and Virus Evaluation (FIVE; Ehrenreich-May, in preparation) indicated that in our sample, fears of contamination, impact of fears on life, and patterns of social distancing, but *not* behaviors related to illness and virus fears were disproportionately observed in the SAD group. This combination of effects may seem to be initially at odds with results from within the same sample indicating favorable attitudes toward vaccine uptake in the SAD group. In other words, to the extent that vaccine uptake and behavioral change due to COVID-related public health recommendations may be conceptually related, it is interesting to note that more subtle behavioral elements of

adherence public health guidance as measured by the FIVE were not more frequently endorsed among the SAD sample. It may therefore be profitable in future work to identify themes and content domains of public health recommendations that are concurrently linked to social-anxiety specific fears (of which vaccine uptake appears to be one), and those that are not, such as more subtle forms of behavioral change such as enhanced contact hygiene (i.e., avoiding touching certain objects), which may be less influenced by fear of negative evaluation.

Additionally, results derived from zero-order correlations among factors contained within the RSQ revealed a number of patterns that may provide additional insight into the nature of coping strategies among individuals with SAD in our sample. According to results presented here, voluntary forms of coping (engagement coping and disengagement coping factors), yielded discrepant effects, with only voluntary disengagement specifically distinguishing SAD from non-SAD groups. This indicates that voluntary strategies such as denial, avoidance, and wishful thinking may be more characteristic of young adults with SAD amidst COVID-19 and related stressors. In a related finding, *both* forms of involuntary coping (involuntary engagement and involuntary disengagement) were significantly more characteristic of the SAD group than the non-SAD group, which supports a general interpretation of enhanced automatized coping responses among young adults with SAD. Another view of these results is that the SAD group reported enhanced use of disengagement of *both* a voluntary and involuntary nature, but endorsed engagement focused coping of only an involuntary nature. It should be explicitly noted, however, that the internal consistency of the primary coping subscale, the secondary coping subscale were both questionable at time point one ( $\alpha=0.67$ , and  $0.65$ , respectively) as was the disengagement coping subscale at both time points ( $\alpha=0.61$ - $0.63$ ), and as such these results should be interpreted with caution. Future research may wish to utilize data collected from the Response to Stress Questionnaire (e.g., specifically the “problems list”) to evaluate specific components of the pandemic that may affect individual coping strategies and response to stress, such as financial problems, access to health care, and isolation from friends and family. Taken together, These findings add to the growing literature illustrating relationships among COVID-19, mental health, and overall functioning among socially anxious adults. Future work should evaluate the long-term impact of these increases in stress and anxiety; and establish if heightened coping methods employed by individuals diagnosed with SAD are adaptive along lengthier timescales.

An additional aim of the current study was to evaluate the association between SAD and COVID-19 vaccination attitudes. Prior work has provided a conflicting view of

how individuals with SAD may or may not comply with COVID-19 preventative measures such as mask wearing and hand washing (Ho & Moscovitch, 2021; Quittkat et al., 2020); however, it is unclear whether the results from Ho & Moscovitch (2021) regarding lower utilization of preventative mask wearing in individuals with high pre-pandemic levels of social anxiety are due in large part to the timing with which data were collected. Specifically, the authors indicated that data were collected during the beginning of the pandemic when COVID-19 restrictions were not uniformly implemented, thus potentially opening those who decided to wear masks in public up to attention and/or criticism from others. This may also be the case in the opposite direction with regard to results by Quittkat and colleagues (2020), such that individuals with higher social anxiety may have been more likely to comply with increased hand-washing in part due to enacted recommendations from the CDC at that time. Therefore, given the centrality of fear of negative evaluation in SAD and the consequent plausible increase in social compliance among this diagnostic group, we hypothesized that individuals with SAD would demonstrate higher rates of self-reported positive attitudes towards receiving the COVID-19 vaccine as compared to those who do not meet diagnostic criteria for SAD.

Results from the present study strongly supported this hypothesis, such that 100% of individuals who met criteria for SAD indicated that they had already gotten at least one dose of the COVID-19 vaccine or that they were planning on getting the COVID-19 vaccine as soon as it was available to them. These attitudes were significantly different between the SAD group and the non-SAD group, such that the SAD group had a significantly greater positive response to COVID-19 vaccine uptake. Moreover, logistic regression analyses also provide support for this hypothesis, such that results indicated that individuals with SAD were significantly more likely to be in the positive COVID-19 vaccination attitude group. These are potentially meaningful results, given the current climate surrounding COVID-19 vaccination and indeed vaccination hesitancy. For example, a study by Reiter and colleagues (2020), during May of 2020, at the height of the pandemic, assessed for COVID-19 vaccine acceptance. Their results showed 31% of individuals in the US general population were “not willing” to get vaccinated. Similar studies by Callaghan et al., (2021) assessing intention to get vaccinated uncovered remarkably similar results, wherein 31.3% of the U.S. population did not intend to pursue vaccination. Moreover, a year after these studies (September 2021) only 53.6% of the population is fully vaccinated leaving the US far from reaching herd immunity. Therefore, social anxiety-related factors may play a role in vaccine adoption, and the present study may further the identification of pathways by which attitudes toward

vaccination may be favorably influenced. Although noted in further detail below, we specifically recommend against intentionally increasing social evaluative fears as a method to facilitate vaccine uptake, we do conversely suggest that illustrating the benefits of social connection may have the desired effect. Inasmuch as our results suggest that individuals with high levels of social anxiety may self-motivate to receive the COVID-19 vaccine, this effect could be potentiated by public health messaging illustrating the importance of social connection, which are a significant source of positive emotions (Baumeister & Leary, 1995). Such messaging could have the dual benefit of potentiating vaccine uptake and establishing or re-establishing social support for individuals with, or at risk for social anxiety, which may further prevent exacerbation or maintenance of anxiety symptoms.

We should note explicitly that the results reported here do not support a general strategy of upwardly modulating social fears (or fear of negative evaluation more specifically) as a method for enhancing vaccine uptake or attitude change. Indeed, further research is required in order to identify potential mediators and moderators of this effect, as it is plausible that sociological factors, political context, socio-economic status, and other individual differences and demographic conditions may influence the direction and magnitude of the relationship between social anxiety and vaccine attitudes. For example, targeting fear of negative evaluation to enhance vaccine uptake may have the opposite of the intended effect within geographic regions or cultural sectors of the population that broadly report vaccine skepticism and renunciation of public health recommendations, as the pressure to avoid negative evaluation may incite socially anxious individuals to conform accordingly. As such, we caution against wholesale adoption of this finding to inform public health campaigns that may play upon social fears in order to facilitate vaccine uptake, due both to ethical implications of such a strategy as well as the possible or even likely existence of variables that we did not account for in our technical approach but could adversely influence vaccine uptake in the context of social anxiety. Likewise, because of the nonexperimental nature of our methodology, explicit causality between these variables cannot be established and therefore the reverse inference that personal vaccine attitudes are directionally caused by social fears is not deductively valid in the context of the research presented here. Rather, our results provide a context for future work evaluating the nuance and complexity of social-evaluative fears as they relate to stress responses amidst COVID-19 restrictions and public health recommendations, and may indeed provide a path toward understanding how social fears adversely affect personal functioning among vulnerable individuals in this or future pandemics.

As with all studies, findings presented here should be viewed in light of study limitations. First, while the present study relied on both clinician and self-report over the course of two time points, the collection of baseline data prior to the COVID-19 pandemic was not available nor was retrospective reporting of pre-pandemic events collected. Future work should utilize both baseline and current functioning measures, and consider conducting rigorous retrospective interviews with participants. Second, the current study recruited a sample of emerging adults enrolled in a major university in the southeastern United States that consisted of predominantly White/Caucasian females; therefore, the results of this study may not generalize to other populations such as adolescents or older adults that are not a part of a university community, nor to other diverse or underrepresented individuals. Thus, future work should explore the findings presented in this study across other populations, particularly across non-White/Caucasian samples. Additionally, the FIVE scale used in the present study has yet to be published or validated given it was developed as a result of the COVID-19 pandemic. Therefore, the further psychometric properties of this scale should be examined in future work. Lastly, given that COVID-19 vaccine availability just started to become available to the public in March of 2021, the present study was only able to assess for COVID-19 vaccination status and attitude during the second time point of our data collection. Moreover, despite COVID-19 vaccines starting to become available at the time of data collection, they were not widely available to college-aged students as higher risk candidates were prioritized for vaccination. As such, we did not collect more in-depth information regarding participants' vaccination hesitancy. Future work should prioritize this, and detail factors involved in vaccination hesitancy in young adult samples. Moreover, future work should examine other diagnostic groups and their relation to COVID-19 vaccination uptake. Another limitation worthy of mention is the possibility of bias inherent in our methodology, which further relates to the generalizability of our results. In particular, we targeted an undergraduate university sample with access to technology resources and comprising a relatively highly educated sector of the population. This methodological approach could potentially introduce forms of bias that should be further evaluated elsewhere by examining effects of interest in non-college educated individuals and different socio-economic strata who may have limited access to the types of technological resources that enabled this study. Another limitation links directly to the non-experimental nature of this work. As such, a causal relationship between SAD and vaccine intention cannot be affirmatively demonstrated within our design. Additional caution is warranted in considering the concurrent association between SAD and intention to vaccinate, as it is possible

that additional and unmeasured variables could represent confounding factors that relate meaningfully to vaccine attitudes. For example, it is possible that personality variables (neuroticism, extraversion) influence both SAD and vaccine attitudes, or also possible that SAD itself is a mediator of general levels of background stress and the intention to vaccinate. In either case, future work should build upon results presented here, by establishing the position of SAD in the broader nomological network of constructs that both directly and indirectly link to personal choices regarding vaccine uptake in this or future pandemics. An additional limitation that should be considered explicitly is the extent to which social desirability of certain answers (particularly endorsement of vaccine uptake, or endorsement of plans to receive the COVID-19 vaccine) might have systematically influenced the results presented here. We did not have independent verification of vaccine status, or eventual vaccine uptake, and as such we cannot definitively conclude whether stated plans or status did indeed match behaviors regarding COVID-19 vaccine uptake. Another limitation is the lack of data on patterns of comorbidity within our total sample, as it is possible that commonly comorbid conditions such as depression could have differentially affected the dependent measures of interest. Accordingly, future work should probe the relative frequency and impact of comorbid conditions as well as lifetime history of psychiatric illness in comparison groups. In a somewhat similar sense, we did also note that we lacked sufficient statistical power to evaluate the potential impact of gender on the pattern of observed results, and as such future work should specifically probe the differential effects of gender on both vaccine attitudes and stress responses among adults with SAD. We should also note that while we had central hypotheses that motivated the technical approach, such as the prediction of enhanced responses to stress among the SAD group, we also evaluated nuanced effects among subscales in self-report measures that were not specifically hypothesized. As such, we emphasize the exploratory nature of those effects and suggest additional future work to replicate and extend these findings. Taken together, this limited the present study's ability to evaluate reasoning for vaccine hesitancy and include more in-depth assessment of vaccination attitude. Therefore, future work should investigate a more detailed account of COVID-19 vaccination attitudes, including interviews surrounding vaccine hesitancy in order to identify additional factors involved in compliance.

## Conclusions

The present study evaluated relationships among COVID-19 and mental health outcomes (e.g., stress, anxiety, coping)

and compliance/attitudes towards receiving the COVID-19 vaccine in socially anxious versus non-socially anxious emerging adults. Results align with prior work suggesting that individuals who meet diagnostic criteria for SAD have poorer outcomes with regard to anxiety and depression; moreover, they also provide new insights into the coping and safety behavior responses of socially anxious adults during COVID-19. Moreover, findings of the present study indicate that individuals with social anxiety are significantly more likely to receive or plan to receive the COVID-19 vaccine. Taken together, the results from the current study provide emerging evidence that social anxiety is a significant factor involved in both the functional relation of COVID-19 and mental health as well as vaccination compliance.

### Tables.

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### Declarations

**Conflict of interest** The authors declare that they have no conflicts of interest.

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

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### References

- American Psychiatric Association (2013). *Diagnostic and Statistical Manual of Mental Disorders* (Fifth Edition). American Psychiatric Association
- Asmundson, G. J. G., Paluszek, M. M., Landry, C. A., Rachor, G. S., McKay, D., & Taylor, S. (2020). Do pre-existing anxiety-related and mood disorders differentially impact COVID-19 stress responses and coping? *Journal of Anxiety Disorders*, 74(102271)
- Baumeister, R. F., & Leary, M. R. (1995). The need to belong: desire for interpersonal attachments as a fundamental human motivation. *Psychological bulletin*, 117(3), 497
- Bendau, A., Plag, J., Petzold, M. B., & Ströhle, A. (2021). COVID-19 vaccine hesitancy and related fears and anxiety. *International immunopharmacology*, 97, 107724. <https://doi.org/10.1016/j.intimp.2021.107724>
- Bibi, A., Lin, M., Zhang, X. C., & Margraf, J. (2020). Psychometric properties and measurement invariance of Depression, Anxiety and Stress Scales (DASS-21) across cultures. *International Journal of psychology: Journal Internationale de Psychologie*, 55(6), 916–925
- Brown, T. A., & Barlow, D. H. (2014). *T.A. Brown, D.H. Barlow Anxiety and Related Disorders Interview Schedule for DSM-5 (ADIS-5)—Adult Version*. Oxford University Press
- Callaghan, T., Moghtaderi, A., Lueck, J. A., Hotez, P., Strych, U., Dor, A. ... Motta, M. (2021). Correlates and disparities of intention to vaccinate against COVID-19. *Social Science & Medicine* (1982), 272, 113638
- Coiro, M. J., Watson, K. H., Ciriegio, A., Jones, M., Wolfson, A., & Compas, B. E. (2021). COVID-19 stress, coping and control: Relations with depression and anxiety in a diverse sample of U.S. adults. Manuscript under review
- Connor-Smith, J. K., Compas, B. E., Wadsworth, M. E., Thomsen, A. H., & Saltzman, H. (2000). Responses to stress in adolescence: Measurement of coping and involuntary stress responses. *Journal of Consulting and Clinical Psychology*, 68(6), 976–992
- Cottin, M., Hernández, C. E., Núñez, C., Labbé, N., Quevedo, I. Y., Davanzo, A., & Behn, A. J. (2021). What if we get sick?": Spanish Adaptation and Validation of the Fear of Illness and Virus Evaluation Scale (FIVE) in a non-clinical sample exposed to the COVID-19 pandemic. *Frontiers in Psychology*, 12, 332
- Cuming, S., Rapee, R. M., Kemp, N., Abbott, M. J., Peters, L., & Gaston, J. E. (2009). A self-report measure of subtle avoidance and safety behaviors relevant to social anxiety: Development and psychometric properties. *Journal of Anxiety Disorders*, 23(7), 879–883
- Delacre, M., Lakens, D., & Leys, C. (2017). Why psychologists should by default use Welch's t-test instead of Student's t-test. *International Review of Social Psychology*, 30(1)
- Gallagher, M. W., Zvolensky, M. J., Long, L. J., Rogers, A. H., & Garey, L. (2020). The impact of Covid-19 experiences and associated stress on anxiety, depression, and functional impairment in American adults. *Cognitive Therapy and Research*, 44(6), 1043–1051
- Goodman, F. R., Rum, R., Silva, G., & Kashdan, T. B. (2021). Are people with social anxiety disorder happier alone?. *Journal of Anxiety Disorders*, 102474
- Ho, J., & Moscovitch, D. (2021). 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. *Anxiety, Stress, & Coping*, 1–15
- Kessler, R. C., Berglund, P., Demler, O., Jin, R., Merikangas, K. R., & Walters, E. E. (2005). Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the National Comorbidity Survey Replication. *Archives of General Psychiatry*, 62(6), 593–602
- Kocovski, N. L., & Endler, N. S. (2000). Social anxiety, self-regulation, and fear of negative evaluation. *European Journal of Personality*, 14(4), 347–358
- Lovibond, P. F., & Lovibond, S. H. (1995). The structure of negative emotional states: Comparison of the Depression Anxiety Stress Scales (DASS) with the Beck Depression and Anxiety Inventories. *Behaviour Research and Therapy*, 33(3), 335–343
- Meltzer, H., Bebbington, P., Dennis, M. S., Jenkins, R., McManus, S., & Brugha, T. S. (2013). Feelings of loneliness among adults with mental disorder. *Social Psychiatry and Psychiatric Epidemiology*, 48(1), 5–13
- Meuret, A. E., Chmielewski, M., Steele, A. M., Rosenfield, D., Petersen, S., Smits, J. A. ... Hofmann, S. G. (2016). The desire to belong: Social identification as a predictor of treatment outcome in social anxiety disorder. *Behaviour Research and Therapy*, 81, 21–34
- Quittkat, H. L., Düsing, R., Holtmann, F. J., Buhlmann, U., Svaldi, J., & Vocks, S. (2020). Perceived Impact of Covid-19 Across Different Mental Disorders: A Study on Disorder-Specific Symptoms, Psychosocial Stress and Behavior. *Frontiers in Psychology*, 11, 586246

- Reiter, P. L., Pennell, M. L., & Katz, M. L. (2020). Acceptability of a COVID-19 vaccine among adults in the United States: How many people would get vaccinated? *Vaccine*, 2020;38(42):6500–6507
- Richey, J. A., White, B. A., Valdespino, A., Ghane, M., & Schmidt, N. B. (2016). Attentional control mediates fearful responding to an ecologically valid stressor. *Anxiety Stress & Coping*, 29(1), 60–79
- Teo, A. R., Lerrigo, R., & Rogers, M. A. (2013). The role of social isolation in social anxiety disorder: A systematic review and meta-analysis. *Journal of Anxiety Disorders*, 27(4), 353–364
- Tonge, N. A., Lim, M. H., Piccirillo, M. L., Fernandez, K. C., Langer, J. K., & Rodebaugh, T. L. (2020). Interpersonal problems in social anxiety disorder across different relational contexts. *Journal of Anxiety Disorders*, 75, 102275
- Winton, E. C., Clark, D. M., & Edelman, R. J. (1995). Social anxiety, fear of negative evaluation and the detection of negative emotion in others. *Behaviour Research and Therapy*, 33(2), 193–196

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