



# COVID-19 and Anxiety Sensitivity Across Two Studies in Argentina: Associations with COVID-19 Worry, Symptom Severity, Anxiety, and Functional Impairment

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## Abstract

**Background** The novel 2019 SARS2-Coronavirus (COVID-19) has had a devastating physical health, mental health, and economic impact, causing millions of infections and hundreds of thousands of deaths. While COVID-19 has impacted the entire world, COVID-19 has disproportionately impacted low-income countries, particularly in South America, causing not only increased mortality but also increased associated mental health complaints. Anxiety sensitivity (AS), reflecting fear of anxiety-related physical sensations, may be particularly important to understand COVID-19 mental health effects among Latinx individuals in South America (Argentina). Past work suggests that Latinx individuals report greater somatization of mental health symptoms, and AS has been specifically linked to greater mental health symptoms. Yet, to date, no work has examined AS as a vulnerability factor for the negative mental health effects of COVID-19.

**Method** Therefore, the current manuscript examined the association of AS with COVID-19 worry, functional impairment, anxiety, and symptom severity across two samples of adults in Argentina: a community sample ( $n = 105$ ,  $M_{age} = 38.58$ ,  $SD = 14.07$ , 69.5% female) and a clinical sample comprised of individuals with an anxiety disorder ( $n = 99$ ,  $M_{age} = 34.99$ ,  $SD = 10.83$ , 66.7% female).

**Results** Results from the current study provide support for AS as a potential vulnerability factor for COVID-19-related mental health problems across both samples, and these effects were evident over and above the variance accounted for by age, sex, pre-existing medical conditions, and COVID-19 exposure.

**Conclusions** These data identify AS as a potential intervention target to reduce COVID-19 mental health burden among adults in Argentina.

**Keywords** COVID-19 · Anxiety sensitivity · Mental health · Latinx · South America

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The novel 2019 SARS2-Coronavirus (COVID-19) has had a devastating impact on the world, causing millions of infections and hundreds of thousands of deaths. Along with a significant impact on physical health, COVID-19 has caused a significant economic impact (Guan et al. 2020; Sun et al. 2020; Zhou et al. 2020) as well as a significant increase in mental health problems, including anxiety, depression, and stress (Gallagher et al. 2020; Pfefferbaum and North 2020; Rajkumar 2020; Wang et al. 2020; Zvolensky et al. 2020c). Recent research documenting the prevalence of mental health problems during COVID-19 suggests that upwards of 35% of people report elevated anxiety symptoms and upwards of 20% of people report depressive symptoms (Huang and Zhao 2020). Additionally, those with *pre-existing* anxiety disorders (pre-COVID-19) show greater stress

response and poorer coping than those without a pre-existing diagnosis (Asmundson et al. 2020).

Importantly, while the virus has impacted the entire world, there is emerging evidence that COVID-19 negatively impacts low income or developing countries, as well as racial and ethnic minorities, including Latinx, at disproportionate rates, including those in South America (Burki 2020; Rodriguez-Morales et al. 2020). Recent reports published by Johns Hopkins University suggest that, out of the countries with the highest mortality rates, three of the top ten countries are in South America, and Argentina reports one of the highest death rates from COVID-19 in the world (Johns Hopkins University 2020). This distinction is clinically important, as research shows that compared to non-Latinx Whites, Latinx adults report higher rates of anxiety symptoms and disorders, with an emphasis on somatization and physical functional impairment (Escovar et al. 2018). Examining literature from past large-scale epidemics, including the HIV/AIDS epidemic, Black and Latinx individuals were disproportionately affected and focusing research and clinical efforts on these high risk populations can reduce health disparities (Macias Gil et al. 2020; Ojikutu and Stone 2021). Yet, empirical knowledge about psychological vulnerabilities related to COVID-19 among Latinx in South America are presently highly limited.

Anxiety sensitivity (AS), defined as fear of fear (physical, cognitive, and social sensations) (Reiss et al. 1986; Reiss and McNally 1985), is a malleable trait-like individual difference factor that may increase vulnerability to the negative mental health effects of COVID-19, and has been specifically linked to heightened mental health complaints among Latinx (Viana et al. 2020; Zvolensky et al. 2020b). Although literature examining AS in terms of COVID-19-specific mental health factors, particularly among Latinx persons, is non-existent, past related work suggests that AS may partially explain (mediate) the relationship between stressful life events and anxiety symptoms (McLaughlin and Hatzenbuehler 2009). Additional work from past large-scale natural disasters, particularly hurricanes, suggests that AS is related to panic disorder symptoms over and above the variance accounted for by trauma exposure (Hensley-Maloney and Varela 2009), and AS amplifies the effects of trait anxiety on somatic symptom presentation (Hensley and Varela 2008). Prospective research following a school shooting found that AS was significant associated with anxiety and post-traumatic stress symptoms (Boffa et al. 2016). However, past work has not explored AS in the context of COVID-19 sequelae.

The AS construct also is theoretically relevant to the Latinx population, but to date no work has examined AS in terms of COVID-19 outcomes among Latinx persons. Indeed, past work suggests that, compared to non-Latinx White adults, Latinx adults report higher levels of somatic

symptoms, independent of anxiety diagnosis (Koss 1990). Other work has found that higher levels of somatic symptoms are associated with poorer chronic illness outcomes among the Latinx population (Vasquez et al. 2009). Furthermore, since AS amplifies the affective response to somatic perturbation (Drahovzal et al. 2006; Varela et al. 2007), AS may be particularly important to the Latinx population. Consistent with this formulation, non-COVID-19 related research has found that AS is associated with greater anxiety (Zvolensky et al. 2018b), depression (Zvolensky et al. 2020b), stress (Viana et al. 2020), post-traumatic stress (Zvolensky et al. 2020d), pain (Bakhshae et al. 2019; Kauffman et al. 2019), and substance use problems (Zvolensky et al. 2020a) among Latinx adults. Work among trauma-exposed Latinx samples, which is likely relevant to the current COVID-19 pandemic, suggests that AS is associated both with elevated mental health complaints as well as acculturative stress (Zvolensky et al. 2018a). In terms of COVID-19-specific mental health concerns in a population of adults in Argentina (Latinx adults), it is possible that COVID-19 anxiety and stress may principally manifest as somatic symptoms and worry about their consequences. AS may theoretically amplify these somatic symptoms where individuals may interpret them as catastrophic, thereby leading to greater overall symptoms and associated functional impairment. Additionally, given that many COVID-19 symptoms are common in everyday life (e.g., coughing, upset stomach), AS may further exacerbate the severity of these symptoms. Importantly, while AS may be more salient for Latinx individuals, preliminary research suggests that the magnitude of association between AS and other mental health facets is similar between Latinx and non-Latinx populations (Jardin et al. 2018).

The current study aimed to examine the role of AS total score, as well as sub-facets, in terms of COVID-19 worry, anxiety, functional impairment, and symptom severity among two samples of adults from Argentina. One sample included adults from the community. Given that pre-existing anxiety disorder may be associated with poorer COVID-19 stress coping (Asmundson et al. 2020), a second sample of adults with a pre-COVID-19 anxiety disorder was included. It was hypothesized that AS total score would be significantly positively associated with COVID-19 worry, anxiety, functional impairment, and symptom severity, and these effects would be evident over and above the variance accounted for by age, sex, COVID-19 exposure, and pre-existing medical conditions. Additionally, given the documented relations between AS and somatic symptoms, it was hypothesized that AS physical concerns would be associated with COVID-19 worry, anxiety, functional impairment, and symptom severity.

## Study 1

### Method

#### Participants

Participants were 105 Spanish-speaking adults ( $M_{age} = 38.58$ ,  $SD = 14.07$ , 69.5% female) participating in a survey about COVID-19 and mental health in Buenos Aires, Argentina, between May 12 and May 28, 2020 (country wide lockdown in Argentina began on March 19, 2020). Inclusion criteria for the current study included being over the age of 18, residing in Buenos Aires (self-report), and provided full and complete data. Using a convenience sampling method, participants were reached via local social media advertisements and completed the study online. Participants provided informed consent prior to study participation. Participants completed a series of self-report measures assessing a range of physical and mental health conditions in Spanish. The study was approved by the IRB of the sponsoring institution.

#### Measures

**Demographics.** Demographics, including age, gender, marital status, education level, current employment, and presence of co-morbid medical conditions, including conditions such as autoimmune disorders, HIV, asthma, etc., were collected from participants.

**Anxiety sensitivity index-3** (Taylor et al. 2007). The ASI-3 is an 18-item measure (adapted in Spanish; Solari and Bogiaizian 2016), based, in part, upon the original ASI (Reiss et al. 1986) in which respondents indicate the extent to which they are concerned about possible negative consequences of anxiety-related symptoms. Responses are rated on a 5-point Likert scale ranging from 0 (*very little*) to 4 (*very much*) and summed to a total score (ASI-3-total). The ASI-3 has been successfully used in past research in Argentina (Bogiaizian et al. 2017) and other Spanish-speaking samples (Zvolensky et al. 2014, 2018b). In the present investigation, internal consistency was excellent for the global score ( $\alpha = 0.91$ ) as well as the sub-facets: physical ( $\alpha = 0.90$ ), social ( $\alpha = 0.80$ ), and cognitive ( $\alpha = 0.90$ ).

**COVID-19 screening and symptoms.** Participants were asked to provide information regarding COVID-19 diagnosis (“Have you been diagnosed with COVID-19?”), exposure to confirmed cases (“Have you been exposed to someone who has confirmed COVID-19?”), and international travel (“Have you traveled to/from an area with community spread COVID-19 within the past

3 months”). This information was used for descriptive purposes. Additionally, for participants that endorsed being diagnosed with COVID-19, suspecting COVID-19 diagnosis, or being in close contact with someone with COVID-19 a composite COVID-19 exposure variable (yes/no) was included as a covariate in regression analyses.

**COVID-19 worry index.** Informed by established measures of worry (Meyer et al. 1990), the COVID-19 worry index is a 15-item measure developed by the current research team to specifically assess worry about contracting and becoming ill from COVID-19, including worry about related symptoms (Buckner et al. *under review*). Respondents are asked to rate their worry about each item (e.g., “I worry that I will come into contact with someone that has COVID-19.”). Responses are rated on a scale ranging from 1 (*Not at all*) to 7 (*A great deal*), and responses were summed for a total score, with higher scores indicating greater COVID-19-related worry. The COVID-19 worry index demonstrated excellent internal consistency ( $\alpha = 0.93$ ) in the present study.

**COVID-19 functional impairment** (Zvolensky 2020a). Participants were asked to rate the amount of difficulty they have had with seven activities in the context of COVID-19, rated on a 4-point Likert scale from 0 (*Not at all true*) to 3 (*Totally true*). Participants were asked to rate difficulty in a number of domains, including maintaining daily hygiene, sleep problems, maintaining contact with friends and family, eating less healthy food, feeling motivated to do work around the house, having problem maintaining a daily routine, problems exercising, and feeling more fatigued ( $\alpha = 0.73$ ).

**COVID-19 anxiety.** COVID-19-specific anxiety was assessed using a newly-developed measure, by asking participants to rate the degree to which they experience anxiety about 22 specific domains indirectly related to COVID-19, rated on a 5-point Likert scale from 0 (*None*) to 4 (*Extreme*). In contrast to COVID-19-related worry, COVID-19-specific anxiety is not focused on contracting the virus and fear of illness, but rather, on the anxiety about the consequences of COVID-19. For example, participants were asked to what degree they are experiencing anxiety about “losing their job” as well as “not receiving necessary medical care if needed,” among others, and the scale showed good internal consistency ( $\alpha = 0.88$ ).

**Severity of COVID-19 symptoms** (Zvolensky 2020b). Based in part on the structure of previously established illness symptom severity measures (Ader 2007), participants were asked to rate how often they experienced a number of COVID-19-related symptoms over the past 2 weeks, rated on a 6-point Likert scale from 0 (*Never*) to 5 (*Almost always*). The contents of the specific scale were COVID-19 specific, taken from the Center for Disease

Control and Prevention list of symptoms for COVID-19 (Center for Disease Control and Prevention 2020). Participants were asked about the following symptoms: dry cough, phlegm in throat, chest tightness/pressure in chest, stuffy/runny nose, sneeze, fatigue, difficulty breathing when sleeping, difficulty breathing when doing light activities, walking slowly due to shortness of breath, intense pressure in chest, feeling of choking, fever, confusion/disorientation, and stomach problems ( $\alpha = 0.80$ ).

## Data Analysis

Data were analyzed using SPSS version 25. First, descriptive statistics and bi-variate correlations were examined among variables. Then, four, 2-step hierarchical regression analyses were conducted, including covariates (age, sex, COVID-19 exposure, co-morbid health conditions) at step 1, and AS total score included at step 2, for each of the outcome variables (COVID-19 worry, functional impairment, and anxiety). Additional exploratory analyses were examined for the sub-facets of AS, including the same covariates at step 1, and all three subscales simultaneously in step 2. Squared semi-partial correlations and change in  $R^2$  were used as indices of effect size to indicate the amount of variance in the outcome that is attributed to each variable (Aiken and West 1991). Examining the mean and variance of COVID-19 symptom severity revealed over-dispersion (variance larger than the mean), suggesting the use of a negative binomial regression using a Generalized Linear Model framework (Hilbe 2011). For this outcome, 95% confidence intervals were presented as indices of effect size.

## Study 1 Results

### Descriptive Statistics and Bi-Variate Relations

In terms of marital status, approximately half (47.6%) of participants reported being single, 43.8% reported being married or cohabiting, and 8.6% reported being separated, divorced, or widowed. About one third (31.4%) of the sample completed high school or less, with 21.9% completing some college, 22.9% graduating from college, and 23.8% completing post-graduate education. In terms of COVID-19 exposure, 0% of participants had a confirmed diagnosis, but 1.9% reported believing they had COVID-19, 1.0% were exposed to someone with a confirmed case of COVID-19, and 1.9% reported being exposed to someone with a suspected COVID-19 diagnosis.

For bi-variate relations among all variables, see Table 1. Of note, AS total score was statistically significantly associated with all criterion variables; AS physical and cognitive sub-facets were associated with all outcomes except for COVID-19 anxiety. Further, despite the potential overlap in content between COVID-19 worry, anxiety, and symptom severity, the correlations between the total scores suggest construct independence. Finally, it is important to note that the AS sub-facets are correlated with each other in the moderate range.

### AS Total Score

*COVID-19 worry.* Step 1 of the model, including covariates only, did not account for statistically significant variance in COVID-19 worry ( $F(4, 100) = 0.739$ ,  $p = 0.57$ ,  $R^2 = 0.03$ ). Including AS total score in the model accounted for statistically significantly more variance in

**Table 1** Bi-variate relations among variables

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
1. Age	–	0.04	–0.02	0.27**	–0.03	–0.01	–0.17	0.11	0.10	–0.02	–0.20	0.29**
2. Sex	–0.08	–	–0.08	–0.04	0.01	0.01	0.02	–0.01	0.03	0.03	0.14	–0.10
3. COVID-19 exposure	–0.08	0.11	–	0.14	0.36**	0.30**	0.38**	0.13	0.36**	0.31**	0.24*	0.13
4. Pre-existing medicine condition	0.12	0.07	0.14	–	–0.03	0.01	–0.01	–0.07	0.10	0.03	–0.01	0.15
5. AS total score	–0.17	0.001	0.12	–0.06	–	0.77**	0.78**	0.72**	0.57**	0.43**	0.34**	0.38**
6. AS physical	–0.09	–0.02	0.07	–0.12	0.84**	–	0.43**	0.27**	0.51**	0.53**	0.18	0.31**
7. AS cognitive	–0.12	0.06	0.02	–0.10	0.82**	0.54**	–	0.39**	0.33**	0.34**	0.36**	0.18
8. AS social	–0.23*	–0.04	0.21*	0.09	0.80**	0.50**	0.47**	–	0.45**	0.09	0.25*	0.38**
9. COVID-19 worry index	0.07	0.08	0.10	0.10	0.52**	0.52**	0.38**	0.38**	–	0.47**	0.27**	0.50**
10. COVID-19 symptom severity	–0.15	0.01	0.11	0.15	0.59**	0.55**	0.43**	0.46**	0.46**	–	0.38**	0.34**
11. COVID-19 functional impairment	–0.14	0.11	0.11	0.14	0.44**	0.36**	0.40**	0.32**	0.31**	0.46**	–	0.28**
12. COVID-19 anxiety	0.24*	–0.06	0.06	0.04	0.23*	0.19	0.14	0.23*	0.51**	0.16	0.37**	–

Note: \* indicates  $p < 0.05$  and \*\* indicates  $p < 0.01$ . Correlations reported below the diagonal are for the community sample (Study 1;  $n = 105$ ) and correlations reported above the diagonal are for the clinical sample (Study 2;  $n = 99$ )



COVID-19 worry ( $F(5, 99) = 9.36, p < 0.001, R^2 = 0.32$ ), and AS total score was a statistically significant predictor ( $b = 0.81, se = 0.14, \beta = 0.55, p < 0.001, sr^2 = 0.29$ ; see Table 2).

**COVID-19 functional impairment.** Step 1 of the model, including covariates only, did not account for statistically significant variance in COVID-19 anxiety ( $F(4, 100) = 1.50, p = 0.21, R^2 = 0.06$ ). Including AS total score in the model accounted for statistically significantly more variance in COVID-19 anxiety ( $F(5, 99) = 6.06, p < 0.001, R^2 = 0.23$ ), and AS total score was a statistically significant predictor ( $b = 0.16, se = 0.04, \beta = 0.43, p < 0.001, sr^2 = 0.18$ ; see Table 2).

**COVID-19 anxiety.** Step 1 of the model, including covariates only, did not account for statistically significant variance in COVID-19 anxiety ( $F(4, 100) = 1.71, p = 0.15, R^2 = 0.06$ ). Including AS total score in the model accounted for statistically significantly more variance in COVID-19 anxiety ( $F(5, 99) = 3.08, p = 0.01, R^2 = 0.13$ ), and AS total score was a statistically significant predictor ( $b = 0.18, se = 0.06, \beta = 0.27, p = 0.006, sr^2 = 0.07$ ; see Table 2).

**COVID-19 symptom severity.** In predicting COVID-19 symptom severity, the model showed good model fit ( $\chi^2(99) = 65.08, p = 0.66$ ). Parameter estimates indicate the AS total score was statistically significantly positively associated with COVID-19 symptom severity ( $b = 0.03, 95\% CI [0.02, 0.05], se = 0.01, p < 0.001$ ).

**AS Sub-facets**

Exploratory analyses of AS sub-facets suggest differential patterns of associations for each outcome. Specifically, AS physical was the only sub-facet statistically significantly associated with COVID-19 worry ( $b = 1.50, se = 0.38, p < 0.001$ ) and COVID-19 symptom severity ( $b = 0.06, se = 0.02, p = 0.01$ ), whereas AS cognitive was the only sub-facet statistically significantly associated with COVID-19 functional impairment ( $b = 0.26, se = 0.26, p = 0.02$ ). Additionally, AS social was the only sub-facet statistically significantly associated with COVID-19 anxiety ( $b = 0.42, se = 0.20, p = 0.04$ ).

**Study 1 Discussion**

The current study explored the role of AS in terms of COVID-19 worry, functional impairment, anxiety, and symptom severity among a community sample of adults in Argentina. Results provide evidence that AS is robustly related to these constructs over and above the variance accounted for by age, sex, COVID-19 exposure, and

**Table 2** Parameter estimates for AS total score—community sample

Model	COVID-19 worry					COVID-19 anxiety					COVID-19 functional impairment				
	b	se	$\beta$	sig.	$sr^2$	b	se	$\beta$	sig.	$sr^2$	b	se	$\beta$	sig.	$sr^2$
1	34.62	6.53		<0.001		11.55	2.66		<0.001		8.88	1.55		<0.001	
Age	0.11	0.14	0.08	0.43	0.01	0.14	0.06	0.24	0.02	0.06	-0.05	0.03	-0.14	0.15	0.02
Sex	2.97	4.20	0.07	0.48	0.01	-0.90	1.71	-0.05	0.60	0.003	0.83	1.00	0.08	0.41	0.01
COVID-19 exposure	10.86	11.72	0.09	0.36	0.01	3.99	4.77	0.08	0.40	0.01	1.79	2.78	0.06	0.52	0.004
Pre-existing medical conditions	3.17	4.28	0.07	0.46	0.01	0.03	1.74	0.001	0.99	0.001	1.51	1.02	0.15	0.14	0.02
2	16.99	6.12		0.01		7.96	2.86		0.01		5.57	1.57		<0.001	
Age	0.23	0.12	0.17	0.05	0.03	0.16	0.06	0.28	<0.001	0.08	-0.02	0.03	-0.07	0.42	0.01
Sex	3.51	3.53	0.08	0.32	0.01	-0.79	1.65	-0.04	0.64	0.002	0.93	0.90	0.09	0.31	0.01
COVID-19 exposure	3.25	9.92	0.03	0.74	0.001	2.44	4.64	0.05	0.60	0.002	0.36	2.54	0.01	0.89	0.001
Pre-existing medical conditions	4.41	3.60	0.10	0.22	0.01	0.29	1.69	0.02	0.87	0.001	1.75	0.92	0.17	0.06	0.03
AS total score	0.88	0.14	0.55	<0.001	0.29	0.18	0.06	0.27	0.01	0.07	0.17	0.03	0.43	<0.001	0.18

pre-existing medical conditions. Additionally, analyses of the AS subscales found differential associations with outcomes, such that physical concerns were associated with COVID-19 worry and symptoms severity, cognitive concerns was associated with functional impairment, and social concerns was associated with anxiety. These results provide initial empirical evidence for the role of AS in terms of COVID-19-related mental health problems among a vulnerable sample of Latinx adults in Argentina.

## Study 2

### Method

#### Participants

Participants were 99 Spanish-speaking adults ( $M_{age} = 34.99$ ,  $SD = 10.83$ , 66.7% female) with a diagnosis of an anxiety disorder who participated in a study about COVID-19 and mental health in Buenos Aires, Argentina; data were collected between May 12 and May 28, 2020. Inclusion criteria for the current study included being over the age of 18, seeking mental health services for anxiety or depression at Asociacion Ayuda Anxiety Disorder Clinic, and providing full and complete data. Using a convenience sampling method, participants were referred to the study by their treating therapist. Participants provided informed consent prior to study participation. Participants completed a series of self-report measures assessing a range of physical and mental health conditions in Spanish. The study was approved by the IRB of the sponsoring institution.

#### Measures

Measures were identical for Study 1 and Study 2, and all measured showed good internal consistency in study 2: ASI 3—total ( $\alpha = 0.90$ ), physical ( $\alpha = 0.91$ ), cognitive ( $\alpha = 0.89$ ), social ( $\alpha = 0.85$ ); COVID-19 worry index ( $\alpha = 0.90$ ); COVID-19 functional impairment ( $\alpha = 0.70$ ); COVID-19 anxiety ( $\alpha = 0.83$ ); COVID-19 symptom severity ( $\alpha = 0.84$ ).

**Anxiety disorder diagnosis.** The Structured Clinical Interview for DSM-IV Axis I Disorders (SCID; First et al. 1996) was administered to the clinical sample to establish the presence of a current anxiety disorder. The SCID was conducted by licensed mental health professionals and confirmed by either a licensed psychiatrist or psychologist.

#### Data Analysis

Data analytic methods remained the same for Study 2 as for Study 1.

## Results

### Descriptive Statistics and Bi-Variate Relations

For anxiety disorder diagnoses, participants met criteria for the following primary diagnoses: 31.3% panic disorder, 36.4% generalized anxiety disorder, 22.2% social anxiety disorder, 8.1% obsessive-compulsive disorder, 1% specific phobia, and 1% illness anxiety disorder. In terms of marital status, 46.5% of participants reported being single, 49.5% reported being married or cohabiting, and 4.0% reported being separated, divorced, or widowed. In terms of education, 27.3% of the sample completed high school or less, with 23.2% completing some college, 34.3% graduating from college, and 15.2% completing post-graduate education. In terms of COVID-19 exposure, 1.0% of participants had a confirmed diagnosis, but 3.0% reported believing they had COVID-19, 0% were exposed to someone with a confirmed case of COVID-19, and 1.0% reported being exposed to someone with a suspected COVID-19 diagnosis.

For bi-variate relations among all variables, see Table 1. Of note, AS total score was statistically significantly associated with all outcomes, but AS physical was not associated with COVID-19 functional impairment, and AS cognitive was not associated with COVID-19 anxiety.

#### AS Total Score

**COVID-19 worry.** Step 1 of the model, including covariates only, accounted for statistically significant variance in COVID-19 worry ( $F(4, 94) = 3.897$ ,  $p = 0.006$ ,  $R^2 = 0.14$ ). Examining individual predictors suggests that possible COVID-19 exposure was statistically significantly associated with COVID-19 worry ( $b = 33.86$ ,  $se = 9.11$ ,  $\beta = 0.36$ ,  $p < 0.001$ ,  $sr^2 = 0.13$ ; see Table 3). Including AS total score in the model accounted for statistically significantly more variance in COVID-19 worry ( $F(5, 93) = 10.98$ ,  $p < 0.001$ ,  $R^2 = 0.37$ ), and AS total score was a statistically significant predictor ( $b = 0.68$ ,  $se = 0.12$ ,  $\beta = 0.52$ ,  $p < 0.001$ ,  $sr^2 = 0.23$ ; see Table 3).

**COVID-19 functional impairment.** Step 1 of the model, including covariates only, accounted for statistically significant variance in COVID-19 anxiety ( $F(4, 94) = 3.30$ ,  $p = 0.01$ ,  $R^2 = 0.012$ ), and age ( $b = -0.09$ ,  $se = 0.04$ ,  $\beta = -0.21$ ,  $p = 0.045$ ,  $sr^2 = 0.04$ ; see Table 3) and possible COVID-19 exposure ( $b = 5.87$ ,  $se = 2.32$ ,  $\beta = 0.25$ ,  $p = 0.01$ ,  $sr^2 = 0.06$ ; see Table 3) were statistically significantly associated with COVID-19 anxiety. Including AS total score in the model accounted for statistically significantly more variance in COVID-19 anxiety ( $F(5, 93) = 4.49$ ,  $p = 0.001$ ,  $R^2 = 0.19$ ), and AS total score was a statistically significant predictor ( $b = 0.10$ ,  $se = 0.02$ ,  $\beta = 0.29$ ,  $p = 0.005$ ,  $sr^2 = 0.07$ ; see Table 3).

**Table 3** Parameter estimates for AS total score—clinical sample

	COVID-19 worry					COVID-19 anxiety					COVID-19 functional impairment					
	<i>b</i>	<i>se</i>	$\beta$	<i>sig.</i>	<i>sr</i> <sup>2</sup>	<i>b</i>	<i>se</i>	$\beta$	<i>sig.</i>	<i>sr</i> <sup>2</sup>	<i>b</i>	<i>se</i>	$\beta$	<i>sig.</i>	<i>sr</i> <sup>2</sup>	
1																
Constant	34.73	6.47		<0.001		10.62	2.42		<0.001		10.20	1.65		<0.001		
Age	0.16	0.17	0.10	0.34	0.01	0.18	0.06	0.28	0.01	0.07	-0.09	0.04	-0.20	0.04	0.04	
Sex	2.13	3.67	0.06	0.56	0.003	-1.35	1.37	-0.10	0.33	0.01	1.60	0.93	0.17	0.09	0.03	
COVID-19 exposure	33.86	9.11	0.36	<0.001	0.13	4.21	3.41	0.12	0.22	0.01	5.87	2.32	0.25	0.01	0.06	
Pre-existing medical conditions	1.02	3.76	0.03	0.79	0.001	0.72	1.41	0.05	0.61	0.002	0.19	0.96	0.02	0.85	0.001	
2																
Constant	19.76	6.13		<0.001		6.29	2.46		0.01	0.07	8.10	1.75		<0.001		
Age	0.16	0.15	0.09	0.28	0.01	0.18	0.06	0.28	<0.001	0.07	-0.09	0.04	-0.21	0.04	0.04	
Sex	1.53	3.16	0.04	0.63	0.002	-1.52	1.27	-0.11	0.23	0.01	1.52	0.90	0.16	0.09	0.03	
COVID-19 exposure	15.85	8.43	0.17	0.06	0.02	-0.99	3.39	-0.03	0.77	0.001	3.35	2.40	0.14	0.17	0.02	
Pre-existing medical conditions	2.66	3.25	0.07	0.41	0.01	1.19	1.30	0.09	0.36	0.01	0.42	0.93	0.04	0.65	0.002	
AS total score	0.68	0.12	0.51	<0.001	0.23	0.20	0.05	0.40	<0.001	0.14	0.10	0.03	0.29	0.01	0.07	

*COVID-19 anxiety.* Step 1 of the model, including covariates only, accounted for statistically significant variance in COVID-19 anxiety ( $F(4, 94)=3.02, p=0.02, R^2=0.11$ ), and age was statistically significantly positively associated with COVID-19 anxiety ( $b=0.178, se=0.06, \beta=0.28, p=0.006, sr^2=0.07$ ; see Table 3). Including AS total score in the model accounted for statistically significantly more variance in COVID-19 anxiety ( $F(5, 93)=6.35, p<0.001, R^2=0.25$ ), and AS total score was a statistically significant predictor ( $b=0.20, se=0.05, \beta=0.40, p<0.002, sr^2=0.14$ ; see Table 3).

*COVID-19 symptom severity.* In predicting COVID-19 symptom severity, the model showed good model fit ( $\chi^2(93)=58.39, p=0.63$ ). Parameter estimates indicate the AS total score is statistically significantly positively associated with COVID-19 symptom severity ( $b=0.02, 95\% CI [0.01, 0.04], se=0.01, p=0.008$ ).

**AS Sub-facets**

Exploratory analyses of AS sub-facets suggest differential patterns of associations for each outcome. Specifically, AS physical (Worry— $b=1.03, se=0.25, p<0.001$ ; Anxiety— $b=0.23, se=0.10, p=0.03$ ) and AS social (Worry— $b=1.03, se=0.27, p<0.001$ ; Anxiety— $b=0.32, se=0.11, p=0.005$ ) were statistically significantly associated with COVID-19 worry and COVID-19 anxiety. Additionally, AS physical was the only sub-facet associated with COVID-19 symptom severity ( $b=0.05, se=0.02, p=0.005$ ), but no sub-facets were statistically significantly associated with COVID-19 functional impairment.

**Study 2 Discussion**

The current study examined the association of AS with COVID-19 worry, functional impairment, anxiety, and symptom severity among a sample of adults with anxiety disorders in Argentina. Like the results from study 1, results indicated the AS total score was significantly associated with each of the outcomes. In terms of AS sub-facets, physical and social concerns were significantly associated with worry and anxiety, and physical concerns along were associated with symptom severity. These results highlight that AS is also an important vulnerability factor for Latinx adults with pre-existing anxiety disorders and may be an important treatment target to mitigate mental health disparities.

## General Discussion

The current manuscript examined the relationship between AS and COVID-19 worry, functional impairment, anxiety, and symptom severity across two samples of adults (general population and a sample with anxiety disorders) from Buenos Aires, Argentina. Results from both samples provide evidence that AS is significantly positively associated with COVID-related worry, anxiety, functional impairment and symptoms severity, and these associations were evident over and above the variance accounted for by age, sex, pre-existing medical conditions, and possible COVID-19 exposure. These results are in line with past work among Latinx adults documenting associations between AS and mental health outcomes (e.g., Viana et al. 2020; Zvolensky et al. 2020d), and extends the findings to COVID-19 specific mental health and functional outcomes. Additionally, the finding that AS is related to more severe COVID-19 symptoms independent of COVID-19 exposure is particularly clinically important, as AS has been shown to be associated with increased risk of chronic medical conditions (Horenstein et al. 2018; Lipsitz et al. 2004), and may worsen COVID-19 outcomes for those with the virus.

It is worth noting that inspection of effect sizes indicates that the magnitude of the association between AS and all criterion variables differs between the community and clinical samples. Although no formal tests were conducted to compare the magnitude of the effects, it appears that the magnitude of the association between AS and COVID-19, as well as functional impairment was largest for the community sample, and the relationship between AS and COVID-19 anxiety was largest of the clinical sample. This finding provides initial evidence that among a clinical sample of adults with anxiety disorders, AS may contribute strongly to exacerbated COVID-19 anxiety, but to a lesser degree worry and functional impairment, whereas AS may be a driver of worry and impairment for the community sample.

Exploratory analyses of AS subscales indicated some differential associations between the community and clinical samples. Across both samples, AS physical concerns were associated with COVID-19 worry and symptom severity. In line with past work suggesting that AS physical concerns is specifically related to vigilance to somatic symptoms common in both worry and medical illness (Gelenberg 2000; Zvolensky and Forsyth 2002), AS physical concerns may be driving the observed relations across community and clinical samples, suggesting this may be a particularly good target for intervention among Latinx individuals, as has been found in past work on Latinx samples (Bakhshaie et al. 2017). Additionally, AS social

concerns was associated with anxiety across both samples, which has been associated in past work with poorer disease outcomes and functional impairment (Dixon et al. 2018). Finally, while AS cognitive concerns was only associated with functional impairment in the community sample, there may be importance to better understanding this facet given that past work specifically links AS cognitive concerns to increased suicide risk (Oglesby et al. 2015). Relatedly, AS cognitive concerns was not associated with COVID-19 anxiety in either sample, which is in contrast with past literature suggesting that targeting AS cognitive concerns improves mental health complaints (Schmidt et al. 2014). Yet, given the fact that Latinx samples have been shown to somaticize anxiety symptoms (Escovar et al. 2018), and no work has examined AS cognitive in Latinx only samples, it is possible that AS physical concerns accounts for more of the variance in the current sample. Further study of AS sub-facets in terms of COVID-19 mental health outcomes is warranted.

The results of the current study may have important clinical implications for a high-risk group particularly vulnerable to the negative health consequences of COVID-19. It is also possible that the results of the study may generalize to other Latinx populations and South American countries, given that COVID-19 appears to disproportionately affect Latinx communities both abroad and in the United States. Additionally, the medical infrastructure in Argentina (Portes and Ross 1976), suggests that these countries may not have all the medical resources needed to handle a large-scale pandemic or its aftermath. Therefore, focusing clinical and research attention on the mental health impact of the pandemic is of utmost importance. Given the robust associations between AS, mental health, and functional outcomes in prior literature and in the current study, assessing and targeting AS may be considered “good clinical practice” during and after COVID-19, even among those with mild symptoms. However, it is important to consider interventions that can be modified according to social distancing practices to curtail the spread of the virus. Previous research examining the efficacy of brief, computer-delivered AS treatments suggests that targeting AS in this fashion is associated with reductions in mental health symptoms (Schmidt et al. 2014; Timpano et al. 2016), and these treatments could be easily adapted to home delivery and delivery via mobile phone application. Developing this intervention may be critical for Latinx adults during and following COVID-19. Finally, due to data collection limitations, there was no variable to control for trait level of negative affect. It would therefore be important to replicate the findings in another sample, controlling for trait level of negative affect, to elucidate the unique effects of AS over and above general negative affect. That said, it is important to note here that past work has recurrently demonstrated AS maintains incremental predictive power relative



to trait level negative affect across decades of research (Eifert et al. 1999; Schmidt et al. 2006; Zvolensky et al. 2005, 2019).

The current study is not without limitations. First, the data were cross-sectional, prohibiting causal claims to be made regarding the associations. Future prospective modelling is critical to understand the temporal ordering of the association between AS and COVID-19 psychological constructs. Additionally, the majority of the sample indicated that they had not been exposed to COVID-19, and it would be important to replicate the current findings, particularly those regarding symptom severity, to those with a confirmed diagnosis of COVID-19 to increase the generalizability of the findings. Further, it is possible that some participants in the community sample had mental health symptoms, but they were not in treatment and thus not included in the clinical sample, and replication and extension of the findings in other, larger populations is warranted. Fourth, due to data collection limitations for the anxiety disorder sample, there is no information regarding the amount of time these individuals had been in treatment, as well as the presence of any comorbid diagnoses. Although the current sample was screened to have a primary anxiety disorder diagnosis, anxiety disorders are commonly comorbid with other conditions and this may limit the generalizability of the current results to all clinical populations.

Overall, the current study presents the first investigation of AS and COVID-19 related worry, anxiety, functional impairment, and symptom severity among two samples of adults in Argentina, and results provide strong evidence for these associations. These results provide important evidence for psychological vulnerability factors that may increase the mental health impact of COVID-19 and developing interventions that target AS may reduce this looming public health crisis.

## Compliance with Ethical Standards

**Conflicts of Interest** The authors declare no conflicts of interest.

**Informed Consent** All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (national and institutional). Informed consent was obtained from all individual subjects participating in the study.

**Animal Rights** No animal studies were carried out by the authors for this article.

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