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ORIGINAL ARTICLE

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The relationship between maladaptive health beliefs, pandemic-related stress, and health anxiety during the COVID-19 pandemic

BACKGROUND
Research has demonstrated that people experience specific distress and anxiety regarding COVID-19. This distress may consist of interconnected symptom categories corresponding to a COVID stress syndrome. Susceptibility to COVID stress syndrome may be related to one's maladaptive health beliefs; however, no research has investigated the association between maladaptive health beliefs and COVID stress. The present study explored the impact of health beliefs on COVID stress, health anxiety, and associated psychological constructs.

PARTICIPANTS AND PROCEDURE
This cross-sectional survey study included 221 adults (*M* age = 20.59, *SD* = 2.28). Participants completed an online survey including demographic questionnaires and self-report measures of health beliefs, COVID stress, health anxiety, and related psychological constructs.

RESULTS
Health anxiety, anxiety sensitivity, state/trait anxiety, intolerance of uncertainty, and depression accounted for significant variance in COVID stress ($F(6, 214) = 11.18$, $R^2 = .24$, $p < .001$). Health beliefs (i.e., perceived likelihood of illness, medical service inadequacy, and difficulty coping) were associated with greater COVID stress, although health beliefs were not found to mediate the relationship between health anxiety and COVID stress.

CONCLUSIONS
Health beliefs were associated with greater COVID stress, although health beliefs did not mediate the relationship between health anxiety and COVID stress. The relationship between health anxiety and COVID stress may be better explained by other COVID-related cognitions (e.g., vaccine efficacy, dangerousness of COVID-19). The findings highlight the importance of peoples' health beliefs during the pandemic. Given anxiety's influence on peoples' behavioural responses to the pandemic, further research should identify COVID-specific cognitions for prevention of COVID stress and health anxiety.

KEY WORDS
anxiety; cross-sectional; pandemic; health cognitions; COVID stress syndrome

ORGANIZATION – University of Regina, Regina, Canada

AUTHORS' CONTRIBUTIONS – A: Study design · B: Data collection · C: Statistical analysis · D: Data interpretation · E: Manuscript preparation · F: Literature search · G: Funds collection

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BACKGROUND

Coronavirus disease 2019 (COVID-19) has significantly impacted global health since it surfaced at the end of 2019 (Al-Metwali et al., 2021). Researchers have explored the psychological impact of the COVID-19 pandemic with studies demonstrating significant stress and anxiety related to COVID-19 among populations in China, the United States, and Canada (Knowles & Olatunji, 2021; Qiu et al., 2020; Wang & Zhao, 2020). Based on data collected from a large sample of Americans and Canadians during the early stages of the pandemic, researchers have identified an interconnected network of various symptoms (i.e., danger and contamination fears, socioeconomic concerns, COVID-related xenophobia, traumatic stress symptoms, compulsive checking and reassurance seeking) that form a COVID stress syndrome. These specific symptoms involved in COVID stress have affected more than 50% of the population (Taylor et al., 2020a, b). Asmundson and colleagues (2020) found that individuals with pre-existing mental health conditions, including depression and anxiety, are more likely to be negatively affected by COVID stress than those without pre-existing mental health conditions. Moreover, Taylor et al. (2020b) reported that individuals with high levels of COVID stress were more likely to have increased levels of health anxiety (HA), anxiety sensitivity (AS), and intolerance of uncertainty (IU). Although studies have explored psychological impacts of the COVID-19 pandemic, little is known about the contribution of maladaptive health beliefs to comorbid HA and COVID stress.

HA refers to anxiety related to the misinterpretation of bodily changes or sensations (e.g., cough, sore throat) that are perceived to be indicative of serious illness (Asmundson et al., 2010; Taylor & Asmundson, 2004). A wealth of literature has demonstrated significant associations between HA and COVID-19-related fears and stress (e.g., Taylor et al., 2020b; Akbari et al., 2021). Additionally, studies of the COVID-19 pandemic have demonstrated the important role that HA and anxiety-related constructs (e.g., anxiety sensitivity), or lack thereof, play in shaping behavioural responses to viral outbreaks (e.g., Akbari et al., 2021; Khoury et al., 2021; Kibbey et al., 2020; Sauer et al., 2020). People who experience too little HA about a viral outbreak may facilitate spread of the virus as they are less likely to engage in hygiene behaviours (e.g., handwashing), adhere to physical distancing measures, and get vaccinated (Taylor, 2019). Conversely, people with excessive HA may engage in socially disruptive behaviours that can affect pandemic resources, such as unnecessarily using hospital emergency services and clinics when they misinterpret minor ailments as indicative of signs of serious infection (Asmundson & Taylor, 2020a, b; Taylor, 2019).

The current understanding of HA is primarily informed by evidence-based cognitive behavioural (CB) models (Abramowitz et al., 2002; Asmundson et al., 2004; Haig-Ferguson et al., 2021; Salkovskis et al., 2003; Taylor & Asmundson, 2004). The initial CB model of HA proposed by Salkovskis et al. (2003) posits that health anxiety is characterized primarily by catastrophic misinterpretations of bodily sensations that stem from dysfunctional beliefs about health and illness and maladaptive coping behaviours (Salkovskis & Warwick, 2001; Asmundson & Taylor, 2020b). Haig-Ferguson and colleagues (2021) adapted the model in the context of COVID-19, outlining the empirically based CBT formulation with further considerations for the role of parents and societal context in anxiety maintenance. Contemporary cognitive-behavioural approaches to health anxiety, pandemics, and trauma-related fears (e.g., Asmundson et al., 2010; Taylor, 2019; Taylor et al., 2020a; Taylor & Asmundson, 2004) have proposed that emotional and behavioural responses to the COVID-19 pandemic, including the development of COVID-related stress and anxiety, may be similarly related to maladaptive health beliefs. Negative beliefs (e.g., worries about COVID-19 infection) lead to checking for COVID-19-related information that makes the threat more predictable and controllable, which can lead to a downward spiral alternating between increasing anxiety symptoms and checking behaviours (Asmundson & Taylor, 2020b; Dennis et al., 2021). Research on past pandemics has similarly found that individuals with more beliefs related to contamination had increased anxiety in response to pandemic illnesses, including H1N1 swine flu (Wheaton et al., 2012), Zika virus (Blakey & Abramowitz, 2017), and Ebola (Blakey et al., 2015).

More recent studies on the COVID-19 pandemic have found that the use of cognitive-based coping strategies, such as psychological flexibility and cognitive reappraisal, mediated the relationship between perceived stress and psychological symptoms (e.g., anxiety and PTSD; Di Maggio et al., 2023; Bruno et al., 2022). While limited research has examined the role of specific maladaptive health beliefs in the development of COVID stress, research has found that fundamental beliefs about the world (e.g., positive nature versus intrinsic uncertainty about the world) and early maladaptive schemas impacted psychological adjustment and distress in response to the COVID-19 pandemic (Faustino et al., 2022; Vazquez et al., 2021). For example, Faustino and colleagues (2022) found that the core psychological patterns of mistrustfulness and vulnerability to harm and illness which lead individuals to have more maladaptive core beliefs about the world acted as underlying mediator variables for the relationship between COVID-19 anxiety and psychological wellbeing and satisfaction. Akbari and colleagues (2021) also found that negative beliefs about the uncontrollability and dangerousness of illness may me-

diate the association between fears of COVID-19 and HA. Research on the COVID stress syndrome provides additional support for CB models as it suggests that the symptoms of COVID stress centre on beliefs pertaining to the perceived dangerousness of COVID-19 (Taylor et al., 2020a). To gain a comprehensive understanding of the association between HA and COVID stress, it is critical to explore the potential relationship between maladaptive health beliefs and adverse psychological responses to the COVID-19 pandemic.

The purpose of the current study was to examine the associations between health beliefs, HA, and associated psychological constructs (i.e., anxiety, depression, AS, IU, and coping strategies), and the development of COVID stress in emerging adults (i.e., aged 17 to 25). Our study focused on this age group as emerging adulthood is the suggested age of onset for clinical levels of HA (Alberts et al., 2016; APA, 2013). First, we hypothesized that there would be significant associations between study measures of interest across the whole study sample. Second, we hypothesized that individuals with elevated levels of COVID stress would show higher levels of HA, related psychological constructs (i.e., anxiety, depression, AS, and IU), and poorer coping strategies. Third, we hypothesized that individuals with higher levels of maladaptive health beliefs would have higher levels of COVID stress. Fourth, we hypothesized that individuals with clinically significant levels of HA would be particularly at risk for the development of COVID stress and associated constructs. Finally, we hypothesized that the association between HA and COVID stress would be mediated by health beliefs.

PARTICIPANTS AND PROCEDURE

PARTICIPANTS

Participants in the current study included adults recruited through the University of Regina's undergraduate psychology participant pool. Individuals recruited through the participant pool were given course credits towards a psychology course for their participation. Participants were considered eligible if they were above the age of 17.

PROCEDURE

The study was approved by the Research Ethics Board at the University of Regina (UofR file: 2020-207). Once participants enrolled in the study via the participant pool Internet-based software program, they were directed to a secure website where informed consent was obtained, and they completed a 60-minute Internet-based survey containing relevant self-report measures described below.

MEASURES

Demographics. A demographic questionnaire was completed which assessed personal and health variables. Participants were asked to provide general demographic information (e.g., age, gender identity, ethnicity, education). The demographic questionnaire also gathered information on whether participants and their family members had mental or physical health conditions. Participants were also asked to provide information on their experiences with COVID-19, such as having been diagnosed with COVID-19 themselves or having friends or family members who have been diagnosed.

COVID Stress Scales (CSS). The CSS consist of 36 self-report items over five subscales that measure fear of becoming infected with COVID-19, fear of coming into contact with contaminated objects or surfaces, fear of foreign individuals who may be carrying the virus (xenophobia), fear of socio-economic related consequences, compulsive checking and reassurance-seeking of COVID-19-related threats, and traumatic stress symptoms related to COVID-19 (Taylor et al., 2020b). The CSS use a 5-point scale to assess COVID-19-related stress over the previous seven days where response options range from 0 (*not at all/never*) to 4 (*extremely/almost always*). Total scores of the CSS range from 0 to 144. Higher scores on the CSS indicate greater levels of COVID stress. The CSS have demonstrated excellent reliability in Canadian and American samples (a ranging from .83 to .95), as well as good convergent and discriminant validity (Taylor et al., 2020b). For the current study, the CSS demonstrated excellent internal consistency ($\alpha = .95$).

Short Health Anxiety Inventory (SHAI). The SHAI consists of 14 self-report items that assess HA independently of physical health status (Salkovskis et al., 2002). Items on the SHAI evaluate worry about health, feared consequences of having an illness, and awareness of bodily sensations or changes over the past 6 months. Total scores range from 0 to 42, where higher scores indicate greater levels of HA. The SHAI has demonstrated good internal consistency, good criterion validity, and strong construct validity in undergraduate student populations (Abramowitz et al., 2007; Alberts et al., 2013, 2016; Salkovskis et al., 2002). In the current study, the SHAI total score demonstrated good internal consistency ($\alpha = .87$).

Health Cognitions Questionnaire (HCQ). The HCQ consists of 20 self-report items that measure four core beliefs involved in the development of HA (i.e., likelihood of illness, awfulness of illness, difficulty coping with illness, and medical service inadequacy; Hadjistavropoulos et al., 2012). Items are rated on a five-point scale that ranges from 1 (*strongly disagree*) to 5 (*strongly agree*). Subscale total scores range from 20 to 100, where higher scores indicate more maladaptive beliefs. The HCQ has demonstrat-

ed predictive and discriminant validity (Alberts et al., 2016; Hadjistavropoulos et al., 2012). The HCQ has also demonstrated adequate to good internal consistency (i.e., awfulness of illness: α = .74; difficulty coping with illness: α = .88) (Alberts et al., 2016; Hadjistavropoulos et al., 2012). For the current study, HCQ subscales demonstrated adequate to good internal consistency (i.e., awfulness of illness: α = .71; difficulty coping with illness: α = .86; likelihood of illness: α = .82; medical service inadequacy: α = .82).

State-Trait Anxiety Inventory (STAI). The STAI consists of two 20-item subscales – State Anxiety and Trait Anxiety. The State Anxiety subscale asks respondents how they feel at the present moment to evaluate the current state of anxiety and related symptoms (Spielberger et al., 1983). The Trait Anxiety subscale measures respondents' generalized tendency to be anxious. Items on the STAI are rated on a 1 to 4 scale. Subscale total scores range from 20 to 80, where higher scores indicate greater levels of anxiety. The STAI has been found to have excellent reliability, and good construct and concurrent validity (Spielberger, 1989). For the current study, the internal consistency for STAI subscales was excellent (i.e., STAI-State: α = .94; STAI-Trait α = .92).

Center for Epidemiological Studies Depression Scale (CES-D). The CES-D consists of 20 self-report items that measure the frequency of depressive symptoms over the course of the previous week (Radloff, 1977). Items are rated on a four-point scale from 0 (*rarely or none of the time*) to 3 (*most or all of the time*). Total scores range from 0 to 60, where higher scores are reflective of greater levels of depression. The CES-D has been found to have good internal consistency in both community and clinical samples (Santor et al., 1995). For the current study, the CES-D total score demonstrated excellent internal consistency (α = .90).

Anxiety Sensitivity Index-3 (ASI-3). The ASI-3 is an 18-item self-report questionnaire composed of three subscales: physical, cognitive, and social concerns (Taylor et al., 2007). Participants are asked to indicate the extent to which they agree or disagree with each item on a five-point scale ranging from 0 (*very little*) to 4 (*very much*). Total scores range from 0 to 72, with higher scores indicating higher levels of AS. The ASI-3 has demonstrated good internal consistency, and convergent, discriminant, structural, and criterion-related validity (Taylor et al., 2007). For the current study, the ASI-3 total score demonstrated excellent internal consistency (α = .90).

Intolerance of Uncertainty Scale – Short Form (IUS-12). The IUS-12 is a 12-item self-report questionnaire which measures responses to uncertainty, ambiguous situations, and the future (Carleton et al., 2007). Items are rated on a five-point scale with possible responses ranging from 1 (*not at all characteristic of me*) to 5 (*entirely characteristic of me*). Total score ranges from 12 to 60, where higher scores indicate greater levels of IU. The IUS-12 total score has demonstrated good convergent and discriminant validity, and internal consistency (Carleton et al., 2007; McEvoy & Mahoney, 2011). For the current study, the IUS-12 total score demonstrated good internal consistency (α = .88).

Coping. Coping in regard to the current COVID-19 pandemic was evaluated using a 28-item scale developed by Taylor and colleagues (2020a). Items on the scale measured participants' use of various coping strategies such as spending time cooking and trying new recipes and practising relaxation exercises. The scale also measured how helpful participants believed each coping strategy to be during the pandemic. Items on the scale were rated on a 5-point Likert scale ranging from 0 (*did not use this coping resource*) to 4 (*tried it and found it extremely helpful*). Higher scores indicated the use of more coping strategies and higher perceived helpfulness of said strategies. Previous information on the validity and reliability of the coping scale is not available. However, in the current study the Coping scale demonstrated good internal consistency (α = .82).

STATISTICAL ANALYSES

Statistical analyses were conducted using IBM SPSS Statistics Version 26. Statistical analyses included: (1) descriptive statistics to describe demographic information of the sample and questionnaire subscales and total scores, (2) bivariate correlations to examine the associations between the study measures; (3) multiple regression analyses to examine what psychological variables accounted for the most variance in CSS, (4) multiple regression analyses to examine what health beliefs accounted for the most variance in COVID stress, (5) a logistic regression to examine the odds of those with high HA (i.e., SHAI total score > 20) having higher COVID stress, symptoms of state/trait anxiety symptoms, depression, AS, IU, and more maladaptive health beliefs than those with low HA (i.e., SHAI total score < 20), and (6) path analyses were conducted using bootstrapping in SPSS AMOS to examine whether health beliefs (i.e., likelihood of illness, awfulness of illness, difficulty coping with illness, and medical service inadequacy) mediated the hypothesised association of HA predicting COVID stress.

RESULTS

SAMPLE CHARACTERISTICS AND DESCRIPTIVE STATISTICS

Sample demographics are presented in Table 1. Participants included 221 undergraduate university students with a mean age of 20.59 (*SD* = 2.28). Thirty-four percent (*n* = 77) of participants reported having an

Table 1

Demographic characteristics (N = 221)

Variable	*n* (%)
Gender	
Male	42 (19.0)
Female	177 (80.1)
Trans/Non-binary	2 (0.9)
Ethnicity	
White/Caucasian	127 (57.5)
Black/African	18 (8.1)
Asian	52 (23.5)
Indigenous/First Nations	10 (4.5)
Middle Eastern	7 (3.2)
Mixed ethnicity	6 (2.7)
Other	1 (0.5)
Education	
≤ High school	139 (62.9)
College certificate/ Some university	70 (31.7)
≥ University diploma	12 (5.4)
Employment status	
Part-time	91 (41.2)
Full-time	21 (9.5)
Student	110 (49.8)
Current living arrangements	
Alone	15 (6.8)
With roommate(s)	34 (15.4)
With parents	149 (67.4)
With spouse/partner	12 (5.4)
Other	8 (3.6)
Relationship status	
Single	124 (56.1)
Dating	81 (36.7)
Common law	9 (4.1)
Engaged	1 (0.5)
Married	6 (2.7)

existing mental health condition, and 15.4% (*n* = 34) reported having been professionally diagnosed with a serious medical illness. At the time of the study, mental health interventions were being accessed by 21.7% of the sample. One hundred and forty-four participants reported having a family member who had been professionally diagnosed with a serious medical illness. One hundred and twenty-nine of the participants reported that themselves (*n* = 8), a family member (*n* = 41), or a friend/acquaintance (*n* = 108) had tested positive for COVID-19. Of those who reported a known case of COVID-19, 43 participants reported a case resulting in hospitalization and 31 participants reported a case resulting in death. Means and standard deviations for study variables can be found in Table 2. Examination of the SHAI mean total score indicated that the overall sample was not overly health anxious, with scores on the SHAI well below those reported in clinical samples and similar to means reported in non-clinical samples in the literature (Alberts et al., 2013). Participant scores on the HCQ were also comparable to those reported among non-clinical samples in the literature (Hadjistavropoulos et al., 2012). Examination of the CSS mean total score indicated that the overall sample was coping well with COVID stress, although the distribution was positively skewed, indicating that a small subset of participants were experiencing elevated COVID stress.

Table 2

Descriptive statistics for study measures

Measure	*M* (*SD*)
CSS	35.47 (23.56)
SHAI	16.37 (7.21)
HCQ subscale	
Awfulness of illness	15.44 (2.59)
Likelihood of illness	12.15 (3.21)
Difficulty coping with illness	21.19 (5.15)
Medical service inadequacy	10.55 (3.33)
IUS	35.19 (8.68)
ASI	46.72 (14.37)
CESD	25.36 (11.64)
STAI	58.33 (22.24)
Coping	41.36 (14.58)

Note. CSS – COVID Stress Scales; SHAI – Short Health Anxiety Inventory; HCQ – Health Cognitions Questionnaire; IUS – Intolerance of Uncertainty Scale; ASI – Anxiety Sensitivity Index; CESD – Center for Epidemiologic Studies Depression Scale; STAI – State-Trait Anxiety Inventory.

ASSOCIATION BETWEEN HA AND RELATED CONSTRUCTS

Our results were, for the most part, consistent with our first hypothesis in that COVID stress (i.e., CSS total score) was significantly associated with all study

Table 3

Correlations among measures

Measure	Correlations										
	1	2	3	4	5	6	7	8	9	10	11
1. CSS	–										
2. SHAI	.36**	–									
3. HCQ – Awfulness of illness	.06	.24**	–								
4. HCQ – Likelihood of illness	.23**	.47**	.09	–							
5. HCQ – Difficulty coping with illness	.21**	.36**	.43**	.27**	–						
6. HCQ – Medical service inadequacy	.20**	.27**	−.06	.22**	.18**	–					
7. IUS	.24**	.29**	.21**	.26**	.26**	.04	–				
8. ASI	.30**	.48**	.29**	.36**	.36**	.11	.52**	–			
9. CESD	.23**	.44**	.06	.40**	.31**	.27**	.38**	.54**	–		
10. STAI	.25**	.45**	.12	.45**	.37**	.22**	.50**	.56**	.81**	–	
11. Coping	.30**	.07	.04	−.01	−.14**	.01	.07	.07	.01	−.04	–

Note. CSS – COVID Stress Scales; SHAI – Short Health Anxiety Inventory; HCQ – Health Cognitions Questionnaire; IUS – Intolerance of Uncertainty Scale; ASI – Anxiety Sensitivity Index; CESD – Center for Epidemiologic Studies Depression Scale; STAI – State-Trait Anxiety Inventory. $^{**}p < .01$.

constructs, with the exception of one health belief (i.e., HCQ-awfulness of illness; see Table 3). The association of interest between COVID stress (i.e., CSS total score) and HA (i.e., SHAI total score) was moderate and statistically significant ($r = .36$). The strongest association was between depression (i.e., CES-D total score) and anxiety (i.e., STAI total score) ($r = .81$). The construct that had the fewest statistically significant associations was coping, which was only associated with HCQ-difficulty coping ($r = -.14$) and COVID stress ($r = .30$).

PSYCHOLOGICAL PREDICTORS OF COVID STRESS

Our results were partially consistent with our second hypothesis. Multiple regression analyses were conducted to examine the proportion of variance in COVID stress that was accounted for by HA, anxiety, depression, AS, and IU. As shown in Table 4, the regression model was statistically significant. A statistically significant effect was found for multiple regression analysis where HA, anxiety, depression, AS, and IU predicted 23.9% of the variance in COVID stress, $F(6, 214) = 11.18$, $R^2 = .24$, $p < .001$. In the model, the strongest predictors of COVID stress were HA and ability to cope. Given that HA and the other associated psychological variables were significantly associated with COVID stress, it is possible that suppression of the variables occurred because of their highly correlated nature.

Table 4

Psychological predictors of COVID stress

Variable	*B*	*SE*	β	*r*
SHAI	.81	.23	.25**	.36**
IUS	.24	.20	.09	.24**
ASI	.15	.13	.09	.30**
CESD	−.03	.21	−.02	.23**
STAI	.08	.12	.07	.25**
Coping	.45	.10	.28**	.30**

Note. SHAI – Short Health Anxiety Inventory; IUS – Intolerance of Uncertainty Scale; ASI – Anxiety Sensitivity Index; CESD – Center for Epidemiologic Studies Depression Scale; STAI – State-Trait Anxiety Inventory. $^{**}p < .01$.

HEALTH BELIEF PREDICTORS OF COVID STRESS

Our results were partially consistent with our third hypothesis in that a proportion of variance in COVID

Table 5

Health cognition predictors of COVID stress

Variable	*B*	*SE*	β	*r*
HCQ – Awfulness of illness	−.05	.66	−.01	.06
HCQ – Likelihood of illness	1.22	.50	.17*	.23**
HCQ – Difficulty coping with illness	.64	.34	.14	.21**
HCQ – Medical service inadequacy	.97	.48	.14*	.20**

Note. HCQ – Health Cognitions Questionnaire; *$p < .05$, **$p < .01$.

stress was accounted for by most of the HCQ subscales (i.e., likelihood of illness, difficulty coping with illness, and medical service inadequacy). As shown in Table 5, the regression model was statistically significant. A statistically significant effect was found for the multiple regression analysis, where health beliefs including likelihood of illness, awfulness of illness, difficulty coping with illness, and medical service inadequacy accounted for 9.4% of the variance in COVID stress, $F(4, 216) = 5.63$, $R^2 = .09$, $p < .001$. Health beliefs including medical service inadequacy and likelihood of illness were significant predictors in the model.

PREDICTING CLINICAL LEVELS OF HA FROM COVID STRESS, HEALTH BELIEFS, AND ASSOCIATED CONSTRUCTS

A logistic regression was conducted to predict clinically significant HA from COVID stress, health beliefs (i.e., difficulty coping, awfulness of illness, medical service inadequacy, and likelihood of illness), anxiety, depression, AS, IU, and coping. Thirty-eight percent ($n = 84$) of participants reported HA in the clinically significant range with SHAI scores above the clinical cut-off score (i.e., 20) (Hadjistavropoulos et al., 2012). Our results were partially supportive of our fourth hypothesis in that individuals with clinically significant HA were at greater risk of one health belief (i.e., likelihood of illness) and depression, but not at greater risk of COVID stress and other related constructs (i.e., anxiety, AS, IU, and coping). While the overall model was statistically significant, $\chi^2(10) = 59.29$, $p < .001$, the only statistically significant predictors were HCQ-likelihood of illness, $Z = 5.07$, $p = .024$, and depression $Z = 4.19$, $p = .041$. The odds of having HA were 1.16 times greater for those with health beliefs related to likelihood of illness and 1.06 times greater for those with depression. The model with the predictors successfully predicted 79.2% of cases compared to a model with no predictors of 72.9%.

EXPLORING HEALTH BELIEFS AS MEDIATING THE ASSOCIATION BETWEEN HA AND COVID STRESS

The results of the path analyses regarding the mediating role of health beliefs in the relationship between HA and COVID stress were not supportive of our fifth hypothesis in that health beliefs did not mediate the association between HA and COVID stress. The presence of all four health beliefs revealed a standardized indirect effect of b = .07 (*SE* = .06) which did not meet statistical significance ($p = .248$) using bias-corrected bootstrapping in SPSS AMOS. Exploratory path analyses were also conducted on each individual health belief subscale. The mediation analysis involving HCQ-likelihood of illness revealed a standardized indirect effect (b = .47 x b = .08) of b = .04 (*SE* = .42) which did not meet statistical significance ($p = .317$) using bias-corrected bootstrapping in SPSS AMOS. The mediation analysis involving HCQ-awfulness of illness revealed a standardized indirect effect (b = .24 x b = −.03) of b = −.006 (*SE* = .017) which did not meet statistical significance ($p = .558$) using bias-corrected bootstrapping in SPSS AMOS. The mediation analysis involving HCQ-difficulty coping revealed a standardized indirect effect (b = .36 x b = .09) of b = .03 (*SE* = .03) which did not meet statistical significance ($p = .170$) using bias-corrected bootstrapping in SPSS AMOS. The mediation analysis involving HCQ-medical service inadequacy revealed a standardized indirect effect (b = .27 x b = .11) of b = .03 (*SE* = .02) which approached statistical significance ($p = .055$) using bias-corrected bootstrapping in SPSS AMOS.

DISCUSSION

The purpose of the current study was to explore the association between health beliefs, HA, and associated psychological constructs in the development of COVID stress in emerging adults during the COVID-19 pandemic. Consistent with our first hypothesis, COVID stress was significantly associated with all study variables except for one health belief (i.e., awfulness of illness). These findings replicate previous research that has shown associations between pandemic-related stress, HA, and related psychological constructs (i.e. AS, IU, and coping) (Asmundson et al., 2020; Taylor et al., 2020b). Regarding our second hypothesis, further analyses showed that HA and coping mechanisms accounted for significant variance in COVID stress. A plethora of evidence has supported this association throughout the course of the pandemic (Asmundson et al., 2020; Asmundson

& Taylor, 2020b; Knowles & Olatunji, 2021; Qiu et al., 2020; Taylor, 2019; Wang & Zhao, 2020).

Consistent with our third hypothesis, health beliefs including likelihood of illness and medical service inadequacy were significant predictors of COVID stress. These results align with research that indicates an association between negative beliefs about health and the development of COVID-19-related fears (Akbari et al., 2021; Faustino et al., 2022). These findings also lend partial support for the COVID stress syndrome and CB models of HA which posit that anxiety and stress centre on beliefs about health and illness, including the misinterpretation of benign somatic symptoms as being indicative of serious illness (Alberts et al., 2013; Faustino et al., 2022; Salkovskis & Warwick, 2001; Taylor et al., 2020a; Vazquez et al., 2021). Contrary to our third hypothesis, our results revealed that beliefs pertaining to awfulness of illness and difficulty coping were not significant predictors of COVID stress. Previous studies with similar results have suggested that this may be due to the lack of unique variance predicted by the health beliefs given their highly correlated nature and the significant overlap they have amongst each other (Alberts et al., 2013, 2016).

Regarding our fourth hypothesis, although COVID stress was associated with HA, COVID stress was not a risk factor for the development of clinically significant HA. This is consistent with the findings of Sauer and colleagues (2020) that people with clinically significant HA reported similar perceived risk of infection as typical individuals and less fear of COVID-19 infection compared to other diseases (e.g., cancer, cardiovascular disease). Moreover, symptoms of HA appear to be primarily focused on and driven by exaggerated disease interpretations, and individuals with clinically significant HA do not differ from typical individuals in their perception of "minor" diseases (Hitchcock & Mathews, 1992; Marcus, 1999; Neng & Weck, 2015; Weck et al., 2012). Some evidence suggests that individuals with clinically significant HA may also react more strongly to personally relevant health risks (Jasper & Witthoft, 2011; Lee et al., 2013; Schutte et al., 2016). As such, it is possible that health anxious individuals may attribute potential COVID-19 symptoms or sensations to other anxiety-inducing diseases (e.g., headache as a brain aneurysm, difficulty breathing as lung cancer) or perceive them as "less severe", thereby reducing their overall anxiety response specific to COVID-19 (Sauer et al., 2020).

Contrary to our final hypothesis, while general health beliefs including the likelihood of developing an illness and the availability of medical services were associated with COVID stress, they did not mediate the association between HA and the development of COVID stress. It is possible that specific health beliefs pertaining directly to COVID-19 may better explain the association between HA and the development of COVID stress. Given that the HCQ focuses on maladaptive health beliefs that are generalized to all serious illnesses, the measure may not adequately reflect perception of risk associated with developing COVID-19 specifically. Consistent with this, Akbari et al. (2021) reported that the strongest mediational relationship between HA and fears of COVID-19 was with negative beliefs, specifically regarding the uncontrollability and dangerousness of COVID-19. Further, specific COVID-19 beliefs such as the perception of severity and the efficacy of vaccinations have been associated with other pandemic behaviours such as vaccination hesitancy, hoarding, and public safety measures (e.g., mask wearing, handwashing) (Magnan et al., 2021; Nowak et al., 2020; Stefanut et al., 2021). Recent research has shown that mixed messaging or conflicting information in the media about COVID-19 may lead to a sense of uncertainty regarding the disease, which may lead to greater HA, more maladaptive health beliefs, and greater overall pandemic-related stress (Asmundson & Taylor, 2020a; Čavojová et al., 2022; Oliver & Wood, 2014; Simonovic & Taber, 2022; Teovanovic et al., 2021). It is possible that beliefs pertaining specifically to the COVID-19 pandemic (e.g., vaccination hesitancy, perceived personal risk, use of public health restrictions) may be more closely associated with the development of COVID stress.

To our knowledge, this was the first study to investigate whether health beliefs are associated with the development of COVID stress in a sample of emerging adults. Examining this association is important in the early identification of and intervention with potentially at-risk individuals with pre-existing anxiety, who may be particularly susceptible to excessive and maladaptive stress during a pandemic (Dennis et al., 2021). The impact of the present study is evident when considering research examining the impact of health beliefs on pandemic behaviours. HA and anxiety sensitivity, or lack thereof, is vital in influencing behavioural responses to pandemics (Asmundson & Taylor, 2020a, b; Khoury et al., 2021; Taylor, 2019). In order to reduce the overall spread of the virus and increase population safety, it is essential to understand the impact of maladaptive health beliefs on adverse psychological and behavioural responses to the COVID-19 pandemic.

There are several limitations of the current study to consider. First, given that the study was conducted in the second wave of the pandemic (i.e., January 2021 to March 2021), participants' psychological responses and health beliefs pertaining to the pandemic may have changed over time. This may have reduced the reliability of some of the findings, given the length of time since the start of the pandemic. It is possible that people's COVID stress, maladaptive health beliefs, and HA may have been more prevalent and closely associated during the first wave of the pan-

demic. Second, our path analyses exploring the mediation of health beliefs on the relationship between HA and COVID stress are limited by our sample size, and future research should examine the relationship between the constructs of interest with a larger sample. Third, our sample consisted of undergraduate students, and the majority of the participants were female and Caucasian, limiting the generalizability of the findings. Fourth, as this is a cross-sectional study, the data preclude inferences regarding the directionality of the causal association between health beliefs, COVID stress, HA, and associated psychological constructs. Longitudinal research is necessary to examine general and specific maladaptive health beliefs over time and their contribution to the development of HA and pandemic-related stress.

In conclusion, the current findings demonstrate that COVID stress is associated with overall levels of HA, poorer use of coping mechanisms, believing an illness is likely to develop, and believing medical services may not be adequate or available. These findings highlight the importance of health beliefs as contributing to the development of COVID stress, thereby partially supporting CB models of HA. More specific health beliefs associated with the COVID-19 pandemic may better explain the association between the pandemic-related stress and clinically significant HA, necessitating further exploration of such explanatory variables. Understanding maladaptive health beliefs and the development of HA and COVID stress is crucial given their vital role in shaping behavioural responses to the pandemic including public safety behaviours, misuse of resources, and vaccination uptake.

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Disclosure

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