

ATTITUDES AND EXPERIENCE DURING THE CORONAVIRUS PANDEMIC

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by

Max Samuel Brumer

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Abstract  
of  
ATTITUDES AND EXPERIENCE DURING THE CORONAVIRUS PANDEMIC  
by  
Max Samuel Brumer

The current research aims to investigate the relationship between stress related to the COVID-19 pandemic and mental health outcomes. The Need-Threat Model of social exclusion is implemented to explore the impact of COVID19 as a social exclusion event. Furthermore, social support, social identity, and ethnic identity are explored as mediating variables. A series of Bayesian structural equation models (BSEM) are implemented to explore three hypotheses in a U.S. and Danish college-aged sample. The results of the BSEMs suggest that COVID stress is a significant predictor of lower belongingness, self-esteem, and life satisfaction. These findings are especially impactful for clinicians and university administrators as they address mental health on campus during and after the COVID-19 pandemic.

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## Chapter 1

### INTRODUCTION

The global pandemic caused by the novel COVID-19 disease has brought devastating repercussions that have substantially altered daily life and have raised concerns about mental health (Niederkrötenhaler et al., 2020; O'Connor et al., 2020; Saltzman et al., 2020). Accordingly, psychological wellbeing has become a concern as people spend more time physically distancing and face an economic recession as shown by consistent job losses, including the United States. It is in this context that there has been a global call for researchers to explore the impact COVID-19 has had on mental health (see, for example, Niederkrötenhaler et al., 2020; O'Connor et al., 2020; Saltzman et al., 2020). Emerging research around the world has begun to articulate mental health outcomes connected to the COVID-19 pandemic. However, to date there has been little available research examining the association between the Coronavirus pandemic and mental health in a cross-cultural context. The present study aims to examine this association in the United States and Denmark.

#### **Background on the Coronavirus**

##### ***Coronavirus Terms***

Several terms became household vocabulary as the virus spread in 2020; however, explicit definitions are needed for a research setting. According to the John Hopkins Medicine, “Coronavirus” refers to hundreds of similar viruses with crown-shaped proteins (Maragakis, 2020). Both Severe Acute Respiratory Syndrome (SARS) and

Middle East Respiratory Syndrome (MERS) are part of this family of viruses. The specific virus behind the current pandemic is the SARS-CoV-2. This virus causes the disease, Coronavirus Disease – 2019, known as COVID-19 (Maragakis, 2020). These terms refer specifically to a medical and epidemiological perspective while the current research refers to the pandemic on a holistic and societal level. As such, the present study will use the terms “the Coronavirus pandemic,” “the COVID-19 pandemic,” and “the pandemic” to refer to the current situation and its societal implications.

### ***Coronavirus Globally***

First recognized in late December 2019 in the Wuhan region of China, the Coronavirus pandemic has quickly grown into a global crisis (Archived: WHO Timeline - COVID-19, 2020). Two weeks after the initial cases were identified, China reported their first COVID-19 related death. Approximately one week later, nations around the world began documenting cases. On January 23, 2020, China announced a lockdown separating Wuhan from the rest of the country in an effort to mitigate the spread of the virus. Italy reported its first COVID-19 case and instituted a local lockdown on February 18<sup>th</sup> and then a national lockdown nearly a month later (Marazziti et al., 2020). This began the first European interaction with SARS-CoV-2. On March 11, 2020, the World Health Organization (WHO) declared the spread of COVID-19 a global pandemic (Cucinotta & Vanelli, 2020). Over one year since the WHO announced the pandemic, nearly 130 million confirmed cases and nearly 2 million deaths have been reported in 192 countries and regions worldwide (Center for Systems Science and Engineering at Johns Hopkins University, 2021).

### ***Coronavirus in the U.S.***

The first case of COVID-19 in the U.S. was reported in Washington state on January 21, 2020 (“A Timeline of COVID-19 Developments in 2020”, 2021). Two weeks later with nearly 10,000 global cases, the former-Trump administration declared a public health emergency and restricted Chinese citizens from entering the U.S. On March 13, two days after the WHO declared a global pandemic, the Trump administration declared a national emergency and formally banned travel from Europe. On March 19, California issued the first state-wide stay-at-home order which mandated all residents to stay at home except for essential travel purposes. By the end of May, 42 states and territories had mandatory stay-at-home orders in place (Moreland et al., 2020) and several states postponed their reopening plans by July (“A Timeline of COVID-19 Developments in 2020”, 2021). On October 2, former President Trump was diagnosed with COVID-19 and admitted to Walter Reed National Military Medical Center where he remained for three days before being discharged. The Pfizer-BioNTech and Moderna vaccines were approved for emergency use by the Food and Drug Administration (FDA) on December 11 and 18, respectively. As of April 1, 2021, the U.S. has reported over 30.5 million cases and over 550,000 deaths (Center for Systems Science and Engineering at Johns Hopkins University, 2021). At the same time, 30% of the U.S. adult population was at least partially vaccinated and 17% were fully vaccinated (Holder, 2021).

### ***Coronavirus in Denmark***

By comparison, Denmark is considered to have survived the early part of the pandemic relatively successfully (Olagnier & Morgensen, 2020). Denmark did not record

their first infection until February 27 – over a month after the U.S (Faktalink, n.d.). One week later, Prime Minister Mette Frederiksen mandated the cancelation of all events with more than 1,000 attendees. On March 11, after the WHO declared the outbreak a global pandemic, Prime Minister Frederiksen announced the closure of all schools, daycares, and other public sector institutions. Denmark closed their borders to all non-Danes on March 14 to further mitigate the spread of the virus. On April 14, Denmark reopened their schools and economy. However, Denmark faced several regional lockdowns throughout the fall. Prime Minister Frederiksen announced a second nationwide lockdown on December 15. Denmark began vaccinating its citizens on December 27 (Faktalink, n.d.). As of early April 2021, Denmark has reported over 230,000 cases and 2,431 deaths (Center for Systems Science and Engineering at Johns Hopkins University, 2021), as well as administered at least one dose of a vaccine to 13% of the population (Holder, 2021).

### **Coronavirus, Belongingness, Wellbeing, and Mental Health**

Initial research on the early days of the COVID-19 pandemic has indicated serious negative outcomes on several indicators of subjective wellbeing. Longitudinal research in New Zealand (Sibley et al., 2020) and Germany (Zacher & Rudolph, 2021) has found that levels of subjective wellbeing, positive affect, and life satisfaction decreased over the course of the pandemic compared to before the pandemic. Being in a U.S. state or local government mandated lockdown significantly predicted lower levels of belonging and higher levels of loneliness (Gratz et al., 2020). Moreover, research on personal interactions with friends, pets, and children in Ireland were associated with

significantly higher levels of positive affect. However, the same results were not found for remote interactions with the same individuals (e.g., video calling with friends or children; Lades et al., 2020). Within the healthcare industry, nurses with low levels of social support were associated with more negative outcomes during the pandemic (Sanghera et al., 2020). Given the negative mental health outcomes during the early months of the pandemic, it is imperative to further examine this relationship in the later stages of the pandemic.

Initial findings on the COVID-19 pandemic are congruent with research on past major disease outbreaks. For instance, the 2003 SARS outbreak was associated with significantly higher levels of psychological symptoms including depression and anxiety (Main et al., 2011). Within the city of Hong Kong, older adult suicides peaked in 2003 during the SARS outbreak, suggesting a meaningful impact on mental health (Chan et al., 2006; Cheung et al., 2008). Lower levels of psychological wellbeing associated with the SARS outbreak has been shown to last for years after the end of the epidemic (Moallef et al., 2021). Moreover, Mak et al. (2009) recruited SARS survivors and found a quarter of participants had post-traumatic stress disorder symptoms 30 months after the outbreak, suggesting long-term consequences of a major pandemic. These findings could further signal a mental health crisis following the present pandemic.

The mental health impact associated with the SARS outbreak in Asia is well documented; however, similar results have been associated with other disease outbreaks. Research on Ebola (Keita et al., 2017), the Zika virus (Kotzky et al., 2019), and MERS (Son et al., 2019), and H1N1 (swine flu; Page et al., 2011) all yielded similar results that

indicate a contagious disease can impact one's mental health. However, significant gaps exist within this line of research. Most research on contagious diseases and mental health focus on healthcare workers (i.e., Sanghera et al., 2020; Son et al., 2019), patients/survivors (i.e., Mak et al., 2009), or those currently receiving mental health treatment at the time of the study (i.e., Page et al., 2011). Additionally, most research examines factors such as coping mechanisms and financial resources instead of the direct relationship between perceptions of the disease and one's mental health (i.e., Taha et al., 2014). Due to this gap in the literature, it is imperative to explore the perceptions of the COVID-19 pandemic and its relationship with subjective wellbeing and mental health and potentially add to the literature on pandemic-related mental health outcomes.

### **Coronavirus in Relation to the Need-Threat Model**

The direct relationship between COVID-19 pandemic perceptions and mental health could fit within the psychological framework of the Need-Threat Model (also referred to as a temporal model of social exclusion; Williams, 2007) which links social exclusion events with a series of cognitive and emotional responses. This model is based on four fundamental needs: 1) belongingness which is one's connectiveness to a group or community, 2) self-esteem which is one's views of self-worth, 3) control which is the perceived ability to be in control of one's environment and social situation, and 4) meaningful existence which is the perception that one's life has worth (Leiro, & Zwolinski, 2014; Williams, 2007). Additional research on the Need-Threat Model has demonstrated that victims may experience higher levels in several additional negative reactions including, but not limited to, frustration, sadness, and anger (Williams, 2007);

aggression (Poon & Wong, 2019); and unethical behavior (Kouchaki & Wareham, 2015). Moreover, the pain associated with being socially excluded has been equated to physical pain (Eisenberger et al., 2003). The Need-Threat Model is separated into three distinct stages. First, the reflexive stage, as its name suggests, is considered to be a reflex reaction where the perception of social exclusion results in immediate decreases in the four fundamental needs described above (Hartgerink et al., 2015). Following the reflexive stage, the reflective stage consists of the implementation of coping mechanisms and a return to normal levels of the fundamental four. People that continue to experience repeated social exclusion enter the resignation stage which is associated with heightened levels of depression and hopelessness (for a full review of the Need-Threat Model see Hartgerink et al., 2015; Williams, 2007). Given that a lack of social inclusiveness has been associated with so many negative outcomes on wellbeing, it is important to better understand the potential implications of social distancing caused by the pandemic.

A review of the literature on the effects of natural disasters on one's psychology may suggest that the Coronavirus and the subsequent lockdowns could act as the social exclusion event that leads to the depletion of the four fundamental needs. Disasters and crises indicate a strong shift in interpersonal relations during the aftermath of a disaster or crisis which can predict future psychological wellbeing (Bonanno et al., 2010). This is especially true within families in which stronger effects are observed with single-parent households (Solomon et al., 1993). However, additional findings suggest that people tend to form closer bonds to family and friends in the wake of a natural disaster. Furthermore, those close ties to relatives and friends have been shown to result in more positive

emotional wellbeing several years after the event (Drabek & Key, 1984). The Coronavirus pandemic may act in a similar manner to either bring friends together or cause rifts within families. A disaster's ability to impact interpersonal relationships examined through the need-threat framework can allow us to see if external impacts on sociability (i.e., a government mandated lockdowns or self-imposed social distancing) predict similar low levels in the fundamental four compared to social rejection (i.e., being excluded from people or groups).

### **Social Support and Social Identity**

One potential mediator for the relationship between the Coronavirus pandemic and psychological wellbeing is social support (Aluh & Onu, 2020). Prior research on the topic has demonstrated that social support is a strong predictor of positive mental health outcomes in a wide range of situations. For instance, victims of terrorist acts have demonstrated more positive psychological wellbeing outcomes when they have access to informal social support (Weinberg, 2017). When faced with racial discrimination, social support acted as a buffer against depressive symptoms (Seawell et al., 2014). Moreover, online social support has been found to significantly predict higher self-esteem (Chiu et al., 2015). The impact of social support on the relationship between the COVID-19 pandemic and mental health outcomes should be examined given its potential impact on subjective wellbeing.

Prior research has shown two distinct phases in terms of social support during a disaster (Kaniasty, 2020). The initial stage is defined by a large increase in social support and comradery. For example, it is possible that people may have provided greater social



support and had comradery during the initial onset of the Coronavirus pandemic in New York City. The people in New York united together nightly to celebrate the city's health care workers and created a sense of comradery (Alpert & Viann, 2020; Newman, 2020). Over a year has passed since the people of New York started their nightly cheering. If this unity was associated with the first stage of disaster-related social support, it is possible we are currently in the second stage. Research suggests this would be a time that is met with a decrease in interpersonal relationships and social support (Kaniasty, 2020). The construct of social support may add to our understanding of the need-threat model in the face of a natural disaster. As such, it is possible that consistent and prolonged social support could mediate the relationship between the Coronavirus pandemic related stressors and mental health outcomes.

### ***Social Identity***

Social identity, defined as one's sense of self derived from group memberships (Tajfel & Turner, 1979), could further interact with mental health outcomes caused by the global pandemic within an NTM context (Kira et al., 2020). Social Identity Theory (SIT) postulates human behavior in terms of social group interactions (Tajfel & Turner, 1979) with wide reaching implications across psychology (Turner & Reynolds, 2010). Social identity has commonly been examined as a predictor of aspects of the fundamental four such as self-esteem (Cameron, 1999; Kaye et al., 2019; Simsek, 2011). Of note, strong in-group ties have been found to be associated with higher levels of self-esteem which is associated with higher levels of life satisfaction within university students (Cameron, 1999; Simsek, 2011). However, two samples of digital gamers yielded differing results

(Kaye et al., 2019). Social identity significantly predicted self-esteem within one sample while a second sample did not. Both gamer samples did not indirectly predict psychological well-being. In all, there is strong support for the relationship between social identity and mental health outcomes; however, the relationship should be examined further within the context of being online.

In addition to examining mental health outcomes within the context of SIT, the social identity model of collective psychosocial resilience (SIMCCR; Drury, 2018; Williams & Drury, 2009) could further aid in our understanding of mental health in the wake of the pandemic. SIMCCR postulates that a common event (in this case the onset of the coronavirus pandemic) leads to a shared social identity which triggers a series of cognitive, affective, and behavioral responses. Events resulting in shared trauma have demonstrated the emergence of shared identities across those effected (Ntontis et al., 2018). In simulation studies, heightened levels of social identity led to prosocial behavior such as helping others escape an emergency (Ntontis et al., 2019). Furthermore, studies of real events indicate a strong link between social identity emerging from a disaster and helping behavior (Ntontis, 2019). However, a recent review on the topic found research on shared trauma and resilience to be limited, insufficiently conceptualized, and lacking generalizability (Ali et al., 2021). As such, further research on common fate events and social identity are necessary. It is possible that the Coronavirus pandemic has emerged as a common fate and unified people together.

### ***Ethnic Identity***

A growing body of research has emerged examining ethnic identity, one's sense of belonging to their culture (Phinney & Ong, 2007), as an aspect of social identity that is especially relevant for immigrants and those living in a multiracial society. Similar to research on general social identity, the multidimensional construct of ethnic identity has been shown to be positively associated with one's subjective mental health (Ai et al., 2014) as well as less psychological distress (Willis & Neblett, 2020) within ethnic minority populations. Research demonstrates ethnic identity's positive predictive ability of favorable outcomes within several U.S. ethnic minority groups, including African Americans (Ajibade et al., 2016), Arab Americans (Atari & Han, 2018), Asian Americans (Iwamoto & Liu, 2010), and Latinx Americans (French & Chavez, 2010). However, it should be noted that ethnic identity has also yielded mixed results largely depending on the specific research questions, age of participants, and variables and samples under investigation (for example, see, Choi et al., 2017; Sheldon et al., 2015). In general, though, ethnic identity is seen as a psychological resource for ethnic minority communities.

Beyond being associated with higher levels of subjective wellbeing, ethnic identity has been found to be a significant mediator in the relationship between discrimination and wellbeing which may provide nuanced insight into the current pandemic. A number of studies have examined ethnic identity's protective ability on the relationship between various forms of discrimination (e.g., micro aggressions and race-related bullying) and outcomes such as depression, self-esteem, and psychological wellbeing (Atari & Han, 2018; Iwamoto & Liu, 2010; Vera et al., 2011). However, high

ethnic identity has also been associated with more negative outcomes in the face of race-related stressors (Wolfram et al., 2018). Given the strong association between ethnic identity and wellbeing, an examination of the current pandemic through an ethnic identity framework may provide valuable insight. It is especially pertinent to explore this relationship in the current climate as the U.S. faces a rise in anti-Asian hate crimes (Misra et al., 2020) and people advocating for racial justice (Collins et al., 2019). As such, given its diverse sample, the present study aims to explore the relationship between one's sense of ethnic identity and subjective wellbeing in the context of the current pandemic.

### **Current Study**

The proposed research study is intended to address several gaps in the research literature. Prior research has demonstrated decreases in the fundamental four after an exclusion event as postulated by the Need-Threat Model. The present study aims to examine if a global pandemic can act as an exclusion event and be similarly associated with low levels of the fundamental four. In doing so, the present study will also add to the limited existing research investigation the association between the COVID-19 pandemic and subjective wellbeing. Lastly, social support, social identity, and ethnic identity have all been linked to higher levels of subjective wellbeing. As such, this relationship is examined in the context of the Need-Threat Model and the Coronavirus pandemic. Addressing these gaps in the literature will strengthen the understanding of subjective wellbeing in the context of a global disaster which has implications for both clinicians and the public.

The current study focuses on three areas. First, the effect of a natural disaster (in this case the COVID-19 pandemic) was examined through the need-threat model of social exclusion/belonging (hypothesis 1). Prior research has indicated an association between mental health outcomes and government restrictions. However, the current study examined potential differences in mental health outcomes when participants had to self-isolate compared to those who are in government-mandated lockdowns (hypothesis 2). Additionally, COVID-19 related fears were examined as a predictor of social support and subjective wellbeing (hypothesis 3). Lastly, cross-cultural differences were assessed for college-aged participants in both the U.S. and Denmark. The current study includes the following hypotheses:

1. Fear of the Coronavirus would predict lower levels in the fundamental four (belongingness, self-esteem, control, and meaningful existence) during the pandemic.
2. Social support would act as a mediator between fear of the Coronavirus and negative mental health outcomes.
3. Social identity and ethnic identity would mediate the relationship between fear of the Coronavirus and negative mental health outcomes.

## Chapter 2

### METHOD

#### Participants

The current study consisted of 326 ( $N = 326$ ) college students from northern California ( $n = 200$ ,  $M_{age} = 20.70$ ,  $SD_{age} = 3.55$ ) and Jutland, Denmark ( $n = 127$ ,  $M_{age} = 23.92$ ,  $SD_{age} = 3.47$ ). The ethnic breakdown of the California sample is as follows: Latinx (32.3%), Asian American/Pacific Islander (24.7%), White (15.7%), Multiethnic (15.2%), Black/African American (9.6%), Other (2.5%). The ethnic breakdown of the Danish sample is as follows: Danish (44.8%), White (41.6%), Other (13.6%). Participants were recruited from public universities in their respective countries. Due to cultural norms surrounding data collection, participants from the two nations were compensated separately. The California sample received .5 research participation credit hours. Participants from the Danish sample were entered into a raffle to win one of three dinner-for-two SmartBoxes valued at 299 DKK each (~47 USD). The study was conducted in English and thus both samples were required to be fluent in the language. All materials and procedures were approved by the California university's IRB and supported by the Danish university.

#### Materials

##### *Demographics*

Participants were asked a series of demographic items, including age, gender, socio-economic status, vaccination status, and ethnicity. Information on occupational

workload and class units were also obtained. More information on participant demographics in this study can be found in Tables 1-3.

**Table 1**  
*Demographic Information of Participants*

Nation	United States		Denmark	
	<i>n</i>	%	<i>n</i>	%
Gender				
Women	157	78.5	94	74.6
Men	42	21.0	29	23.0
Other/Prefer not to say	1	0.5	3	2.4
Year in school				
Freshman	63	31.5	28	22.2
Sophomore	53	26.5	38	30.2
Junior	59	29.5	23	18.3
Senior	21	10.5	16	12.7
Super senior or graduate student	0	0.0	6	4.8
Graduate student	0	0.0	13	10.3
Missing/other	4	2.0	2	1.6
Major				
Psychology	73	36.5	50	39.7
Other	127	63.5	76	60.3
Classroom Style				
Virtual	198	99.0	102	81.0
Hybrid	2	1.0	18	14.3
Other/in-person	0	0.0	6	4.8
Employment				
Unemployed	90	45.0	53	42.1
Required to work in-person	61	31.5	43	34.1
Work in-person by choice	38	19.0	10	7.9
Work virtually	11	5.5	18	14.3
Missing	0	0.0	2	1.6
Received a COVID-19 vaccine				
Yes	115	57.5	15	11.9
No	85	42.5	111	88.1
Want a COVID-19 vaccine <sup>a</sup>				
Yes	83	72.2	108	97.3
No	32	27.8	2	2.7
Family History				
First generation	18	9.0	8	6.3
Second generation	94	47.0	11	8.7

Nation	United States		Denmark	
	<i>n</i>	%	<i>n</i>	%
Third generation or higher	82	41	105	83.3
Unknown/Missing	6	3.0	2	1.6

*Note.* *N* = 326

<sup>a</sup> Reflects the number and percentage of participants who had not received a COVID-19 vaccine.

**Table 2**

*U.S. Participants' Family Income in USD*

	<i>n</i>	%
Less than \$35,000 per year	45	22.5
\$35,000 - \$64,999 per year	51	25.5
\$65,000 - \$99,999 per year	29	14.5
\$100,000 or more per year	40	20.0
Do not know/Missing	35	17.5

*Note.* *N* = 200

**Table 3**

*Denmark Participants' Family Income in USD*

	<i>n</i>	%
Less than \$40,801 per year	9	8
\$40,801 - \$73,400 per year	16	12.8
\$73,401 - \$106,100 per year	19	16
\$106,101 - \$130,500 per year	15	11.9
\$130,501 or more per year	25	19.8
Do not know/missing	42	31.7

*Note.* *N* = 126

### ***Multigroup Ethnic Identity Measure – Revised***

The Multigroup Ethnic Identity Measure – Revised (MEIM-R; Phinney & Ong, 2007) is a six-item scale assessing a person's ethnic identity. It includes two dimensions: ethnic identity commitment (EIC; three items) and ethnic identity exploration (EIE; three items). Responses range from 1 (*strongly disagree*) to 5 (*strongly agree*). Additionally,



the scale starts with an open-ended question prompting respondents to state their self-labeled ethnic identity.

The MEIM-R is a widely used measure of ethnic identity and has provided evidence for both the reliability and validity of the scale (Chakawa et al., 2015; Herrington et al., 2016; Musso et al., 2018). However, it should be noted that the internal reliability of the MEIM-R has been shown to be a function of education (Herrington et al., 2016). Studies that contain more highly educated samples tend to be associated with higher internal reliability coefficients. In particular, college samples yielded an average Cronbach's  $\alpha$  of .90, whereas those with less than a high school education yielded an average Cronbach's  $\alpha$  of .81 for the total scale. Conversely, support for convergent and divergent validity has been found as the subscales have been positively related to positive affect and negatively related to negative affect (Yoon, 2011). Moreover, both subscales have received strong average Cronbach's  $\alpha$ s across multiple studies (EIE = .84; EIC = .86; Herrington et al., 2016). The current samples yielded adequate to strong internal reliability for the exploration subscale ( $\alpha_{\text{U.S.}} = .86$ ;  $\alpha_{\text{Denmark}} = .75$ ) as well as the commitment subscale ( $\alpha_{\text{U.S.}} = .85$ ;  $\alpha_{\text{Denmark}} = .79$ ).

### ***COVID Stress Scale***

The COVID Stress Scale (CSS; Taylor et al., 2020a; Taylor et al., 2020b) was used to measure perceptions related to the COVID-19 pandemic. The CSS consists of 36 items across five subscales. Subscales one through three are on a five-point summative response scale ranging from *not at all* (0) to *extremely* (4). The first subscale, Danger and Contamination (DAC; 12 items), examines the participant's level of fear towards the

virus (e.g., “I am worried that I can’t keep my family safe from the virus;” “I am worried that if someone coughed or sneezed near me, I would catch the virus”). Subscale two examines the socio-economic consequences of the virus (SEC; 6 items; e.g., “I am worried about grocery stores running out of food”). The Xenophobia subscale (XEN; 6 items) examines the participant’s fear of others in regard to the virus (e.g., “I am worried that foreigners are spreading the virus in my country”). The Traumatic Stress subscale (TRS; 6 items; e.g., “I had trouble sleeping because I worried about the virus”) uses a five-point summative response scale ranging from *never* (0) to *almost always* (4). Lastly, the Checking subscale (CEK; 6 items) examines the participants information gathering habits (e.g., “Social media posts concerning COVID-19”).

The psychometric properties of the scale have been recently examined within cross-cultural samples (Taylor et al., 2020a; Taylor et al., 2020b). The scale has been shown to be reliable and demonstrated evidence for convergent and divergent validity (Taylor et al., 2020a; Taylor et al., 2020b). The scale has been reported to have sufficient internal reliability as demonstrated by strong Cronbach’s  $\alpha$  levels for each subscale in multiple samples: DAC ( $\alpha = .94-.95$ ), SEC ( $\alpha = .90-.91$ ), XEN ( $\alpha = .92-.93$ ), TRS ( $\alpha = .93$ ), CEK ( $\alpha = .83-.86$ ; Taylor et al., 2020a). The current samples yielded strong to excellent internal reliability for each subscale: DAC ( $\alpha_{U.S.} = .93$ ;  $\alpha_{Denmark} = .91$ ), SEC ( $\alpha_{U.S.} = .94$ ;  $\alpha_{Denmark} = .91$ ), XEN ( $\alpha_{U.S.} = .92$ ;  $\alpha_{Denmark} = .86$ ), TRS ( $\alpha_{U.S.} = .87$ ;  $\alpha_{Denmark} = .86$ ), CEK ( $\alpha_{U.S.} = .85$ ;  $\alpha_{Denmark} = .78$ )

### ***Fundamental Four Needs***

**Self-Esteem.** Participants' level of self-esteem was measured through the Rosenberg Self-Esteem Scale (RSES; Rosenberg, 1965). The RSES is a vastly popular measure of an individual's self-esteem and has undergone a number of psychometric evaluations in varying sample populations (for example, see Kielkiewicz et al., 2020; Salerno et al., 2017; Xu & Leung, 2018). The RSES consists of 10 items on a four-point summative response scale with the following anchors: *strongly disagree* (1), *disagree* (2), *agree* (3), and *strongly agree* (4). Five items are positively worded (e.g., "I feel that I have a number of good qualities") and five items are negatively worded (e.g., "I feel I do not have much to be proud of"). The negatively worded items are recoded so higher scores indicate higher levels of self-esteem. The current sample yielded strong internal reliability in the U.S. sample ( $\alpha = .87$ ) and excellent internal reliability in the Danish sample ( $\alpha = .92$ ).

**Belonging.** Participants' level of belongingness was measured through the 12-item General Belongingness Scale (GBS; Malone et al., 2012). The GBS is on a seven-point summative response scale ranging from *strongly disagree* (1) to *strongly agree* (7). Six items measure the participant's sense of inclusion (e.g., "I feel accepted by others") and six items are reverse scored as they measure the participant's level of exclusion (e.g., "I feel like an outsider").

The GBS has been subjected to a series of psychometric tests and has been found to provide evidence for reliability and validity. Initial construction of the GBS provided strong model fit indices (CFI = .97; TLI = .96; RMSEA = .08; SRMR = .03) when

conducting confirmatory factor analysis (Malone et al., 2012). The current sample demonstrated excellent internal reliability in the U.S. sample ( $\alpha = .91$ ) and Danish sample ( $\alpha = .94$ ).

**Control.** A revised version of the Autonomy Scale (Ford & Wooldridge, 2012) was used to measure a person's sense of autonomy – or control over their lives. The questionnaire originally was intended for a workplace setting (e.g., “I have the freedom to decide what I do on my job”) but has been adapted to measure a more general sense of control in one's life (e.g., “I have the freedom to decide what I do”). The scale consists of four items each on a four-point scale ranging from *strongly disagree* (1) to *strongly agree* (4). The original scale has been shown to have adequate reliability ( $\alpha = .78$ ). The U.S. ( $\alpha = .88$ ) and Danish samples ( $\alpha = .82$ ) demonstrated slightly higher internal reliability compared to the original scale.

**Meaningful Existence.** The final aspect of the fundamental four was measured by one's sense of meaningful existence through the Fulfilment Scale (FS; Luthar & Ciciolla, 2015). The FS consists of five items and includes items such as, “I strive to achieve important goals”; these are scored on a five-point scale ranging from *not at all true* (1) to *very true* (5). Initial assessments of this scale demonstrate strong internal reliability (Luthar & Ciciolla, 2015).

Meaningful existence was also measured through a one-item life satisfaction scale (LS; Walen & Lachmen, 2000). The question asks participants to rate their life on an 11-point scale ranging from *worst possible life overall* (0) to *best possible life overall* (10). Strong evidence has been found for the validity and reliability of single item life

satisfaction measures (Cheung & Lucas, 2014). The single item measure has been shown to act similarly to other measures of life satisfaction demonstrating convergent and divergent validity (Cheung & Lucas, 2014).

### ***Wellbeing***

Participants' subjective well-being was measured through the Psychological Wellbeing Scale (PWS; Ryff & Keyes, 1995). The PWS is an 18-item scale consisting of six dimensions with three questions per dimension: self-acceptance, environmental mastery, positive relations, purpose in life, personal growth, and autonomy. Items (e.g., "When I look at the story of my life, I am pleased with how things have turned out so far") are on a 7-point scale ranging from *strongly disagree* (1) to *strongly agree* (7). The scale has been shown to have modest correlations with its longer form version (Ryff & Keyes, 1995). The scale has also been shown to have adequate to strong internal reliability (Cheah et al., 2020; Mirandola et al., 2019). Additionally, the original long-form of the scale has demonstrated support for various forms of validity such as construct, convergent, and divergent validity (Ryff, 1989).

Each subscale of the PWS yielded extremely low internal reliability within one or both samples for each subscale: autonomy ( $\alpha_{U.S.} = .53$ ;  $\alpha_{Denmark} = .57$ ), environmental mastery ( $\alpha_{U.S.} = .59$ ;  $\alpha_{Denmark} = .73$ ), personal growth ( $\alpha_{U.S.} = .73$ ;  $\alpha_{Denmark} = .69$ ), relation with others ( $\alpha_{U.S.} = .56$ ;  $\alpha_{Denmark} = .72$ ), purpose in life ( $\alpha_{U.S.} = .30$ ;  $\alpha_{Denmark} = .38$ ), and self-acceptance ( $\alpha_{U.S.} = .67$ ;  $\alpha_{Denmark} = .87$ ). The PWS was removed from future analyses because of the low internal reliability on each subscale for one or both samples.

### ***Social Support***

Social support was measured through the six-item Reduced Multidimensional Scale of Perceived Social Support (R-MSPSS; Porter et al., 2019). The scale (e.g., “There is a special person who is around when I am in need”) is on a summative response scale ranging from *very strongly disagree* (1) to *very strongly agree* (7). Furthermore, the scale has demonstrated evidence for both internal reliability (Porter et al., 2019). Additionally, the reduced measure demonstrated similar associations with both psychological wellbeing and various relationship constructs such as marital quality suggesting support for convergent and divergent validity (Porter et al., 2019). Both the U.S. ( $\alpha_{\text{U.S.}} = .85$ ) and the Danish ( $\alpha_{\text{Denmark}} = .88$ ) yielded strong internal reliability.

### ***Social and Personal Identities***

Lastly, participants’ social and personal identities were measured through the Social and Personal Identities scale (SIPI; Nario-Redmond et al., 2004). The two eight-item factors measure one’s social identity (e.g., “My family nationality or nationalities”) and personal identity (e.g., “My creativity”). The scale is on a 9-point spectrum ranging from *not applicable to who I am* (1) to *extremely important to who I am* (9). The scale has yielded strong internal reliability in a number of samples for the social ( $\alpha = .55-.79$ ) and personal ( $\alpha = .77-.83$ ) identities (Nario-Redmond et al., 2004). Moreover, this scale has demonstrated strong construct validity (Nario-Redmond et al., 2004). The current samples yielded adequate to strong internal reliability for the social identity subscale ( $\alpha_{\text{U.S.}} = .83$ ;  $\alpha_{\text{Denmark}} = .75$ ) as well as the personal identity subscale ( $\alpha_{\text{U.S.}} = .84$ ;  $\alpha_{\text{Denmark}} = .80$ ).

## **Procedures**

Participants from both countries completed the questionnaires online through the Qualtrics system. California participants accessed the survey through the Psychology Department's research participant pool system. The Danish participants accessed the survey through a link that was distributed via email and Facebook posts. Once participants entered the surveys, they were asked which school they attended. This then directed participants to different informed consent forms based on their university (see Appendix A). Once consent was obtained, participants were directed to the inventories and a demographics form. Upon completion of the inventories, participants were directed to a debriefing form where they were thanked for their participation. Danish participants were given a link to an additional survey on the debriefing page. This survey allowed participants to provide their contact information so they could be entered to win one of the three gift cards. The survey took approximately 30 minutes to complete. Data collection occurred during the months of April and May 2021 in both countries simultaneously.

## **Data Analysis**

U.S. and Danish samples were compared to address the following hypotheses using the statistical programming language, R (R Core Team, 2021):

1. Fear of the Coronavirus would predict lower levels in the fundamental four (belongingness, self-esteem, control, and meaningful existence) during the pandemic.

2. Social support would act as a mediator between fear of the Coronavirus and negative mental health outcomes.
3. Social identity and ethnic identity would mediate the relationship between fear of the Coronavirus and negative mental health outcomes.

Additionally, the following packages were used throughout the data analysis process: “psych” (Revelle, 2020), “tidyverse” (Wickham et al., 2019), “pacman” (Rinker & Kurkiewicz, 2017), “lavaan” (Rosseel, 2012), and “blavaan” (Merkl & Rosseel, 2018). Frequentist Structural equation modeling (SEM) was initially planned; however, the COVID stress variable was highly skewed. Bayesian SEM has been found to be effective when dealing with highly skewed data with small sample sizes (Liu et al., 2015). As a result, Bayesian inferencing was used to test the above hypotheses. Based on the recommendations of Garnier-Villarreal and Jorgensen (2020), the BSEM model fit was measured by the posterior predictive p-value (PPP), Bayesian  $\hat{\Gamma}$  ( $\hat{\Gamma}$ ) and the Bayesian root mean square error of approximation (BRMSEA). However, the BRMSEA should be interpreted with caution. Hoofs et al. (2018) recommend interpreting the BRMSEA when the sample size is greater than 1,000. However, the BRMSEA can be appropriate when sample sizes are smaller than 1,000 if a model fit is assessed through the DevM method (Garnier-Villarreal & Jorgensen, 2020). The first hypothesis includes COVID stress predicting the four fundamental needs. To address the second hypothesis, the R-MSPSS was placed in the model to mediate the path between COVID stress and the fundamental four plus the LSM. An additional model substituted the R-MSPSS with the MEIM-R and SIPI to assess the third hypothesis. Mediation analyses were conducted based on the



recommendations of Miočević et al. (2018). The controlled direct effect (CDE), pure natural indirect effect (PNIE), and total natural indirect effect (TNIE) were reported along with the posterior distributions for each path in the model. The CDE is the direct effect of COVID stress on the outcome variable when accounting for the mediator in the model. The PNIE is the indirect path from COVID stress to the outcome variable through the mediator. The TNIE is the total effect of COVID stress and the mediator on the outcome variable. Each model ran for three chains. Each chain consisted of a burn-in of 1,000 iterations and a sample of 10,000 iterations. The anonymized data and R script can be found on the Open Science Framework ([https://osf.io/ubs56/?view\\_only=5d09665b39b842d996be26aefe0f296c](https://osf.io/ubs56/?view_only=5d09665b39b842d996be26aefe0f296c)).

### ***Specification of Model Priors***

A combination of diffuse and weakly informative priors was utilized for each of the structural equation models. Due to a lack of available information, diffuse priors were used for the factor loadings of the CSS, RAS, FS, and RMSPSS. Weakly informative priors were used for the paths between latent variables ( $M = 0$ ,  $SD = 10$ ). Additional information on prior distributions can be found in Appendix A.

## Chapter 3

### RESULTS

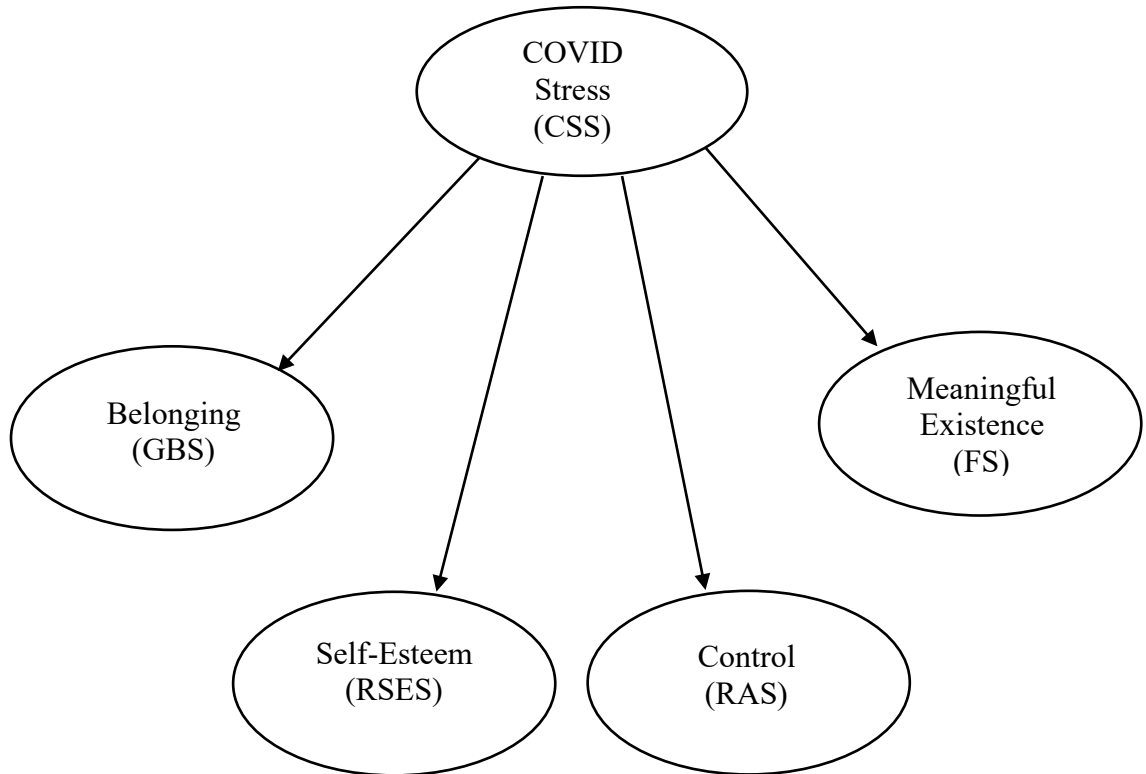
All analyses were conducted through the R programming language (R Core Team, 2021). Means and standard deviations along with bivariate correlations between the latent variables can be found in Appendix B. First, the results of the relationship between COVID stress and the fundamental four will be discussed. Next, the mediating roles of social support, social identity, and ethnic identity will be examined individually.

#### **COVID-19 Stress and the Fundamental Four**

A pictorial representation of the Bayesian structural equation model (BSEM) path is shown in figure 1. Within the U.S. sample, the model adequately fits the data as shown by the posterior predictive p-value ( $PPP < .001$ ), Bayesian RMSEA ( $BRMSEA = .08$ ), and Bayesian  $\hat{\Gamma}$  ( $\hat{\Gamma} = .83$ ). Similar model fit was obtained by the Danish sample ( $PPP < .000$ ,  $BRMSEA = .08$ ,  $\hat{\Gamma} = .83$ ). Within the U.S. sample, the path between COVID stress and belongingness had a posterior mean of  $-.327$  with the 95% credible interval (CI) not containing zero (95% CI  $[-.622, -.046]$ ). Additionally, the path between COVID stress and self-esteem had a posterior mean of  $-.202$  (95% CI  $[-.338, -.077]$ ). Similar results emerged in the Danish sample which showed the relationship between COVID Stress and self-esteem with a posterior mean of  $-.527$  (95% CI  $[-.870, -.223]$ ). Additional parameter estimates for the U.S. and Danish samples are displayed in Appendix C.

**Figure 1**

*Path model for hypothesis one.*



*Note.* Parentheses contain the names of the scales that represent the latent variable. CSS = COVID Stress Scale; GBS = General Belongingness Scale; RAS = Revised Autonomy Scale; FS = Fulfilment Scale.

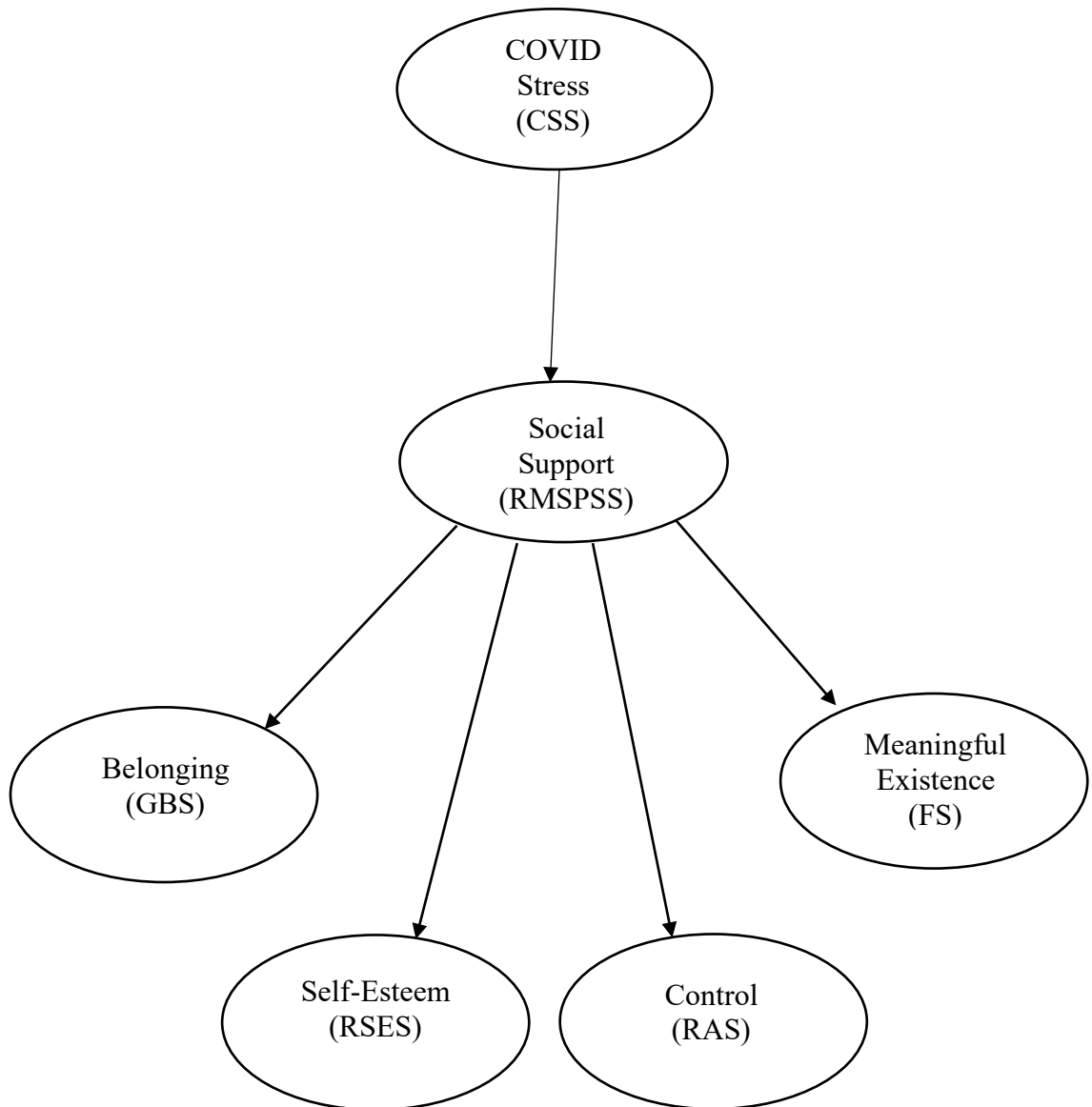
### **COVID-19 Stress and Mental Health Outcomes through Social Support**

An example representation of the BSEM for hypothesis two can be found in figure two. Both the U.S. sample ( $PPP < .000$ ,  $BRMSEA > .08$ ,  $\hat{\Gamma} < .80$ ) and the Danish sample ( $PPP < .000$ ,  $BRMSEA > .08$ ,  $\hat{\Gamma} < .80$ ) yielded high levels of misspecification based on the model fit indices and were not interpreted further. An additional post-hoc model was conducted in which social support predicted the mental health outcomes with COVID stress as a covariate. Similar to the previous models with social support, both the

Danish and U.S. samples yielded a high level of misfit and was not interpreted further  
( $PPP < .000$ ,  $BRMSEA > .08$ ,  $\hat{\Gamma} < .80$ ).

**Figure 2**

*Path model for hypothesis two.*



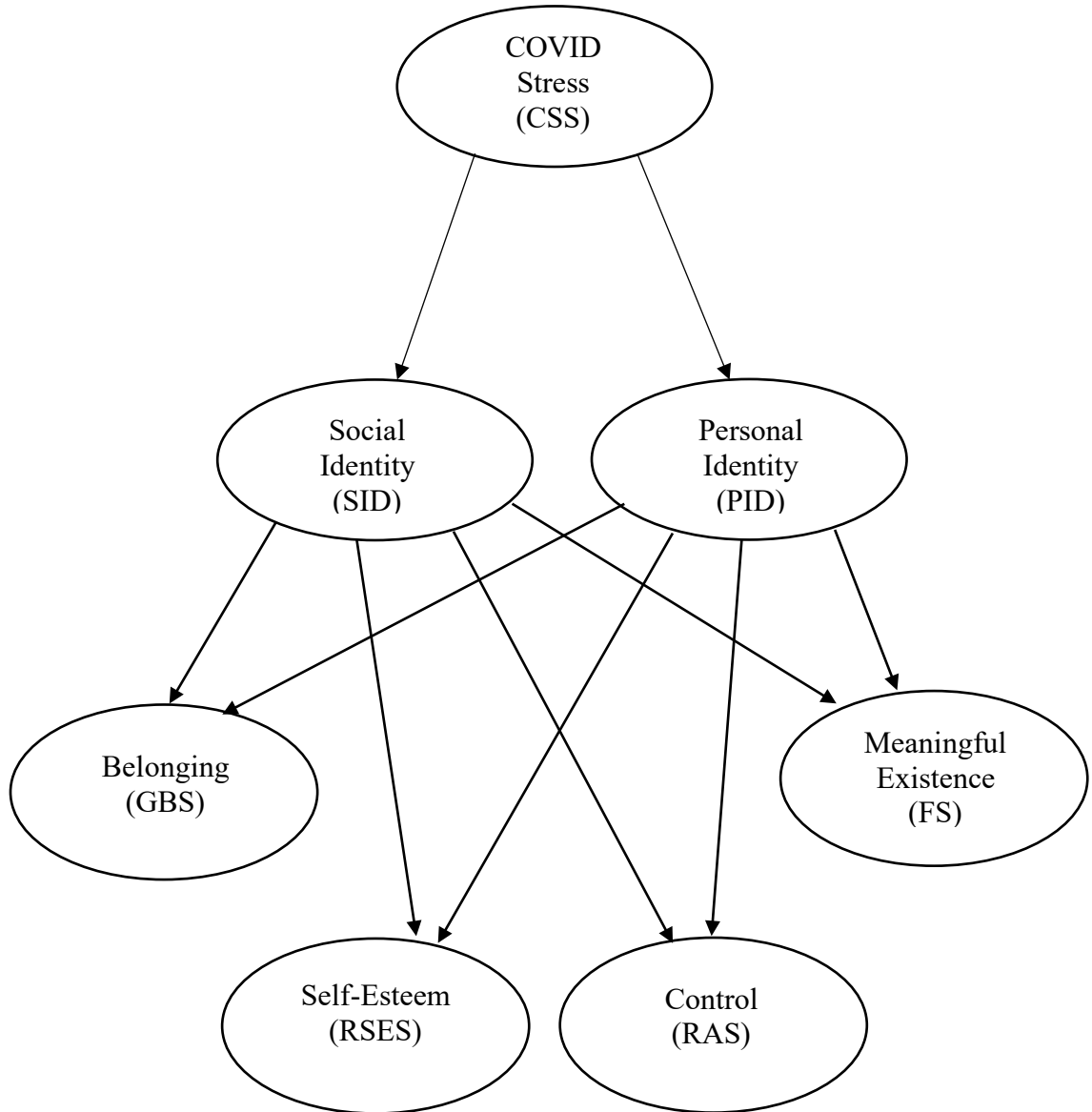
*Note.* Parentheses contain the names of the scales that represent the latent variable. CSS = COVID Stress Scale; GBS = General Belongingness Scale; RAS = Revised Autonomy Scale; FS = Fulfilment Scale; RMSPSS = Reduced Multidimensional Scale of Perceived Social Support.

### **COVID-19 Stress and Mental Health Outcomes through Social Identity**

Hypothesis three was tested with two separate models. The first model utilizes social and personal identity as mediators between COVID stress and mental health outcomes (Figure 3). The U.S. sample yielded adequate model fit ( $PPP < .000$ ,  $BRMSEA = .07$ ,  $\hat{\Gamma} = .80$ ). However, the Danish sample yielded low model fit and was not interpreted further ( $PPP < .000$ ,  $BRMSEA > .08$ ,  $\hat{\Gamma} < .80$ ). Within the U.S. sample, COVID stress significantly predicted lower belongingness (posterior mean =  $-.406$ , 95% CI  $[-.727, -.109]$ ), self-esteem (posterior mean =  $-.216$ , 95% CI  $[-.363, -.084]$ ), and life satisfaction (posterior mean =  $-.460$ , 95% CI  $[-.831, -.104]$ ) as well as higher levels of social identity. Moreover, personal identity significantly predicted higher levels in all five outcome variables: belongingness (posterior mean =  $2.64$ , 95% CI  $[0.835, 5.202]$ ), self-esteem (posterior mean =  $1.423$ , 95% CI  $[0.497, 2.681]$ ), control (posterior mean =  $1.559$ , 95% CI  $[0.539, 2.973]$ ), meaningful existence (posterior mean =  $1.922$ , 95% CI  $[0.704, 3.580]$ ), and life satisfaction (posterior mean =  $3.630$ , 95% CI  $[1.263, 6.827]$ ). In all, the data suggested a significant TNIE for belongingness (posterior mean =  $-.306$ , 95% CI  $[-.608, -.004]$ ), self-esteem (posterior mean =  $-.200$ , 95% CI  $[-.340, -.061]$ ), and life satisfaction (posterior mean =  $-.367$ , 95% CI  $[-.729, -.005]$ ). However, the PNIE was not significant for both mediators and all outcome variables. This suggests that the variables had a significant impact on the outcome; however, no mediation occurred. Additional posterior distribution information is found in Appendix D.

**Figure 3**

*Path model for hypothesis three with social identity as a mediator.*



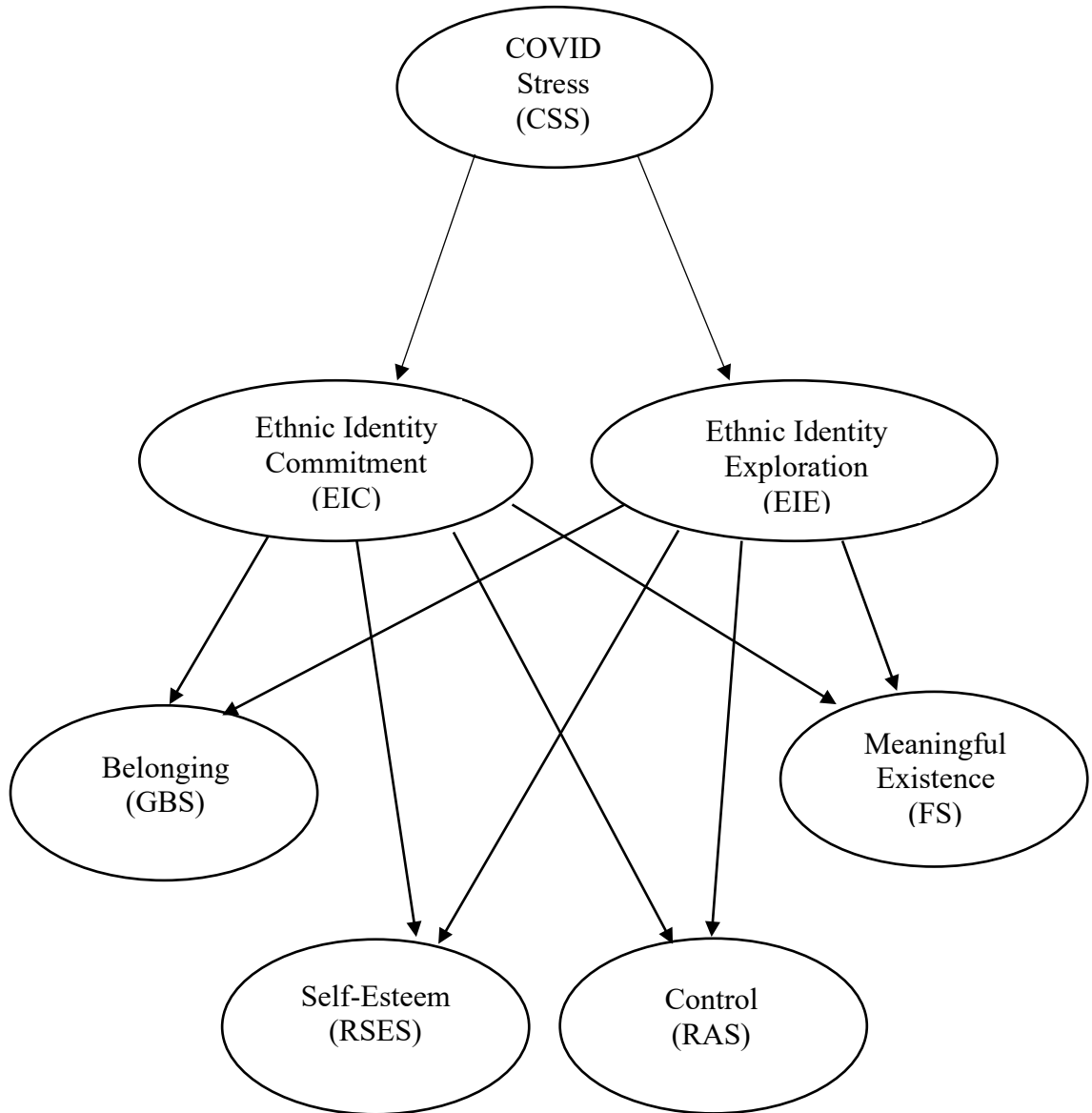
*Note.* Parentheses contain the names of the scales that represent the latent variable. CSS = COVID Stress Scale; GBS = General Belongingness Scale; RAS = Revised Autonomy Scale; FS = Fulfilment Scale; SID = Social Identity; PID = Personal Identity.

### **COVID-19 Stress and Mental Health Outcomes through Ethnic Identity**

In addition to social identity, ethnic identity was examined as a mediator (Figure 4). Both the U.S. (PPP < .000, BRMSEA = .08,  $\hat{\Gamma}$  = .82) and the Danish (PPP < .000, BRMSEA = .08,  $\hat{\Gamma}$  = .82) samples yielded adequate model fit. Within the U.S. model, COVID stress significantly predicted lower levels in belongingness (posterior mean = -.411, 95% CI [-.725, -.111]), self-esteem (posterior mean = -.240, 95% CI [-.390, -.101]), control (posterior mean = -.160, 95% CI [-.326, -.004]), and life satisfaction (posterior mean = -.496, 95% CI [-.885, -.130]). Additionally, COVID stress significantly predicted higher levels in both ethnic identity exploration (posterior mean = .306, 95% CI [.118, .520]) and commitment (posterior mean = .220, 95% CI [.012, .444]). Higher ethnic identity exploration yielded higher levels in meaningful existence (posterior mean = .195, 95% CI [.023, .379]) while higher ethnic identity commitment significantly predicted belongingness (posterior mean = .510, 95% CI [.195, .842]), self-esteem (posterior mean = .188, 95% CI [.049, .330]), and meaningful existence (posterior mean = .167, 95% CI [.001, .339]). There was a significant total effect on belongingness (posterior mean = -.315, 95% CI [-.617, -.013]), self-esteem (posterior mean = -.201, 95% CI [-.339, -.063]), and life satisfaction (posterior mean = -.381, 95% CI [-.741, -.020]). However, no indirect paths were significant, suggesting mediation did not occur. Additional parameter information can be found in Appendix E. Lastly, a final model was conducted that examined the mediating role of ethnic identity within a subsample of ethnic minority participants. The model demonstrated low model fit (PPP < .000, BRMSEA > .08,  $\hat{\Gamma}$  = .80) and was not interpreted further.

**Figure 4**

*Path model for hypothesis three with ethnic identity as a mediator.*



*Note.* Parentheses contain the names of the scales that represent the latent variable. CSS = COVID Stress Scale; GBS = General Belongingness Scale; RAS = Revised Autonomy Scale; FS = Fulfilment Scale.



In sum, COVID Stress significantly predicted several outcome variables across models. However, model two yielded low model fit and was not interpreted. Furthermore, social support, social identity, and ethnic identity did not significantly mediate the relationship between COVID stress and the outcome variables.

## Chapter 4

### DISCUSSION

The present study aimed to examine the global COVID-19 pandemic and its impact through the lens of the Need-Threat Model (NTM) of social exclusion with college-aged samples from the U.S. and Denmark. Prior research on the NTM has shown ostracizing events to result in decreases in the fundamental four which consists of self-esteem, belongingness, control, and autonomy (Williams, 2007). However, the current study is the first to directly explore the NTM through the framework of a natural disaster rather than ostracism. Additionally, social support (e.g., Chiu et al., 2015), social identity (e.g., Kaye et al., 2019), and ethnic identity (e.g., Atari & Han, 2018) have been shown to be protective factors against threats to wellbeing and mental health. The present pandemic allows for the examination of the NTM during a global viral outbreak. Moreover, this allows for the examination of the mediating role of social support, social identity, and ethnic identity during a pandemic. As such, the current study hypothesized that the COVID-19 pandemic would act in a similar manner leading to high levels of COVID-19 stress being associated with low levels the fundamental four. Next, social support, social identity, and ethnic identity were each placed into the model individually to determine their mediating ability. Implications of these results for clinicians and university administrators will be discussed.

#### **COVID-19 Stress and the Fundamental Four**

I first examined the ability of COVID-19 stress to predict lower levels in the fundamental four (belongingness, self-esteem, control, and meaningful existence). It was expected that stress related to the Coronavirus would predict lower levels in the fundamental four. Findings partially supported this hypothesis in both samples. Within the U.S. sample, COVID stress predicted lower belongingness and self-esteem. However, the Danish sample only yielded lower self-esteem. As such, while the possibility that COVID-19 acts as a negative event within the Need-Threat Model (NTM) is possible, it appears that the pandemic uniformly predicting all of the fundamental four did not emerge. There are several possible reasons for this partial support within this model. First, research on the NTM focuses on various forms of ostracism as a negative event while the present research examines the NTM in the context of a natural disaster which acts as a negative event. The differences in the conceptualization of the negative event may further explain the findings. The pandemic may result in isolation through social distancing; but, this is conceptually different from ostracism and social exclusion. Additionally, the NTM has mostly been initiated within a lab setting (Williams, 2007) which may differ substantially from the real world. However, at least one study in recent years has found that social exclusion in everyday life is associated with lower levels of the fundamental four (Nezlek et al., 2012). Yet, we need to bear in mind that research on social exclusion in daily life is sparse. Moreover, the NTM has often used overt forms of social exclusion through methods such as Cyberball (Williams, 2007), the life alone method (Twenge et al., 2001), and asking participants about specific events (Nezlek et al., 2012). Research on social exclusion clearly demonstrates a negative association with the

fundamental four. However, the current research examines a natural disaster within the context of the NTM which may account for the hypothesis being partially supported.

Although the results do not overwhelmingly support the idea that the pandemic neatly fits within the NTM framework, the significant relationships that emerged in this study are noteworthy. Both samples had lower levels in self-esteem which suggests the pandemic has a direct effect on mental health, especially in the Danish sample. On average, higher levels in COVID related stress were associated with modest levels in self-esteem for the U.S. sample. This relationship was two times stronger for the Danish sample, suggesting Danes are more susceptible to the pandemic's influence on mental health. Prior research comparing Danish and U.S. samples have found that Danes rate higher in life satisfaction compared to their U.S. counterparts (Biswas-Diener, 2010). It is possible that the major life disruptions caused by the pandemic could account for the differences in self-esteem. However, additional research is needed to further explore this relationship. These findings are especially pertinent to Danish clinicians as they address the mental health repercussions of the pandemic. These findings suggest that clinicians in both nations may aim to reduce COVID related stress to improve patients' self-esteem.

### **COVID-19 Stress and Mental Health Outcomes through Social Support**

Next, the mediating role of social support was examined. Hypothesis two states that social support would act as a mediator between Coronavirus stress and negative mental health outcomes. However, findings did not support this hypothesis. The data did not yield adequate model fit and was not interpreted further. Given that the model fit for hypotheses one and three were adequate, the likely culprit was the inclusion of social

support as a mediator. There are several possible reasons why this hindered model fit in both samples, which is contrary to prior research. However, the current model has COVID stress predicting social support which may have resulted in lower model fit. Prior studies have examined the relationship in the context of the pandemic without exploring the direct relationship (e.g., Grey et al., 2020). As such, the inclusion of COVID stress may have hindered model fit. Implementing COVID stress as a covariate rather than a predictor variable may increase model fit and yield significant results.

A post-hoc analysis was conducted to determine the fit of the model when COVID-19 stress is implemented as a covariate. However, the model yielded high levels of misfit and the model was not interpreted further. The manner in which COVID stress was measured could explain the lack of a relationship. Grey et al. (2020) examined participants who were currently experiencing social isolation as a result of the COVID-19 pandemic. The current study did not directly measure the participant's current social isolation status. As such, it is possible that participants varied in the amount they isolated from others. Moreover, the current study collected data during a period when stay-at-home orders were not in place. The lack of clear and direct social isolation could further explain the differing results.

### **COVID-19 Stress, Social Identity, and Ethnic Identity**

Finally, social identity and ethnic identity were used to mediate the relationship between COVID-19 stress and mental health outcomes. Hypothesis three stated that social identity would mediate the relationship between Coronavirus stress and negative mental health outcomes but were not supported by the results. This hypothesis was tested

by using three different forms of social identity as mediators. The first model used social and personal identity as mediators in the relationship between COVID stress and mental health outcomes. Contrary to the hypothesized results, no mediation occurred. However, within the U.S. sample, COVID stress significantly predicted lower levels in belongingness, self-esteem, and life satisfaction. The same model with a Danish sample yielded low model fit and was not interpreted. As a result, the model fit the U.S sample better and suggests that COVID stress is a stronger indicator of mental health through social identity within the U.S.

Similar results were found when ethnic identity exploration and commitment were used as mediators. Within the U.S. sample, COVID Stress significantly predicted lower levels of belongingness, self-esteem, autonomy, and life satisfaction. The total effect of COVID stress, social, and personal identity was significant for belongingness, self-esteem, and life satisfaction with no mediation occurring. Covid stress predicted fewer outcome variables within the Danish sample. The model demonstrated that COVID stress has a significant negative impact on self-esteem. Additionally, the total effect on self-esteem is significant; however, mediation did not occur. This suggests that COVID stress is a stronger indicator of mental health outcomes within a U.S. sample compared to a Danish sample.

Mediation did not occur within both samples and models which may be explained in several ways. To date, there is no prior research exploring the models conducted in this study. As such, it is possible that this indirect relationship through social and ethnic identity does not exist. Other mediating factors may be at play in both the U.S. and

Danish samples such as emotion regulation which has been widely explored in the context of mental health (Hu et al., 2014). Additionally, most research on social identity within Denmark explores the topic in the context of minority groups within the country (e.g., Buckser, 1999; Dinesen, 2009; Valentin, 2015). Moreover, ethnic identity has been found to be especially impactful for ethnic minority groups (Ai et al., 2014; Willis & Neblett, 2020). The Danish sample consisted of mostly white participants which could explain the lack of mediating effect. Furthermore, it is possible that differences in the conception of social identity differs between the two nations which could explain the high levels of misfit within the Danish models. However, the U.S. sample was substantially more diverse. The model yielded high levels of misfit when examining the role of ethnic identity within a sample of ethnic minority participants suggesting ethnic identity does not mediate the relationship. This could be due to the reduced sample size which caused several errors when running the Markov chains. This type of error has been shown to produce biased results and my account for the inadequate model fit (Stan Development Team, 2020). As such, additional research is needed to further investigate this relationship.

The lack of mediation does not discount the crucial findings of this study. COVID stress significantly predicted lower levels in several factors relating to mental health especially within the U.S. sample. This is important for clinicians and researchers as both nations and the rest of the world navigate and address the pandemic's impact on mental health. Reducing the stress people face as a function of the pandemic could be positively associated with one's mental health through better self-esteem and belongingness.

## **Limitations and Future Directions**

There are several potential limitations of the current research that could be explored in future studies. First, the COVID Stress Scale (CSS) yielded highly skewed distributions that limited the potential analyses that could be conducted which could bias findings in this study. This may be a result of timing and the nature of the survey. The CSS was developed during the onset of the pandemic while the present study took place a year later. As such, major contributors of stress may have changed over the course of the pandemic. It is also possible the impact on mental health resulting from the pandemic has not materialized yet. Future research should continue to explore this relationship. Additionally, future research could benefit by exploring pandemic related stressors through more sensitive measures that may yield normal distributions. Additionally, the relationship between the COVID-19 pandemic and mental health should be compared to similar relationships in past pandemics and epidemics. By addressing these future directions, researchers and clinicians may have a more comprehensive picture of pandemics and their impact on mental health as well as be more prepared to address future pandemics.

## **Conclusion**

The current research is, to the author's knowledge, the first examination of the COVID-19 pandemic's effect on mental health through the Need-Threat Model. The global pandemic has significantly altered daily life and poses a significant threat to mental health. As such, the present research aimed to examine the impact of COVID-19 on the fundamental four as well as life satisfaction. The hypothesis that COVID stress



would predict lower levels in the fundamental four was partially supported. Contrary to the hypothesized results, social support, social identity, and ethnic identity did not mediate this relationship. However, COVID stress did significantly predict lower levels in participants' sense of belonging, self-esteem, and life satisfaction. In general, COVID stress significantly impacted mental health more broadly within the U.S. sample compared to the Danish sample. These results are significant in that they can inform clinicians, university administrators, and researchers of the link between the pandemic and mental health within college samples in the two countries under investigation in this study, U.S. and Denmark, as well as college students in other countries. Moreover, these findings can be used to inform university, state/regional, and national policy concerning mental health as people cope in the aftermath of the pandemic. Additional research is needed to investigate this relationship outside of college-aged individuals and in different nations around the world.

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APPENDIX A  
Prior distributions of factor loadings

**Table A1**  
*Factor Loading Prior Distributions for the MEIM-R*

	<i>M</i>	<i>SD</i>
Exploration		
Item 1	.73	.10
Item 4	.79	.10
Item 5	.84	.10
Commitment		
Item 2	.86	.10
Item 3	.71	.10
Item 6	.77	.10

*Note. Estimates are based on the findings of Musso et al. (2018)*

**Table A2***Factor Loading Prior Distributions for the RSES*

	<i>M</i>	<i>SD</i>
Item 1	.76	.10
Item 2	.74	.10
Item 3	.77	.10
Item 4	.66	.10
Item 5	.70	.10
Item 6	.85	.10
Item 7	.80	.10
Item 8	.73	.10
Item 9	.68	.10
Item 10	.76	.10

*Note. Estimates are based on the findings of Sinclair et al. (2010)*

**Table A3***Factor Loading Prior Distributions for the GBS*

	<i>M</i>	<i>SD</i>
Item 1	.70	.10
Item 2	.67	.10
Item 3	.78	.10
Item 4	.66	.10
Item 5	.65	.10
Item 6	.77	.10
Item 7	.82	.10
Item 8	.67	.10
Item 9	.79	.10
Item 10	.70	.10
Item 11	.78	.10
Item 12	.66	.10

*Note. Estimates are based on the findings of Malone et al. (2012)*

**Table A4***Factor Loading Prior Distributions for the SIPI*

	<i>M</i>	<i>SD</i>
Item 1	.31	.10
Item 2	.41	.10
Item 3	.66	.10
Item 4	.70	.10
Item 5	.32	.10
Item 6	.40	.10
Item 7	.44	.10
Item 8	.75	.10
Item 9	.78	.10
Item 10	.69	.10
Item 11	.55	.10
Item 12	.48	.10
Item 13	.76	.10
Item 14	.53	.10
Item 15	.57	.10
Item 16	.62	.10

*Note. Estimates are based on the findings of Nario-Redmond et al. (2004)*

APPENDIX B  
Bivariate Correlations, Means, and Standard Deviations

**Table B1**

*Means, standard deviations, and correlations with 95% confidence intervals for the U.S. Sample.*

Variable	1	2	3	4	5	6	7	8	9	10	11
1. EIE											
2. EIC	.67** [.59, .74]										
3. RSES	.03 [-.11, .17]	.18* [.04, .31]									
4. GBS	.08 [-.06, .21]	.23** [.09, .36]	.56** [.46, .65]								
5. RAS	.13 [-.01, .26]	.18** [.05, .31]	.46** [.35, .57]	.41** [.29, .52]							
6. FS	.27** [.13, .39]	.31** [.18, .43]	.50** [.38, .59]	.43** [.31, .54]	.63** [.54, .71]						
7. LSM	.09 [-.05, .23]	.18* [.04, .31]	.41** [.29, .52]	.49** [.38, .59]	.28** [.15, .41]	.40** [.28, .51]					
8. RMSPSS	.21** [.07, .34]	.27** [.14, .39]	.39** [.26, .50]	.66** [.57, .73]	.41** [.28, .52]	.47** [.35, .57]	.44** [.32, .55]				
9. SID	.37** [.24, .48]	.46** [.34, .56]	-.00 [-.14, .13]	.11 [-.03, .25]	.06 [-.08, .20]	.22** [.09, .35]	.10 [-.03, .24]	.11 [-.03, .24]			
10. PID	.24**	.26**	.15*	.16*	.23**	.34**	.24**	.23**	.56**		



Variable	1	2	3	4	5	6	7	8	9	10	11
	[.10, .36]	[.13, .39]	[.01, .28]	[.02, .29]	[.09, .36]	[.21, .46]	[.11, .37]	[.10, .36]	[.46, .65]		
11. CSS	.16* [.03, .30]	.10 [-.03, .24]	-.22** [-.35, -.09]	-.16* [-.29, -.02]	-.09 [-.22, .05]	.01 [-.13, .15]	-.15* [-.28, -.01]	-.01 [-.15, .13]	.18* [.04, .31]	.13 [-.01, .26]	
<i>M</i>	3.55	3.71	2.86	5.03	3.28	3.85	6.72	5.14	5.67	6.09	0.96
<i>SD</i>	0.95	0.87	0.52	1.11	0.62	0.83	1.59	1.40	1.72	1.50	0.61

*Note.* Values in square brackets indicate the 95% confidence interval for each correlation. EIE = Ethnic Identity Commitment; EIC = Ethnic Identity Commitment; RSES = Rosenberg Self-Esteem Scale; GBS = General Belonginess Scale; RAS = Revised Autonomy Scale; FS = Fulfillment Scale; LSM = Life Satisfaction Measure; RMSPSS = Reduced Multidimensional Scale of Perceived Social Support; SID = Social Identity; PID = Personal Identity; CSS = COVID Stress Scale. \* indicates  $p < .05$ . \*\* indicates  $p < .01$ .

**Table B2***Means, standard deviations, and correlations with confidence intervals for the Danish sample.*

Variable	1	2	3	4	5	6	7	8	9	10	11
1. EIE											
2. EIC	.53** [.40, .65]										
3. RSES	.05 [-.13, .22]	.12 [-.05, .29]									
4. GBS	.05 [-.12, .23]	.07 [-.11, .24]	.71** [.62, .79]								
5. RAS	-.02 [-.19, .16]	.13 [-.04, .30]	.57** [.44, .68]	.55** [.42, .66]							
6. FS	.20* [.03, .37]	.10 [-.08, .27]	.59** [.47, .70]	.48** [.34, .61]	.43** [.28, .56]						
7. LSM	.12 [-.05, .29]	.22* [.05, .38]	.59** [.46, .69]	.57** [.43, .67]	.42** [.26, .55]	.54** [.40, .65]					
8. RMSPSS	.03 [-.15, .20]	.05 [-.12, .22]	.55** [.41, .66]	.77** [.68, .83]	.38** [.22, .52]	.43** [.28, .56]	.46** [.31, .59]				
9. SID	.48** [.33, .60]	.47** [.32, .60]	.02 [-.15, .20]	.13 [-.05, .29]	.04 [-.13, .22]	.16 [-.02, .32]	.17 [-.00, .34]	.07 [-.10, .24]			
10. PID	.29** [.12, .44]	.05 [-.13, .22]	-.01 [-.19, .16]	.03 [-.14, .21]	.01 [-.17, .18]	.15 [-.03, .32]	.11 [-.07, .28]	-.02 [-.19, .16]	.21* [.03, .37]		

Variable	1	2	3	4	5	6	7	8	9	10	11
11. CSS	.11 [-.07, .28]	-.05 [-.22, .13]	-.34** [-.48, -.17]	-.08 [-.25, .10]	-.14 [-.31, .04]	-.04 [-.22, .13]	-.04 [-.22, .13]	.04 [-.14, .21]	.17 [-.01, .33]	.15 [-.03, .32]	
<i>M</i>	2.44	3.16	2.86	5.19	3.39	3.75	6.30	5.47	4.38	4.92	0.49
<i>SD</i>	0.92	0.90	0.61	1.15	0.50	0.80	1.84	1.40	1.25	1.42	0.40

*Note.* Values in square brackets indicate the 95% confidence interval for each correlation. EIE = Ethnic Identity Commitment; EIC = Ethnic Identity Commitment; RSES = Rosenberg Self-Esteem Scale; GBS = General Belonginess Scale; RAS = Revised Autonomy Scale; FS = Fulfillment Scale; LSM = Life Satisfaction Measure; RMSPSS = Reduced Multidimensional Scale of Perceived Social Support; SID = Social Identity; PID = Personal Identity; CSS = COVID Stress Scale. \* indicates  $p < .05$ . \*\* indicates  $p < .01$ .

APPENDIX C  
Results of COVID Stress Predicting the Fundamental Four

**Table C1**

*COVID Stress predicting the fundamental four posterior distributions of factor loadings for the U.S. Sample*

Variable	Estimate <sup>a</sup>	SD <sup>b</sup>	95% CI <sup>c</sup>
CSS			
DAC	1.000		
SEC	0.978	0.124	0.754, 1.241
XEN	0.379	0.080	0.232, 0.544
TS	0.417	0.070	0.288, 0.563
CEK	0.835	0.116	0.629, 1.083
GBS			
Item 1	1.000		
Item 2	0.734	0.061	0.615, 0.853
Item 3	0.861	0.063	0.738, 0.983
Item 4	0.740	0.065	0.613, 0.867
Item 5	0.761	0.054	0.657, 0.866
Item 6	0.782	0.067	0.651, 0.914
Item 7	0.876	0.064	0.751, 1.003
Item 8	0.778	0.053	0.674, 0.883
Item 9	0.865	0.064	0.740, 0.990
Item 10	0.803	0.051	0.704, 0.905
Item 11	0.895	0.051	0.796, 0.997
Item 12	0.738	0.060	0.619, 0.856
RSES			
Item 1	1.000		
Item 2	0.617	0.059	0.504, 0.734
Item 3	0.763	0.070	0.627, 0.901
Item 4	0.659	0.062	0.540, 0.781
Item 5	0.897	0.066	0.766, 1.027
Item 6	0.881	0.062	0.760, 1.003
Item 7	0.884	0.064	0.760, 1.010
Item 8	0.867	0.076	0.719, 1.015
Item 9	1.015	0.069	0.880, 1.150
Item 10	1.013	0.071	0.874, 1.151
RAS			
Item 1	1.000		
Item 2	0.737	0.059	0.625, 0.859
Item 3	1.004	0.073	0.867, 1.154
Item 4	0.911	0.079	0.761, 1.071
FS			

Variable	Estimate <sup>a</sup>	SD <sup>b</sup>	95% CI <sup>c</sup>
Item 1	1.000		
Item 2	1.283	0.110	1.081, 1.512
Item 3	1.180	0.081	1.031, 1.350
Item 4	1.178	0.104	0.988, 1.395
Item 5	1.055	0.103	0.864, 1.264

*Note.* CSS = COVID Stress Scale; GBS = General Belongingness Scale; RSES = Rosenberg Self-Esteem Scale; RAS = Revised Autonomy Scale; FS = Fulfillment Scale.

<sup>a</sup> Reflects the mean of the posterior distribution.

<sup>b</sup> Reflects the standard deviation of the posterior distribution.

<sup>c</sup> Reflects the upper and lower bounds of a 95% credible interval (CI).

**Table C2**

*COVID Stress predicting the fundamental four posterior distributions of unstandardized regression weights and covariances for the U.S. sample*

Variable	Estimate <sup>a</sup>	SD <sup>b</sup>	95% CI <sup>c</sup>
Regressions			
CSS			
GBS	-0.327	0.146	-0.622, -0.046
RSES	-0.202	0.067	-0.338, -0.077
RAS	-0.106	0.075	-0.256, 0.040
FS	0.021	0.080	-0.135, 0.179
Covariances			
GBS			
RSES	0.393	0.064	0.279, 0.527
RAS	0.344	0.069	0.218, 0.489
FS	0.405	0.077	0.267, 0.569
RSES			
RAS	0.169	0.032	0.112, 0.236
FS	0.214	0.036	0.149, 0.291
RAS			
FS	0.303	0.045	0.222, 0.400

*Note.* CSS = COVID Stress Scale; GBS = General Belongingness Scale; RSES = Rosenberg Self-Esteem Scale; RAS = Revised Autonomy Scale; FS = Fulfillment Scale.

<sup>a</sup> Reflects the mean of the posterior distribution.

<sup>b</sup> Reflects the standard deviation of the posterior distribution.

<sup>c</sup> Reflects the upper and lower bounds of a 95% credible interval (CI).

**Table C3**

*COVID Stress predicting the fundamental four posterior distributions of factor loadings for the Danish sample*

Variable	Estimate <sup>a</sup>	SD <sup>b</sup>	95% CI <sup>c</sup>
CSS			
DAC	1.000		
SEC	0.486	0.095	0.325, 0.698
XEN	0.479	0.121	0.261, 0.740
TS	1.020	0.159	0.767, 1.381
CEK	0.840	0.149	0.596, 1.181
GBS			
Item 1	1.000		
Item 2	0.781	0.059	0.666, 0.898
Item 3	0.989	0.054	0.881, 1.094
Item 4	0.803	0.060	0.687, 0.920
Item 5	0.728	0.054	0.622, 0.834
Item 6	0.746	0.066	0.618, 0.876
Item 7	0.816	0.074	0.669, 0.963
Item 8	0.846	0.055	0.739, 0.956
Item 9	0.841	0.056	0.733, 0.952
Item 10	0.818	0.054	0.713, .924
Item 11	0.933	0.050	0.835, 1.032
Item 12	0.694	0.058	0.581, 0.809
RSES			
Item 1	1.000		
Item 2	0.627	0.053	0.525, 0.732
Item 3	0.897	0.065	0.769, 1.025
Item 4	0.703	0.058	0.590, 0.816
Item 5	0.801	0.066	0.673, 0.929
Item 6	0.960	0.053	0.856, 1.064
Item 7	1.026	0.057	0.914, 1.139
Item 8	0.793	0.071	0.655, 0.930
Item 9	0.707	0.070	0.570, 0.845
Item 10	0.846	0.071	0.708, 0.984
RAS			
Item 1	1.000		
Item 2	0.948	0.133	0.712, 1.234
Item 3	1.030	0.151	0.762, 1.358
Item 4	1.113	0.174	0.816, 1.505
FS			
Item 1	1.000		
Item 2	1.379	0.270	0.938, 1.984

Variable	Estimate <sup>a</sup>	SD <sup>b</sup>	95% CI <sup>c</sup>
Item 3	1.487	0.219	1.139, 1.992
Item 4	1.504	0.256	1.093, 2.091
Item 5	1.175	0.237	0.780, 1.706

*Note.* CSS = COVID Stress Scale; GBS = General Belongingness Scale; RSES = Rosenberg Self-Esteem Scale; RAS = Revised Autonomy Scale; FS = Fulfillment Scale.

<sup>a</sup> Reflects the mean of the posterior distribution.

<sup>b</sup> Reflects the standard deviation of the posterior distribution.

<sup>c</sup> Reflects the upper and lower bounds of a 95% credible interval (CI).



**Table C4**

*COVID Stress predicting the fundamental four posterior distributions of unstandardized regression weights and covariances for the Danish sample*

Variable	Estimate <sup>a</sup>	SD <sup>b</sup>	95% CI <sup>c</sup>
Regressions			
CSS			
GBS	-0.267	0.303	-0.861, 0.323
RSES	-0.527	0.165	-0.870, -0.223
RAS	-0.192	0.113	-0.425, 0.019
FS	-0.087	0.136	-0.361, 0.181
Covariances			
GBS			
RSES	0.667	0.106	0.481, 0.899
RAS	0.328	0.073	0.201, 0.487
FS	0.363	0.092	0.204, 0.567
RSES			
RAS	0.167	0.037	0.102, 0.248
FS	0.242	0.052	0.152, 0.356
RAS			
FS	0.110	0.034	0.053, 0.184

*Note.* CSS = COVID Stress Scale; GBS = General Belongingness Scale; RSES = Rosenberg Self-Esteem Scale; RAS = Revised Autonomy Scale; FS = Fulfillment Scale.

<sup>a</sup> Reflects the mean of the posterior distribution.

<sup>b</sup> Reflects the standard deviation of the posterior distribution.

<sup>c</sup> Reflects the upper and lower bounds of a 95% credible interval (CI).

## APPENDIX D

Results of COVID Stress Predicting Mental Health Outcomes through Social Identity

**Table D1***COVID stress predicting mental health outcomes through social identity posterior distributions of factor loadings for the U.S. sample*

Variable	Estimate <sup>a</sup>	SD <sup>b</sup>	95% CI <sup>c</sup>
CSS			
DAC	1.000		
SEC	1.014	0.131	0.780, 1.295
XEN	0.404	0.083	0.251, 0.577
TS	0.424	0.072	0.291, 0.576
CEK	0.862	0.119	0.649, 1.118
GBS			
Item 1	1.000		
Item 2	0.734	0.061	0.614, 0.855
Item 3	0.855	0.063	0.731, 0.979
Item 4	0.732	0.066	0.604, 0.862
Item 5	0.763	0.053	0.658, 0.867
Item 6	0.776	0.066	0.648, 0.907
Item 7	0.873	0.064	0.748, 0.999
Item 8	0.784	0.053	0.681, 0.890
Item 9	0.861	0.063	0.736, 0.986
Item 10	0.804	0.051	0.705, 0.903
Item 11	0.898	0.051	0.800, 0.999
Item 12	0.732	0.060	0.614, 0.850
RSES			
Item 1	1.000		
Item 2	0.619	0.058	0.506, 0.735
Item 3	0.763	0.069	0.628, 0.900
Item 4	0.659	0.062	0.539, 0.781
Item 5	0.895	0.066	0.766, 1.024
Item 6	0.879	0.062	0.758, 1.001
Item 7	0.884	0.064	0.760, 1.010
Item 8	0.868	0.075	0.721, 1.017
Item 9	1.009	0.070	0.871, 1.146
Item 10	1.008	0.071	0.869, 1.146
RAS			
Item 1	1.000		
Item 2	0.736	0.059	0.624, 0.856
Item 3	1.000	0.073	0.865, 1.150
Item 4	0.909	0.078	0.762, 1.070
FS			

Variable	Estimate <sup>a</sup>	SD <sup>b</sup>	95% CI <sup>c</sup>
Item 1	1.000		
Item 2	1.292	0.110	1.089, 1.523
Item 3	1.171	0.081	1.024, 1.341
Item 4	1.177	0.104	0.986, 1.396
Item 5	1.058	0.102	0.871, 1.270
SID			
Item 1	1.000		
Item 2	6.697	2.871	2.586, 13.203
Item 3	3.673	1.645	1.350, 7.506
Item 4	5.200	2.266	1.978, 10.426
Item 5	9.035	3.812	3.524, 17.617
Item 6	6.877	2.920	2.676, 13.497
Item 7	8.758	3.708	3.404, 17.112
Item 8	6.058	2.608	2.337, 12.004
PID			
Item 1	1.000		
Item 2	6.097	2.199	2.342, 10.838
Item 3	7.571	2.599	3.013, 13.080
Item 4	9.796	3.278	3.923, 16.614
Item 5	8.833	2.953	3.523, 14.990
Item 6	11.164	3.697	4.457, 18.798
Item 7	7.988	2.758	3.162, 13.882
Item 8	9.411	3.132	3.766, 15.931

*Note.* CSS = COVID Stress Scale; GBS = General Belongingness Scale; RSES = Rosenberg Self-Esteem Scale; RAS = Revised Autonomy Scale; FS = Fulfillment Scale; SID = Social Identity; PID = Personal Identity.

<sup>a</sup> Reflects the mean of the posterior distribution.

<sup>b</sup> Reflects the standard deviation of the posterior distribution.

<sup>c</sup> Reflects the upper and lower bounds of a 95% credible interval (CI).

**Table D2**

*COVID stress predicting mental health outcomes through social identity posterior distributions of unstandardized regression weights for the U.S. sample*

Variable	Estimate <sup>a</sup>	SD <sup>b</sup>	95% CI <sup>c</sup>
GBS			
CSS	-0.406	0.158	-0.727, -0.109
SID	-0.035	0.499	-1.101, 0.979
PID	2.642	1.128	0.835, 5.202
PNIE <sub>SID</sub>	-0.004	0.048	-0.099, 0.090
PNIE <sub>PID</sub>	0.105	0.062	-0.017, 0.226
TNIE	-0.306	0.154	-0.608, -0.004
RSES			
CSS	-0.216	0.071	-0.363, -0.084
SID	-0.345	0.263	-0.987, 0.043
PID	1.423	0.564	0.497, 2.681
PNIE <sub>SID</sub>	-0.041	0.023	-0.086, 0.005
PNIE <sub>PID</sub>	0.056	0.032	-0.007, 0.119
TNIE	-0.200	0.071	-0.340, -0.061
RAS			
CSS	-0.118	0.080	-0.278, 0.035
SID	-0.364	0.302	-1.100, 0.092
PID	1.559	0.632	0.539, 2.973
PNIE <sub>SID</sub>	-0.043	0.028	-0.097, 0.011
PNIE <sub>PID</sub>	0.062	0.035	-0.007, 0.131
TNIE	-0.099	0.080	-0.255, 0.057
FS			
CSS	-0.026	0.082	-0.189, 0.135
SID	-0.053	0.268	-0.634, 0.494
PID	1.922	0.744	0.704, 3.580
PNIE <sub>SID</sub>	-0.006	0.026	-0.056, 0.044
PNIE <sub>PID</sub>	0.076	0.042	-0.007, 0.159
TNIE	0.043	0.084	-0.122, 0.209
LSM			
CSS	-0.460	0.186	-0.831, -0.104
SID	-0.425	0.620	-1.862, 0.668
PID	3.630	1.452	1.263, 6.827
PNIE <sub>SID</sub>	-0.050	0.059	-0.165, 0.065
PNIE <sub>PID</sub>	0.144	0.083	-0.019, 0.306
TNIE	-0.367	0.185	-0.729, -0.005
SID			
CSS	0.118	0.067	0.032, 0.289
PID			

CSS	0.040	0.030	-0.004, 0.114
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*Note.* Results are grouped by outcome. CSS = COVID Stress Scale; GBS = General Belongingness Scale; RSES = Rosenberg Self-Esteem Scale; RAS = Revised Autonomy Scale; FS = Fulfillment Scale; LSM = Life Satisfaction Measure; SID = Social Identity; PID = Personal Identity; PNIE = pure natural indirect effect; TNIE = total natural indirect effect.

<sup>a</sup> Reflects the mean of the posterior distribution.

<sup>b</sup> Reflects the standard deviation of the posterior distribution.

<sup>c</sup> Reflects the upper and lower bounds of a 95% credible interval (CI).

**Table D3**

*COVID stress predicting mental health outcomes through social identity posterior covariance distributions for the U.S. sample*

Variable	Estimate <sup>a</sup>	SD <sup>b</sup>	95% CI <sup>c</sup>
GBS			
RSES	0.313	0.057	0.209, 0.434
RAS	0.257	0.063	0.141, 0.387
FS	0.279	0.066	0.159, 0.417
LSM	0.783	0.150	0.512, 1.098
RSES			
RAS	0.123	0.028	0.072, 0.183
FS	0.156	0.031	0.102, 0.221
LSM	0.237	0.063	0.119, 0.369
RAS			
FS	0.240	0.039	0.169, 0.325
LSM	0.151	0.071	0.016, 0.296
FS			
LSM	0.265	0.077	0.122, 0.424

*Note.* CSS = COVID Stress Scale; GBS = General Belongingness Scale; RSES = Rosenberg Self-Esteem Scale; RAS = Revised Autonomy Scale; FS = Fulfillment Scale; LSM = Life Satisfaction Measure.

<sup>a</sup> Reflects the mean of the posterior distribution.

<sup>b</sup> Reflects the standard deviation of the posterior distribution.

<sup>c</sup> Reflects the upper and lower bounds of a 95% credible interval (CI).

## APPENDIX E

Results of COVID Stress Predicting Mental Health Outcomes through Ethnic Identity

**Table E1***COVID stress predicting mental health outcomes through ethnic identity posterior distributions of factor loadings for the U.S. sample*

Variable	Estimate <sup>a</sup>	SD <sup>b</sup>	95% CI <sup>c</sup>
CSS			
DAC	1.000		
SEC	1.007	0.131	0.770, 1.286
XEN	0.396	0.083	0.241, 0.567
TS	0.428	0.074	0.294, 0.583
CEK	0.886	0.125	0.667, 1.159
GBS			
Item 1	1.000		
Item 2	0.734	0.061	0.616, 0.854
Item 3	0.855	0.062	0.734, 0.978
Item 4	0.733	0.065	0.604, 0.861
Item 5	0.764	0.052	0.661, 0.867
Item 6	0.776	0.067	0.645, 0.908
Item 7	0.874	0.063	0.751, 1.000
Item 8	0.786	0.053	0.684, 0.890
Item 9	0.861	0.063	0.736, 0.986
Item 10	0.803	0.051	0.703, 0.904
Item 11	0.899	0.050	0.801, 0.998
Item 12	0.730	0.060	0.611, 0.849
RSES			
Item 1	1.000		
Item 2	0.616	0.058	0.503, 0.731
Item 3	0.761	0.068	0.629, 0.895
Item 4	0.656	0.062	0.537, 0.778
Item 5	0.895	0.065	0.766, 1.024
Item 6	0.880	0.061	0.761, 1.002
Item 7	0.886	0.064	0.761, 1.013
Item 8	0.867	0.076	0.719, 1.015
Item 9	1.010	0.070	0.874, 1.145
Item 10	1.007	0.071	0.868, 1.145
RAS			
Item 1	1.000		
Item 2	0.735	0.059	0.625, 0.856
Item 3	0.999	0.072	0.865, 1.147
Item 4	0.908	0.078	0.759, 1.068
FS			

Variable	Estimate <sup>a</sup>	SD <sup>b</sup>	95% CI <sup>c</sup>
Item 1	1.000		
Item 2	1.280	0.108	1.080, 1.506
Item 3	1.160	0.080	1.013, 1.326
Item 4	1.166	0.102	0.979, 1.378
Item 5	1.058	0.101	0.871, 1.265
EIE			
Item 1	1.000		
Item 2	1.294	0.109	1.095, 1.524
Item 3	1.023	0.100	0.841, 1.236
EIC			
Item 1	1.000		
Item 2	0.770	0.072	0.636, 0.918
Item 3	1.086	0.100	0.904, 1.300

*Note.* CSS = COVID Stress Scale; GBS = General Belongingness Scale; RSES = Rosenberg Self-Esteem Scale; RAS = Revised Autonomy Scale; FS = Fulfillment Scale; EIE = Ethnic Identity Exploration; EIC = Ethnic Identity Commitment.

<sup>a</sup> Reflects the mean of the posterior distribution.

<sup>b</sup> Reflects the standard deviation of the posterior distribution.

<sup>c</sup> Reflects the upper and lower bounds of a 95% credible interval (CI).



**Table E2**

*COVID stress predicting mental health outcomes through ethnic identity posterior distributions of unstandardized regression weights for the U.S. sample*

Variable	Estimate <sup>a</sup>	SD <sup>b</sup>	95% CI <sup>c</sup>
GBS			
CSS	-0.411	0.157	-0.725, -0.111
SID	-0.052	0.163	-0.374, 0.264
PID	0.510	0.165	0.195, 0.842
PNIE <sub>EIE</sub>	-0.016	0.052	-0.118, 0.086
PNIE <sub>EIC</sub>	0.112	0.070	-0.026, 0.250
TNIE	-0.315	0.154	-0.617, -0.013
RSES			
CSS	-0.240	0.073	-0.390, -0.101
SID	-0.006	0.074	-0.151, 0.139
PID	0.188	0.071	0.049, 0.330
PNIE <sub>EIE</sub>	-0.002	0.024	-0.049, 0.045
PNIE <sub>EIC</sub>	0.041	0.028	-0.013, 0.095
TNIE	-0.201	0.070	-0.339, -0.063
RAS			
CSS	-0.160	0.082	-0.326, -0.004
SID	0.106	0.085	-0.059, 0.277
PID	0.117	0.081	-0.041, 0.278
PNIE <sub>EIE</sub>	0.032	0.029	-0.025, 0.090
PNIE <sub>EIC</sub>	0.026	0.024	-0.021, 0.073
TNIE	-0.102	0.079	-0.256, 0.052
FS			
CSS	-0.058	0.084	-0.223, 0.105
SID	0.195	0.091	0.023, 0.379
PID	0.167	0.086	0.001, 0.339
PNIE <sub>EIE</sub>	0.060	0.035	-0.008, 0.127
PNIE <sub>EIC</sub>	0.037	0.028	-0.018, 0.091
TNIE	0.038	0.084	-0.126, 0.202
LSM			
CSS	-0.496	0.192	-0.885, -0.130
SID	0.115	0.199	-0.276, 0.507
PID	0.364	0.195	-0.011, 0.757
PNIE <sub>EIE</sub>	0.035	0.065	-0.092, 0.163
PNIE <sub>EIC</sub>	0.080	0.064	-0.045, 0.205
TNIE	-0.381	0.184	-0.741, -0.020
EIE			
CSS	0.306	0.102	0.118, 0.520
EIC			

CSS	0.220	0.110	0.012, 0.444
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*Note.* Results are grouped by outcome. CSS = COVID Stress Scale; GBS = General Belongingness Scale; RSES = Rosenberg Self-Esteem Scale; RAS = Revised Autonomy Scale; FS = Fulfillment Scale; LSM = Life Satisfaction Measure; EIE = Ethnic Identity Exploration; EIC = Ethnic Identity Commitment; PNIE = pure natural indirect effect; TNIE = total natural indirect effect.

<sup>a</sup> Reflects the mean of the posterior distribution.

<sup>b</sup> Reflects the standard deviation of the posterior distribution.

<sup>c</sup> Reflects the upper and lower bounds of a 95% credible interval (CI).

**Table E3**

*COVID stress predicting mental health outcomes through ethnic identity posterior covariance distributions for the U.S. sample*

Variable	Estimate <sup>a</sup>	SD <sup>b</sup>	95% CI <sup>c</sup>
GBS			
RSES	0.336	0.059	0.230, 0.462
RAS	0.293	0.065	0.174, 0.429
FS	0.326	0.069	0.202, 0.473
LSM	0.878	0.158	0.592, 1.210
RSES			
RAS	0.149	0.030	0.095, 0.213
FS	0.184	0.033	0.126, 0.254
LSM	0.297	0.068	0.171, 0.439
RAS			
FS	0.268	0.041	0.194, 0.355
LSM	0.219	0.075	0.077, 0.375
FS			
LSM	0.348	0.082	0.196, 0.520

*Note.* CSS = COVID Stress Scale; GBS = General Belongingness Scale; RSES = Rosenberg Self-Esteem Scale; RAS = Revised Autonomy Scale; FS = Fulfillment Scale; LSM = Life Satisfaction Measure.

<sup>a</sup> Reflects the mean of the posterior distribution.

<sup>b</sup> Reflects the standard deviation of the posterior distribution.

<sup>c</sup> Reflects the upper and lower bounds of a 95% credible interval (CI).

**Table E4**

*COVID stress predicting mental health outcomes through ethnic identity posterior distributions of factor loadings for the Danish sample*

Variable	Estimate <sup>a</sup>	SD <sup>b</sup>	95% CI <sup>c</sup>
CSS			
DAC	1.000		
SEC	0.518	0.117	0.340, 0.776
XEN	0.501	0.139	0.265, 0.798
TS	1.068	0.202	0.782, 1.514
CEK	0.895	0.193	0.619, 1.316
GBS			
Item 1	1.000		
Item 2	0.778	0.059	0.664, 0.894
Item 3	0.987	0.055	0.880, 1.095
Item 4	0.801	0.060	0.684, 0.919
Item 5	0.726	0.054	0.620, 0.831
Item 6	0.745	0.067	0.614, 0.877
Item 7	0.818	0.073	0.675, 0.961
Item 8	0.845	0.055	0.737, 0.954
Item 9	0.840	0.055	0.731, 0.950
Item 10	0.817	0.054	0.710, 0.923
Item 11	0.931	0.050	0.834, 1.028
Item 12	0.693	0.059	0.578, 0.810
RSES			
Item 1	1.000		
Item 2	0.623	0.053	0.520, 0.728
Item 3	0.894	0.066	0.764, 1.024
Item 4	0.698	0.059	0.585, 0.814
Item 5	0.803	0.066	0.673, 0.932
Item 6	0.959	0.053	0.856, 1.065
Item 7	1.031	0.057	0.919, 1.142
Item 8	0.786	0.070	0.651, 0.923
Item 9	0.705	0.071	0.564, 0.845
Item 10	0.843	0.072	0.702, 0.984
RAS			
Item 1	1.000		
Item 2	0.935	0.129	0.709, 1.212
Item 3	1.012	0.145	0.760, 1.328
Item 4	1.079	0.164	0.790, 1.437
FS			
Item 1	1.000		
Item 2	1.367	0.259	0.938, 1.955

Variable	Estimate <sup>a</sup>	SD <sup>b</sup>	95% CI <sup>c</sup>
Item 3	1.453	0.213	1.114, 1.943
Item 4	1.525	0.252	1.115, 2.106
Item 5	1.173	0.228	0.786, 1.679
EIE			
Item 1	1.000		
Item 2	1.706	0.462	1.080, 2.812
Item 3	1.400	0.383	0.889, 2.295
EIC			
Item 1	1.000		
Item 2	0.617	0.114	0.404, 0.854
Item 3	1.243	0.190	0.913, 1.652

*Note.* CSS = COVID Stress Scale; GBS = General Belongingness Scale; RSES = Rosenberg Self-Esteem Scale; RAS = Revised Autonomy Scale; FS = Fulfillment Scale; EIE = Ethnic Identity Exploration; EIC = Ethnic Identity Commitment.

<sup>a</sup> Reflects the mean of the posterior distribution.

<sup>b</sup> Reflects the standard deviation of the posterior distribution.

<sup>c</sup> Reflects the upper and lower bounds of a 95% credible interval (CI).

**Table E5**

*COVID stress predicting mental health outcomes through ethnic identity posterior distributions of unstandardized regression weights for the Danish sample*

Variable	Estimate <sup>a</sup>	SD <sup>b</sup>	95% CI <sup>c</sup>
GBS			
CSS	-0.256	0.333	-0.925, 0.394
SID	0.007	0.279	-0.543, 0.562
PID	0.106	0.177	-0.236, 0.460
PNIE <sub>EIE</sub>	0.001	0.063	-0.121, 0.124
PNIE <sub>EIC</sub>	-0.016	0.052	-0.118, 0.086
TNIE	-0.271	0.326	-0.910, 0.368
RSES			
CSS	-0.533	0.183	-0.919, -0.209
SID	-0.004	0.140	-0.278, 0.278
PID	0.111	0.087	-0.058, 0.285
PNIE <sub>EIE</sub>	-0.001	0.031	-0.062, 0.060
PNIE <sub>EIC</sub>	-0.017	0.033	-0.081, 0.048
TNIE	-0.551	0.183	-0.910, -0.192
RAS			
CSS	-0.178	0.124	-0.435, 0.053
SID	-0.089	0.102	-0.306, 0.102
PID	0.099	0.064	-0.025, 0.229
PNIE <sub>EIE</sub>	-0.016	0.026	-0.067, 0.034
PNIE <sub>EIC</sub>	-0.015	0.028	-0.069, 0.039
TNIE	-0.209	0.126	-0.455, 0.037
FS			
CSS	-0.123	0.149	-0.430, 0.159
SID	0.213	0.137	-0.022, 0.518
PID	0.026	0.078	-0.128, 0.179
PNIE <sub>EIE</sub>	0.039	0.043	-0.046, 0.124
PNIE <sub>EIC</sub>	-0.004	0.021	-0.046, 0.038
TNIE	-0.088	0.146	-0.375, 0.199
LSM			
CSS	-0.195	0.436	-1.062, 0.657
SID	0.030	0.368	-0.693, 0.770
PID	0.519	0.234	0.058, 0.985
PNIE <sub>EIE</sub>	0.006	0.082	-0.155, 0.166
PNIE <sub>EIC</sub>	-0.078	0.130	-0.333, 0.177
TNIE	-0.267	0.440	-1.130, 0.596
EIE			
CSS	0.182	0.160	-0.101, 0.522
EIC			

CSS	-0.150	0.222	-0.608, 0.269
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*Note.* Results are grouped by outcome. CSS = COVID Stress Scale; GBS = General Belongingness Scale; RSES = Rosenberg Self-Esteem Scale; RAS = Revised Autonomy Scale; FS = Fulfillment Scale; LSM = Life Satisfaction Measure; EIE = Ethnic Identity Exploration; EIC = Ethnic Identity Commitment; PNIE = pure natural indirect effect; TNIE = total natural indirect effect.

<sup>a</sup> Reflects the mean of the posterior distribution.

<sup>b</sup> Reflects the standard deviation of the posterior distribution.

<sup>c</sup> Reflects the upper and lower bounds of a 95% credible interval (CI).

**Table E6**

*COVID stress predicting mental health outcomes through ethnic identity posterior covariance distributions with social identity as a mediator for the Danish sample*

Variable	Estimate <sup>a</sup>	SD <sup>b</sup>	95% CI <sup>c</sup>
GBS			
RSES	0.654	0.105	0.472, 0.883
RAS	0.322	0.072	0.196, 0.481
FS	0.352	0.090	0.196, 0.549
LSM	1.262	0.248	0.823, 1.799
RSES			
RAS	0.160	0.037	0.095, 0.241
FS	0.237	0.051	0.149, 0.347
LSM	0.715	0.128	0.492, 0.996
RAS			
FS	0.112	0.033	0.055, 0.185
LSM	0.306	0.089	0.149, 0.496
FS			
LSM	0.537	0.125	0.319, 0.810

*Note.* CSS = COVID Stress Scale; GBS = General Belongingness Scale; RSES = Rosenberg Self-Esteem Scale; RAS = Revised Autonomy Scale; FS = Fulfillment Scale; LSM = Life Satisfaction Measure.

<sup>a</sup> Reflects the mean of the posterior distribution.

<sup>b</sup> Reflects the standard deviation of the posterior distribution.

<sup>c</sup> Reflects the upper and lower bounds of a 95% credible interval (CI).