SEX DIFFERENCES IN MALADAPTIVE EMOTIONAL AND BEHAVIORAL REPONSES TO COVID-19: WHAT IS THE ROLE OF PERSONALITY?

By

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DEDICATION

To my mom, who has never waivered in her belief in me. Mom, without your support and encouragement throughout all points in my life, even the difficult times, I would not be pursuing higher education. You have instilled in me the confidence to do anything I set my mind to. I will never be able to thank you enough, but I intend to spend my life trying.

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ABSTRACT

Recent research indicates that males are more non-adherent to public health measures for containing COVID-19 while females experience more COVID-19-related distress. Personality traits may influence both non-adherence and distress. I examined sensation seeking (SS), anxiety sensitivity (AS), impulsivity, and hopelessness as traits potentially associated with non-adherence and distress in response to COVID-19. Furthermore, I sought to understand if known sex differences in SS (male>female) and AS (female>male) may explain sex differences on these two COVID-19 outcomes. In the first month of the pandemic, 400 adults (mean age=32.16 years; 45.3%F) completed the Substance Use Risk Profile Scale to assess personality. Degree of adherence to public health recommendations and COVID-19-related distress were also measured. Male sex was indirectly related to poorer adherence to stay-at-home advisories via SS, and female sex was indirectly related to higher COVID-19 distress via AS. Personality-targeted interventions may help reduce non-adherence and COVID-19 distress, potentially reducing sex differences.

Keywords: COVID-19, pandemic, non-adherence, distress, anxiety sensitivity, sensation seeking, impulsivity, sex differences

LIST OF ABBREVIATIONS AND SYMBOLS USED

α	Cronbach's Alpha
AS	Anxiety sensitivity
ASI	Anxiety Sensitivity Index
ASI-3	Anxiety Sensitivity Index 3
CBT	Cognitive Behavioral Therapy
CDC	Centre for Disease Control
CFI	Comparative Fit Index
CI	Confidence Interval
COVID-19	Coronavirus disease of 2019
CSS	COVID-19 Stress Scale
CTV	Canadian Television Network
F	Female
H1	Hypothesis 1
H2	Hypothesis 2
HOP	Hopelessness
IMP	Impulsivity
M	Mean
N	Sample size
RMSEA	Root mean square error of approximation
SD	Standard deviation
SRMR	Standardized root mean residual

SS	Sensation seeking
SURPS	Substance Use Risk Profile Scale
US	United States
WHO	World Health Organization

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CHAPTER 1. GENERAL INTRODUCTION

The novel coronavirus (COVID-19) outbreak began in Wuhan, China, in December 2019. Within a matter of months, the virus had rapidly spread across the globe. In March 2020, the outbreak had been declared a global pandemic by the World Health Organization with 118,000 confirmed cases of the virus reported worldwide (WHO, 2020). More than a year later, in June 2021, there have been 172 million cases of COVID-19 and 3.7 million deaths due to the deadly virus (Pettersson, Manley, & Hern, 2021). The COVID-19 pandemic has drastically changed the ways in which society functions and has altered the lives of countless individuals globally. The virus itself brings threat of severe illness or even death, as well as fears for the health and wellbeing of loved ones. Extreme strain has been placed on healthcare systems due to increased hospital admissions of individuals infected with COVID-19; individuals suspecting the presence of other illness are now hesitant to use primary care for fear of contracting COVID-19, perhaps allowing their conditions to worsen without medical attention (Wright et al., 2020). Present and future consequences also loom due to the public health measures imposed to reduce the spread of COVID-19. For example, school closures may have profound impacts on the education of children (Kuhfeld et al., 2020), as well as their physical and mental health (Hoffman & Miller, 2020); job insecurity and mass company closures bring potential or actual loss of income (Nicola et al., 2020); even fears about a lack of access to necessities have occurred during the pandemic, as shortages of medical supplies (Khot, 2020) and food supplies (Barman, Das, & Kanti De, 2021) have occurred as a result of supply chain interruptions.

Indeed, given the ease with which COVID-19 and its variants can spread, several public health and safety measures have been taken up in jurisdictions across the globe. At the pandemic onset, state of emergency declarations, stay-at-home orders, non-essential business closures, social distancing guidelines, and hand sanitizing were implemented as the primary means for reducing viral spread (CDC, 2020). A few months into the pandemic, mask-wearing was endorsed, with emphasis on the use of medical masks or reusable cloth masks with proper filters and fit. Masks are effective at reducing the risk of both contracting and spreading COVID-19 (Government of Canada, 2020). Most recently, vaccinations have been developed as the primary means of protection against COVID-19. While no vaccinations are 100% effective, researchers and the Centers for Disease Control and Prevention (CDC) report the Pfizer-BioNTech and Moderna COVID-19 vaccines as 82% effective against COVID-19 after the first dose and 94% effective after receiving the second dose (CDC, 2021; Pilishvili, 2021).

Despite the necessity of these public health measures, ‘pandemic fatigue’, or a demotivation to follow preventative COVID-19 protocols, such as social distancing, has increased among the general public (WHO, 2020) and as a result, some are not adhering to these protocols (iCare Study, 2020). Moreover, Canadians have reported a decline in mental health (i.e., increased anxiety, stress, depression) since public health measures began (Statistics Canada, 2020; Warren et al., 2021). This decline in mental health is reflected in the results of a recent study demonstrating increased frequency of use of acute mental health care services, particularly among those aged 30-40 years (Nejati et al., 2021), as well as an increase in demand for general mental health services for youth and women (Canadian Press, 2021). Indeed, while the pandemic has had negative

consequences across multiple facets of life (Galea, Merchant, & Lurie, 2020), too little adherence or too much distress in response to the COVID-19 pandemic and its associated health protocols are considered maladaptive (Taylor et al., 2020) for reasons covered in the following sections. It is important to note that I refer to these two maladaptive responses as "COVID-19 adherence" and "COVID-19 distress", respectively, which should not be confused with non-adherence to measures used to recover from personal COVID-19 infection or to distress about actually being infected with COVID-19.

Maladaptive Responses to COVID-19

Despite the dangers to the self and others associated with COVID-19, 20% of adults worldwide chose not to adhere to social distancing guidelines during the peak of the pandemic in March 2020, with more and more adults not adhering as the pandemic continued (iCare Study, 2020). This statistic is troubling, particularly when considering the consequences of non-adherence. For example, a simulation model run by Alagoz and colleagues (2021) showed that the implementation of social distancing guidelines a week prior to when they actually were instated in New York City (March 4th, 2020) would have reduced the total number of cases by over 150,000 by May 31st. Furthermore, an additional one-week delay in social distancing would have increased cases by 1.2 million in that same timeframe. Indeed, it is evident that maladaptive behaviors such as non-adherence increase the risk of contracting COVID-19, as well as spreading the virus. In addition, contracting COVID-19 may lead to severe negative outcomes such as over-burdening health care systems and unnecessary COVID-19 related deaths.

Another dimension of maladaptive responses to COVID-19 is psychological distress (i.e., anxiety, depression, stress; Taylor, 2019). For example, an observational

study during the early months of the pandemic indicated university students experienced an increase in anxiety, depression, suicidal thoughts, and suicidal intent (Kaparounaki et al., 2020). Reactions of distress in the context of COVID-19 may come as a response to the pandemic itself; the virus looming and threatening the health and safety of the individual and their loved ones can lead to this increase in distress. Alternatively, or in addition, distress may increase as a result of the social isolation that accompanies the COVID-19 health protocols and containment measures. Recent research has summarized many of the sources of distress in response to the pandemic. Firstly, many individuals experience distress in response to the pandemic due to fears of contamination and the dangers of COVID-19 (Taylor et al., 2020) as well as concerns about the pandemic exerting its effects on the way society functions. Specifically, many view the COVID-19 pandemic as a pervasive existential threat. People may also feel threatened by an increase in occupational hazards due to the risk of contracting the virus, and by the risk of socio-economic hardship and unemployment as the pandemic persists (Coelho, Suttiwan, Arato, & Zsido, 2020). Pre-existing psychological issues may also exacerbate general worry about the pandemic, creating excessive levels of psychological distress (Asmundson et al., 2020). Indeed, excessive psychological distress in response to the COVID-19 pandemic may be maladaptive.

Substance use may also be considered a maladaptive reaction to COVID-19, particularly when substance use behaviors increase or are initiated due to the pandemic and its associated public health orders (i.e., lockdown). For example, Sharma and colleagues (2020) identified an increase in alcohol use among nearly 70% of young adults (18 -25) surveyed. Furthermore, this change was most prominent among those who

reported increased loneliness, depression, and anxiety (Sharma et al., 2020). Similarly, a study by Rogers, Shepherd, Garey, and Zvolensky (2020) found COVID-19 related worry was associated with substance use coping motives; this effect was strongest among those who had initiated substance use during COVID-19. Other studies in the context of COVID-19 have found similar results – for example, a study by Rodriguez, Litt, and Stewart (2020) found that women experiencing high psychological distress in response to the pandemic were drinking more than women with less psychological distress, suggesting that women, in particular, are drinking to cope with COVID-19 related distress. Even in the case of cannabis use, prospective research suggests that facets of psychological distress (i.e., depression and social isolation) predict increased cannabis use during the pandemic (Bartel, Sherry, & Stewart, 2020). Furthermore, Taylor and colleagues (2021) identified that both COVID-19 related worry/fear, as well as non-adherence to health protocols (e.g., social distancing) were related to substance abuse, with the first a theoretical cause of substance abuse and the latter a theoretical consequence of substance intoxication. Indeed, it is evident that substance use and abuse have increased following the onset of the COVID-19 pandemic, at least in certain subgroups, and this change is associated with other maladaptive responses to COVID-19, such as non-adherence to health protocols and COVID-19 related distress.

Other research has found social factors to be related to COVID-19 stress and fear. Specifically, research by Ahuja and colleagues (2020) suggests those high in COVID-19-related xenophobia (i.e., blaming foreign groups (e.g., Asians) for the spread of COVID-19) predicted low wellbeing during the pandemic. In the same study, collectivism (i.e., belongingness and strong social connections) acted as a buffer against COVID-19 stress

(Ahuja et al., 2020). These findings are interesting to consider, as extant research conflicts as to whether xenophobia is related to general low wellbeing (Sirgy et al., 2019) or whether placing blame on others serves as a means of maintaining a feeling of control during a devastating pandemic (Nelkin & Gilman, 1988).

Overall, the COVID-19 pandemic has brought uncertainty and threat into the lives of many. In combination with exacerbating economic, psychological, social, and health-related factors, excessive reactions of psychological distress may arise in response to the pandemic (Taylor et al., 2020).

Predictors of Non-Adherence

It is important to distinguish between two related constructs of adherence and compliance. Adherence will be discussed in the context of the present thesis as a willingness to follow public health measures. In contrast, compliance refers to a more passive behavior of obeying such measures; compliance is not the focus of the present thesis. Recent research has identified several predictors of non-adherence in the context of COVID-19 containment strategies. Specifically, political affiliation, age, personality, and sex are the factors most frequently associated with non-adherence in the context of the COVID-19 pandemic.

First, political affiliation may influence non-adherence behaviors. Barbieri and Bonini (2021) identified those belonging to extreme right-wing political parties as showing low rates of adherence to public health measures enforced by the Italian government. The effect of political group differences in adherence to public health measures was replicated by Gollwitzer and colleagues (2020) in an American sample; findings showed those who voted for Donald Trump (Republican) in the 2016 election

were 14% less likely to physically distance from others between March and May 2020 in comparison to those who voted for Hillary Clinton (Democrat). Furthermore, regular viewing of the right-wing Fox News outlet was related to lower adherence to social distancing guidelines (Gollwitzer et al., 2020). Gratz et al. (2021) did not replicate the difference in adherence between political parties but identified COVID-19-specific pseudoscientific beliefs (i.e., "wearing face masks can lead to serious health problems") as related to low levels of adherence to social distancing protocols (Gratz et al., 2021). Further, with Fox News having reported pseudoscientific claims related to COVID-19 in the past (Scheirer, 2020), this suggests a link between exposure to pseudoscientific material in the media, conservative political affiliations, and lack of adherence to COVID-19 health protocols.

Second, age has been reported as a predictor of non-adherence in the context of COVID-19. Specifically, research has found that adolescents and young adults are more likely than other age groups to disregard social distancing guidelines (Coroiu, Moran, Campbell, & Geller, 2020; Nivette et al., 2021; Park et al., 2020). Further research identified that in a sample of US college students experiencing COVID-19 symptoms, only 46% decided to stay home and less than 5% of those individuals decided to get tested for COVID-19 (Cohen, Hoyt, & Dull, 2020). These high rates of non-adherence occur despite the high levels of COVID-19-related distress documented among university students (e.g., Kaparounaki et al., 2020). While young age is clearly related to non-adherence to both social distancing and isolation/stay-at-home protocols, Nivette and colleagues (2021) found that other characteristics, such as personality factors and

demographic characteristics (e.g., gender), in combination with young age, are influencing non-adherence behaviors.

Third, the presence of certain personality factors appears to have a robust effect on adherence behaviors. Indeed, while some studies have examined personality traits associated with prosocial behavior as a predictor of adhering to health protocols (Han, 2021; O'Brien, Tourigny, & Manser Payne, 2021), others have examined the traits which are related to non-adherence behaviors. For example, Nivette and colleagues (2021) found non-adherence was more prominent among those with 'anti-social potential', meaning low scores on indices of shame, acceptance of moral rules, and self-control, as well as high engagement in delinquent behaviors (Nivette et al., 2021). Similarly, Nowak and colleagues (2020) identified those high in "dark triad" personality traits (psychopathy, narcissism, Machiavellianism; characterized as impulsive, risk-taking, and self-interested individuals) as less likely to engage in preventative COVID-19 behaviors. Interestingly, Taylor and colleagues (2020) identified too little anxiety as a predictor of non-adherence to public health and safety measures, which falls in line with prior findings on low anxiety being a predictor of risk-taking behaviors (Giorgetta et al., 2012). Indeed, these researchers reported that "under-responders" (individuals with low fear/anxiety about COVID-19) were more likely to disregard social distancing measures. This effect was strongest among those with a robust belief in their own health. Individuals with these traits did not adhere to public health measures due to an unrealistic expectation of invincibility against COVID-19 (Taylor et al., 2020).

Fourth, there is an apparent difference in adherence to COVID-19 protocols between the sexes. For example, males have a higher COVID-19 mortality rate in

comparison to females (Jin et al., 2020) with some suggesting that poor compliance with public health measures may help explain this disparity (Reeves & Ford, 2020). To corroborate this claim, a longitudinal cohort study based in Switzerland found males were more non-adherent than females to public health measures (Nivette et al., 2021). This sex difference was found to be particularly prominent among non-migrant males with higher education and higher socio-economic status (Nivette et al., 2021). Similarly, Coroiu et al. (2020), as well as Park et al. (2020), also reported males as less adherent to social distancing guidelines compared to females.

It is evident that males are not adhering to COVID-19 health protocols as often as their female counterparts. Males' poor adherence to COVID-19 safety protocols may be detrimental to the physical wellbeing of themselves and others as the pandemic continues, since non-adherence puts not only themselves at risk of contracting the deadly virus, but others as well since their non-adherence can contribute to viral spread. Indeed, while sex and personality both seem to influence non-adherence behaviors in the context of COVID-19, no research has yet considered if known sex differences personality may help explain the above-described sex differences in non-adherence behaviors.

Predictors of COVID-19 Related Distress

While not everyone experiences heightened distress in response to the COVID-19 pandemic or pandemic containment measures, some individuals do (Xiong et al., 2020). Recent research has identified several demographic and psychological variables that have been associated with pandemic-related distress. These include: the presence of pre-existing mental health conditions, age, sex, anxiety-related factors, and personality.

Perhaps unsurprisingly, pre-existing mental health issues are known predictors of pandemic-related distress. For example, a recent review aimed to examine the effects of pre-existing psychiatric disorder across both past pandemics and the recent COVID-19 pandemic. The review showed those with pre-existing mental health issues experienced an increase in mental health symptoms (i.e., depression, anxiety) during pandemic-times, in addition to increased hospitalizations during this period (Neelam et al., 2021). Furthermore, research during the COVID-19 pandemic found that past-year mental health issues predicted elevated COVID-19 related distress and high distress during social isolation, although such effects were small (Taylor et al., 2020). Similarly, Asmundson et al. (2020) found those with pre-existing anxiety and mood disorders scored higher on indices of COVID-19 related stress and traumatic stress symptoms in comparison to those without a mental illness. These findings demonstrate that, for those already suffering from a mental health issue or factors that predispose to a mental health issue, better strategies for coping during the pandemic are needed to reduce excessive psychological distress.

Younger age has also been shown to be a risk factor for increased COVID-19 related distress. Specifically, young Canadians (aged 15 – 30) have reported they are extremely concerned about COVID-19 (Statistics Canada, 2020). Relatedly, young Canadians have also reported poorer mental health during the COVID-19 pandemic in comparison to their pre-pandemic mental health (Findlay, Arim & Kohen, 2020). This finding has been replicated across a number of COVID-19 studies; Park and colleagues (2020), Glowacz and Schmits (2020), Huang and Zhao (2020), and Varma, Junge, Meaklim, and Jackson (2021) all report younger age as predictive of increased COVID-

19 distress. Glowacz and Schmits (2020) suggest this finding may be due to higher intolerance of uncertainty, higher consumption of digital media related to COVID-19, or perhaps higher levels of alcohol consumption. Chronic heavy drinking can worsen distress in the long run according to pre-pandemic studies (Bell & Britton, 2014) although this has yet to be studied in the context of the pandemic. Huang and Zhao (2020) suggest that younger individuals may be ruminating more on the COVID-19 outbreak, leading to poor mental health. Indeed, it is evident that younger individuals are more vulnerable to experiencing an increase in psychological distress as a result of COVID-19.

In addition to the above-described characteristics, anxiety-related risk factors may also account for COVID-19 related distress. For example, Heffner, Vives, and Feldmanhall (2021) found high trait anxiety was the strongest predictor of emotional distress during the pandemic, almost three times more predictive than 30 other variables thought to influence COVID-19 distress; female gender was the second most predictive variable. Moreover, pre-existing poor emotion regulation strategies (a risk for anxiety and other psychiatric symptoms; Berking & Wupperman, 2012) have been shown to be associated with greater distress during the pandemic (which was more prevalent among women in this sample), as predicted using a machine learning algorithm (Prout et al., 2020). Furthermore, certain indices of personality related to anxiety have also been shown to predict pandemic-related distress. Specifically, anxiety sensitivity (i.e., a fear of anxiety-related sensations; Woicik et al., 2009) was linked with an increase in pandemic-related distress in the context of the Ebola pandemic (Blakey et al., 2015). This may have been due to the high levels of vigilance toward bodily sensations characteristic of high

anxiety sensitive individuals (Zvolensky & Forsyth, 2002). Specifically, individuals high in anxiety sensitivity react anxiously to benign somatic sensations – perhaps associating them with the development of COVID-19 (Blakey et al., 2015). Increased fear of contracting COVID-19 among those high in anxiety sensitivity has been reported elsewhere; McKay, Yang, Elhai, and Asmundson (2020) found anxiety sensitivity to be associated with increased levels of fear of contracting the virus. This result was further supported by Warren and colleagues (2021), who found high anxiety sensitivity to be associated with a stronger fear of COVID-19 as well as with higher levels of anxiety and depression in the context of the COVID-19 pandemic. Similarly, results of an Argentinian study identified anxiety sensitivity as a vulnerability factor for COVID-19 mental health issues (Rogers et al., 2021). Indeed, anxiety-related factors, and largely the personality trait of anxiety sensitivity, seems to influence COVID-19 related stress, fear, and resulting poor mental health. Interestingly, only two of the above-referenced studies on personality-related risk (Heffner et al., 2021; Prout et al., 2020) examined the role of gender in predicting COVID-19-related distress.

Nonetheless, recent research has demonstrated a sex difference in experiencing COVID-19 related distress. Specifically, females are responding to the pandemic and its associated public health measures with increased psychological distress relative to males. This includes increased symptoms of post-traumatic stress (Liu et al., 2020), heightened symptoms of anxiety, as well as worsened mental health in comparison to their pre-pandemic mental health (Statistics Canada, 2020). Previous research identified females as more reliant than males on their social networks, particularly in times of stress (Taylor et al., 2000). Obtaining social support during the pandemic has become more difficult due

to COVID-19 stay-at-home orders and isolation protocols. Without usual in-person access to their social network, females may experience an increase in distress if they are adhering to public health measures. To corroborate this claim, Statistics Canada (2020) found that females were more likely than males to report worse mental health since social distancing protocols began. A systematic review by Xiong and colleagues (2020) further supports this claim, as several studies examined within the review identified females as more vulnerable to excessive psychological distress in response to the COVID-19 pandemic. The authors suggest this sex difference in distress may be due to a higher percentage of females than males employed in front-line positions which are negatively impacted by the pandemic, such as retail and healthcare services. Females may also have an increased care burden in the home, with one study showing that females in particular experience greater family interference with work when homeschooling children in comparison to their male counterparts (Desroches et al., in press). Indeed, with household and child-related duties increasing during stay-at-home orders, psychological distress experienced by females during the pandemic may be exacerbated (Park et al., 2020; Xiong et al., 2020).

Indeed, females are disproportionately experiencing excessive psychological distress in response to COVID-19 in comparison to males. Furthermore, the presence of anxiety-related personality factors, such as anxiety sensitivity, and demographics, such as young age, may exacerbate these responses and influence the emotional wellbeing of these individuals during pandemic-times. However, research has not yet considered the degree to which sex differences in pandemic-related distress might be explained by sex differences in personality.

The Four-Factor Vulnerability Model

The four-factor vulnerability model for substance misuse (Conrod, Pihl, Stewart, & Dongier, 2000) may be a useful model for understanding individual differences in maladaptive responses to the pandemic, including both non-adherence and distress. This model identifies four factors of personality as relevant in engaging in addictive behaviors, such as gambling or substance misuse (Conrod et al., 2000). Impulsivity (i.e., acting without forethought), sensation seeking (i.e., preference for new and exciting experiences), anxiety sensitivity (i.e., fear of anxiety-related sensations), and hopelessness (i.e., depression-proneness) are all thought to act as vulnerabilities to addictive behaviors. While this framework was initially adopted to examine vulnerability to substance misuse behaviors, the above-listed personality traits may also be useful in examining maladaptive responses to the COVID-19 pandemic, as described below.

Individuals high in impulsivity are likely to act without thinking when presented with immediate rewards, even if negative consequences are associated with the behavior in the longer term (Woicik et al., 2009). Impulsivity has been shown to be related to non-adherence behaviors during the pandemic (Nivette et al., 2021), reflective of impulsive individuals not suppressing their responses to immediate rewards, like social contact, despite knowing the consequences could be deadly. Further, impulsivity may be related to distress during the pandemic. A study by Gecaite-Stonciene and colleagues (2021) found impulsivity mediated the relationship between problematic internet use and pandemic-related distress (i.e., symptoms of depression and anxiety). In addition, impulsive purchasing of necessities during the COVID-19 pandemic is associated with low emotional stability and negative affect (Garbe, Rau, & Toppe, 2020). Furthermore,

impulse-buying has been associated with a strong belief that COVID-19 is severe and pervasive (Deng et al., 2020).

The four-factor vulnerability framework has linked the sensation seeking trait to risk-taking behaviors, such as shoplifting or driving under the influence (Woicik et al., 2009). In the context of a pandemic, risk-taking behaviors could include non-adherence to social distancing and stay-at-home advisories, as such non-adherence behaviors are "risky" in that they increase the likelihood of contracting or spreading COVID-19. This claim falls in line with research by Nowak et al. (2020), who identified those high in "dark triad" traits as less likely to adhere to public health measures; these individuals are typically described as risk-takers (Nowak et al., 2020). Similarly, Galasso and colleagues (2020) also identified low risk-aversion as a factor reducing one's willingness to take part in public health measures. Furthermore, individuals high in sensation seeking are known to seek out risky and exciting experiences that would cause nervousness or anxiety in most (Woicik et al., 2009). Taylor and colleagues (2020) characterized those less likely to adhere to social distancing as low in anxiety and having a robust belief in their health, which is in line with the personality of a sensation seeker, who take risks with less regard for their wellbeing in comparison to an individual low in sensation seeking. Indeed, it seems plausible that the traits identified by various researchers as associated with non-adherence to COVID-19 protocols could be related to the sensation seeking trait, although this remains to be directly tested.

Those high in the trait of anxiety sensitivity are prone to interpreting benign bodily sensations through a lens of anxiety. As some symptoms of COVID-19 have been shown to have similarities to certain anxiety-related symptoms, such as pressure on the

chest and shortness of breath (CDC, 2020), perhaps individuals high in anxiety sensitivity would be more apt to interpret those sensations as signs of having contracted COVID-19. Indeed, the Anxiety Sensitivity Index 3 (ASI-3; Taylor et al., 2007) assesses anxiety sensitivity across three dimensions: physical (i.e., fear that physical anxiety-related sensations will lead to adverse somatic consequences), cognitive (i.e., fears that cognitive-related difficulties will lead to insanity), and social (i.e., fears that displays of anxiety will lead to social embarrassment) concerns (Taylor et al., 2007). The physical concerns subscale seems particularly relevant during the COVID-19 pandemic. This is substantiated by Warren et al. (2021) who found an increase in anxiety sensitivity physical concerns of one standard deviation unit was associated with a 93% increase in risk of reaching high (i.e., clinically significant) levels of COVID-19 fear. Furthermore, this four-factor vulnerability model has shown that those high in anxiety sensitivity are also more prone than others to experiencing general anxiety and depression in non-pandemic times (Woicik et al., 2009). Indeed, it is likely that anxiety sensitivity continues to act as an influencing factor for excessive psychological distress during the COVID-19 pandemic. As mentioned earlier, while past research has linked anxiety sensitivity to psychological distress during the Ebola pandemic (Blakey et al., 2015), this relationship between anxiety sensitivity and distress has also been found in relation to the COVID-19 pandemic as well (McKay et al., 2020; Warren et al., 2021).

Finally, individuals high in the hopelessness personality trait have low optimism about themselves and their future, generally poor mood, and feel unable to change their apparent bleak future ahead (Woicik et al., 2009). Hopelessness may relate to non-adherence behaviors during the pandemic, perhaps through apathy associated with little

hope for current conditions of the pandemic to improve. Hopelessness may also be related to pandemic-related distress, as individuals high in hopelessness may also be prone to depression (Abramson, Metalsky, & Alloy, 1989; Conrod, Pihl, Stewart, & Dongier, 2000) and panic (Conrod et al., 2000) – mental health conditions that can exacerbate pandemic-related distress.

While all four traits in the above-described four-factor personality vulnerability framework (Woicik et al., 2019) may be theoretically related to non-adherence and/or psychological distress in the context of the COVID-19 pandemic, sensation seeking and anxiety sensitivity seem to be most related to these outcomes in terms of theory and evidence, respectively. Furthermore, sex differences exist in these personality traits which may contribute to the known sex differences in non-adherence and psychological distress in response to COVID-19, described above.

Sex Differences in Personality

As previously described, non-adherence behaviors and excessive psychological distress are considered maladaptive reactions to the pandemic (Taylor et al., 2020). Further, as described earlier, sex differences in these responses to the COVID-19 pandemic have been found in recent research. Specifically, males are more likely than females to disregard public health measures (Coroiu et al., 2020; Nivette et al., 2021) such as social distancing (Litton et al., 2020), possibly accounting for males' high COVID-19 mortality (Reeves & Ford, 2020). Conversely, psychological distress is greater among females, both in response to the pandemic generally (Liu et al., 2020; Xiong et al., 2020) and in response to public health measures for pandemic containment (Statistics Canada, 2020).

Interestingly, these sex differences in responses to COVID-19 are mirrored in the personality traits of sensation seeking and anxiety sensitivity, respectively. Specifically, a review by Cross, Cyrenne, and Brown (2013) compiled data demonstrating that men are typically higher in the sensation seeking trait compared to women. This finding has been replicated across populations, as studies with samples based in China, the US, Canada, Europe, and Australia all find males score higher on various indices of sensation seeking compared to females (Cross et al., 2013). Hypothesized reasons for this sex difference point to sensation seeking as a possible evolutionary advantage for mating, or as a result of societal gender stereotypes (Cross et al., 2013). With males scoring higher on indices of sensation seeking, and males' greater risk-taking behaviors possibly accounting for their greater non-adherence to public health guidelines, sensation seeking should be examined as a mediating (i.e., intervening and explanatory) factor when considering sex differences in non-adherence behaviors during the COVID-19 pandemic.

Furthermore, pre-pandemic research has found females to consistently score higher on indices of anxiety sensitivity (Bernstein et al., 2006; Deacon, Abramowitz, Woods, & Tolin, 2003). Using the Anxiety Sensitivity Index (ASI), Stewart, Taylor, and Baker (1997) identified that females differed in anxiety sensitivity in comparison to men, with females scoring significantly higher on the global construct of anxiety sensitivity as well as the physical concerns facet of anxiety sensitivity when compared to men (Stewart et al., 1997). Indeed, with females scoring higher on anxiety sensitivity, a trait known to contribute to psychological distress during pandemic times (Blakey et al., 2015; Rogers et al., 2021) it is possible that sex differences in anxiety sensitivity may mediate (intervene

and explain) the relationship between female sex and elevated psychological distress in response to COVID-19 and its containment.

Overall then, these known sex differences in personality may act as mediating factors in helping to understand why the sexes differ in their tendencies to choose not to adhere to public safety measures and in their tendencies to experience psychological distress in response to the pandemic and measures to contain it. This points to the importance of examining the influence of personality in explaining sex differences in maladaptive COVID-19 related outcomes from within the framework of the four-factor personality vulnerability model (Woicik et al., 2009).

The Present Study

This thesis sought to examine whether known sex differences in personality may help explain why females and males differ in their maladaptive responses to COVID-19 and its associated public health measures. It is important here to consider the differences in meaning of the constructs of sex and gender. Sex refers to one's biological endowment (or one's sex assigned at birth) and is typically considered a binary construct (male or female). In contrast, gender refers to one's perceived sense of identity which may or may not match with one's biological endowment; gender is typically considered as a non-binary construct (i.e., man, woman, or other gender identity such as non-binary, transgender, two-spirited, etc.). While some of the studies cited within this thesis examine gender differences (as opposed to sex differences) in response to COVID-19, they have been interpreted as relevant in understanding sex differences as well.[1] While sex and

[1] In the present thesis, women were considered equal to female and men were considered equal to male when no information or analyses relevant to biological sex were included in research cited. In addition, genders apart from men and women were not considered as so little research has examined these groups in relation to COVID-19 distress and non-adherence behaviors.

gender are not always matched, teasing apart sex and gender effects on COVID-19 outcomes go beyond the scope of this thesis and are an important future area of enquiry.

To examine whether sex differences in personality might help explain sex differences in maladaptive COVID-19 outcomes, my thesis assessed the roles of personality traits (sensation seeking and anxiety sensitivity, in particular) as potential mediators between sex (male vs. female) and reactions to the COVID-19 pandemic (non-adherence and psychological distress, respectively). Firstly, I hypothesized that higher levels of sensation seeking would help explain the relationship between male (vs. female) sex and greater non-adherence to COVID-19 health protocols. Secondly, I hypothesized that higher levels of anxiety sensitivity would help explain the relationship between female (vs. male) sex and greater COVID-19-related psychological distress. I reasoned that if my hypotheses were supported, my thesis would replicate known sex differences in the personality traits of anxiety sensitivity and sensation seeking (Cross et al., 2013; Stewart et al., 1997) as well as sex differences in COVID-19 outcomes (Liu et al., 2020; Nivette et al., 2021; Statistics Canada, 2020). Furthermore, my study would provide a novel extension of those prior results by identifying these traits as helping account for sex differences in psychological distress in response to COVID-19 and in non-adherence to public health guidelines. Such results would lend an improved understanding of the processes by which one's sex may influence maladaptive reactions to the COVID-19 pandemic, and to its associated public health viral containment measures.

Gaining a clearer understanding of how sex and personality exert their effects on responses to the pandemic is crucial for developing interventions which may reduce these harmful behaviors, particularly during pandemic-times when such behaviors can have

far-reaching and serious effects. One example of an effective intervention may be Preventure, a CBT-based personality targeted intervention associated with the four-factor vulnerability model used in the present study (Woicik et al., 2009). While Preventure was designed to target substance misuse, the program has shown efficacy in reducing risk-taking behaviors and distress (see review by Conrod, 2016). Thus, the program may be suitable for targeting the problematic and risky behavior of non-adherence to COVID-19 protocols and excessive reactions of distress in response to such protocols. Indeed, by gaining an understanding of the personality factors underlying such reactions to the pandemic in the present study, future intervention research could aim to target the mechanisms of underlying personality mediators to reduce maladaptive reactions to the COVID-19 pandemic, particularly the high levels of non-adherence shown by males and the high levels of pandemic-related distress shown by females.

CHAPTER 2. SEX DIFFERENCES IN MALADAPTIVE EMOTIONAL AND BEHAVIORAL RESPONSES TO COVID-19: WHAT IS THE ROLE OF PERSONALITY?

The manuscript on which this thesis is based appears in this chapter. Readers are advised that Sarah DeGrace, under the supervision of Dr. Sherry Stewart, was responsible for preparing the initial draft of the manuscript, incorporating feedback from her co-authors, and preparing the manuscript for submission. The manuscript underwent peer review at *Personality and Individual Differences*. Sarah incorporated suggested revisions from the reviewers with guidance from Dr. Sherry Stewart and her coauthors. The manuscript was accepted for publication on March 16th, 2021 and published on March 30th, 2021. Copyright permissions from the publisher to include this paper in this thesis are included in Appendix A. The full reference is as follows: DeGrace, S., Baptist-Mohseni, N., Single, A., Keough, M. T., Wardell, J. D., & Stewart, S. H. (2021). Sex differences in maladaptive emotional and behavioral responses to COVID-19: What is the role of personality? *Personality and Individual Differences, 178.* doi:10.1016/j.paid.2021.110834

Introduction

There are two general types of maladaptive emotional/behavioral reactions to the deadly COVID-19 pandemic. On one extreme are failures to adhere to public health guidelines for preventing viral spread, and on the other are excessive distress reactions to the pandemic.

To reduce spread of COVID-19, governments have instated several public health measures. As effective preventative measures against the coronavirus (CDC, 2020), social distancing and stay-at-home advisories were widely implemented as the main containment strategies early in the pandemic. Nearly 20% of adults worldwide were non-adherent during April 2020 (Lavoie, 2020), heightening their risk of contracting/spreading COVID-19. At the other end of the continuum are those who experience severe pandemic-related distress (Taylor, 2019). Both personality and sex appear to play a role in the degree of these reactions to pandemics (Taylor, 2019).

Males straggle behind females in taking up social distancing measures (Litton, 2020). Males' poorer adherence to public health containment measures may help explain their higher COVID-19 mortality (Reeves & Ford, 2020). Conversely, females are experiencing greater COVID-19-related distress (Liu et al., 2020).

Two traits may be useful in understanding these variable reactions to the pandemic: sensation seeking (SS; preference for novelty) and anxiety sensitivity (AS; fear of anxiety). SS has been consistently linked to risk-taking (e.g., driving under the influence, shoplifting; Woicik et al., 2009) suggesting it may be related to risky non-adherence to public health guidelines. AS may be relevant to understanding excessive pandemic-related distress. AS is associated with elevated anxiety in non-pandemic times

and specifically linked with Ebola pandemic-related distress (Blakey et al., 2015). Research has demonstrated sex differences in these traits: males score higher in SS (Cross et al., 2013), females higher in AS (Stewart et al., 1997).

I aimed to understand whether sex differences in SS and AS help explain sex differences in COVID-19-related non-adherence and distress. While recent research has implicated both sex (Volk et al., 2021) and personality (Nowak et al., 2020) as individual contributors, no studies have yet examined how sex and personality may work together to contribute to maladaptive responses to COVID-19. Examining the relations of sex to non-adherence and distress through personality advances the extant literature by providing mechanisms to help explain previously reported sex differences in these important pandemic responses. These are important questions for determining appropriate intervention targets for increasing adherence to public health viral containment measures, particularly in males, and for reducing excessive pandemic-related distress, especially in females. I hypothesized significant indirect effects of male sex on two indices of non-adherence through SS [H1], and significant indirect effects of female sex on two indices of COVID-19-related distress through AS [H2].

Participants and Procedure

400 Canadian adults (45.3%F (n=181); *M* age=*32.16* years, range=18-74, *SD=9.53*) were recruited via Prolific, a survey website, between April 30-May 4, 2020. They completed measures online. My data were collected as part of a larger study (Wardell et al., 2020); only measures relevant to the current sub-study are described.

Materials

Demographics.

Participants reported demographic information (e.g., sex, age).

Substance Use Risk Profile Scale (SURPS; Woicik et al., 2009).

The SURPS is a 23-item measure tapping four personality traits. Two were most relevant for the present study: SS (6 items; e.g., *I enjoy new and exciting experiences, even if they are unconventional*) and AS (5 items; e.g., *It frightens me when I feel my heartbeat change*). The other two traits were included as controls to ensure specificity of results to AS and SS: Impulsivity (IMP; 5 items; action without forethought; e.g., *I usually act without stopping to think*) and hopelessness (HOP; 7 items; depression-proneness; e.g., *I feel that I'm a failure*) since each of these could be related to non-adherence (IMP through acting without thinking; HOP through apathy) and distress (IMP through impulsive stockpiling; HOP through related mental health issues). The SURPS has excellent psychometric properties (Woicik et al., 2009); each scale showed adequate-to-good internal consistency (present sample α's=0.79-0.89).[2]

Non-Adherence.

Two questions (Appendix C) pertained to participants' non-adherence to stay-at-home and social distancing protocols, respectively, in the month since pandemic onset. The first asked: *"What sorts of things have you left your residence for?".* Participants indicated yes (=1) or no (=0) to leaving their home for 14 listed activities; 9 of these were deemed non-essential (*e.g., to visit friends who do not live with you*) by the research team and were summed (range=0-9). The second asked: *"How often have you engaged in a social activity that involved going within 2 meters of someone you did not live with?"*.

[2] Information of the SURPS scoring can be found in Appendix B.

Response options ranged from *0=never* to *6=21+ times*[3]. Descriptions of the scoring methods for these questions are described in Appendix C.

COVID-19 Distress.

Two questions (Appendix C) pertained to participants' COVID-19-related distress ("*How anxious/worried does reading news or updates on the COVID-19 emergency make you feel?"; "In general, how worried are you about COVID-19?"), each answered on a 7-point scale (1=not at all; 7=extremely)* [4].

Data Analysis

Hypothesized models were tested using path modelling in MPlusV8 (Muthén & Muthén, 2017). In both models, sex was the predictor, and the four personality traits were correlated mediators. In Model 1, stay-at-home and social distancing compliance items were correlated non-adherence outcomes (Figure 1a). In Model 2, COVID-19 news anxiety and COVID-19 general anxiety were correlated distress outcomes (Figure 1b).

The following indices/cutoffs were used to assess model fit: comparative fit index (CFI) ≥ .95, root mean square error of approximation (RMSEA) ≤ .06, and standardized root mean residual (SRMR) ≤ .08 (Hu & Bentler, 1999). Unstandardized coefficients with 95% confidence intervals (CIs) were used to assess pathways and indirect effects (Lambdin, 2012). Bias corrected bootstrapping (10,000 samples) was used. If the CIs did

[3] While these items were author-compiled at the onset of the pandemic, they show similarity to validated COVID-19 non-adherence measures (e.g., Taylor et al., 2021) and were significantly intercorrelated (r=.36, p<.01), suggesting face and construct validity, respectively.

[4] While these items were author-compiled at the onset of the pandemic, they show similarity to validated COVID-19-related distress measures (Taylor et al., 2021) and are significantly intercorrelated (r=.70, p<.01), suggesting face and construct validity, respectively.

not cross zero, then the pathways/indirect effects were considered significant (Fritz & MacKinnon, 2007).

Results

Descriptive statistics are shown in supplementary Table 1 (see Appendix D) as a function of sex. Female sex was associated with elevations on both distress measures and male sex with elevations on both non-adherence measures. SS levels were higher in males. AS levels were higher in females. No other demographic or personality measure varied by sex (see Appendix E for correlation matrix).

Model Results

Model 1 (Figure 1; see Appendix F) showed excellent fit: CFI=1.000; RMSEA=0.000 (95% CI [0.000, 0.088]); SRMR=0.008. Male sex was associated with higher SS, and female sex with higher AS. SS was positively associated with leaving home for non-essential reasons and IMP was positively associated with going within 6-feet of others. Partially consistent with H1, male sex was indirectly associated with more leaving home for non-essential reasons via higher SS levels (standardized estimate: -0.026; 95% CI [-0.049, -0.004]).

Model 2 (Figure 1; see Appendix G) showed excellent fit: CFI=0.997; RMSEA=0.040 (95% CI [0.000, 0.115]); SRMR=0.017. Sex differences in the personality mediators were as described for Model 1. AS was positively associated with news anxiety and overall COVID-19 anxiety. Consistent with H2, female sex was indirectly associated with more news anxiety and more COVID-19 anxiety via higher AS levels (standardized estimates: 0.050, 95% CI [0.017, 0.082]; 0.055, 95% CI [0.021,

0.088], respectively). No other personality-mediated pathways proved significant in either model.[5]

Discussion

Partially consistent with H1, my modelling suggested that males' higher levels of SS may help explain why males are less adherent to stay-at-home advisories. These findings replicate prior results that males are less adherent to public health protocols for reducing COVID-19 viral spread (Litton et al., 2020) and extend them by identifying a trait that may explain males' greater non-adherence. However, it was IMP rather than SS that was associated with more frequently going within 6-feet of others during the pandemic, and there was no indirect effect of sex on this non-adherence outcome via SS. Perhaps SS is associated with non-compliance with stay-at-home advisories given sensation seekers' high need for novelty and boredom-proneness (Woicik et al., 2009). It may be high IMP individuals, rather than high SS individuals, who have problems maintaining social distance due to their difficulties in inhibiting immediately rewarding behavior (Woicik et al., 2009) like close social contact.

Consistent with H2, my modelling suggested that females' higher levels of AS may help explain why females are more distressed in relation to news about COVID-19 and the COVID-19 pandemic more generally. These findings replicate prior results showing female sex to be a consistent predictor of pandemic-related distress (Taylor, 2019) and extend them by identifying a trait that may explain females' greater

[5]To examine the robustness of sex-related pathways to COVID-19 adherence (model 1) and distress (model 2), we ran supplementary models with other demographic covariates (age, employment status, student status, and pre-COVID-19 income). Inclusion of these covariates did not substantially change effects, supporting the main role of personality in explaining sex differences in COVID-19-related adherence and distress. Thus, for simplicity, we opted to present the original models in the text.

susceptibility to this distress. Consistent with research during the Ebola pandemic (Blakey et al., 2015), AS was associated with greater anxiety and worry in response to the COVID-19 pandemic. Individuals high in AS may misinterpret harmless physical sensations as related to the development of COVID-19, contributing to their heightened anxiety (Blakey et al., 2015). Indeed, AS may contribute to pandemic-related distress, given its role as an "anxiety-amplifying" factor (Taylor, 1999).

My study has extended previous literature by identifying a set of mediation models that may uniquely explain sex differences in COVID-19-related outcomes through personality mediators. However, my study has several potential limitations. First, the non-adherence and COVID-19 distress outcomes were assessed using single-item measures which can be prone to error, leading to potential underestimation of predictors'/mediators' relations with the outcomes. Moreover, this research took place at pandemic onset when validated scales measuring COVID-19 distress/non-adherence did not yet exist. Now that multi-item measures of each construct are emerging, future studies could replicate my preliminary results using validated non-adherence and distress outcome measures (e.g., Taylor et al., 2021). Second, my measure of adherence to stay-at-home advisories coded 'to pick up alcohol' as a non-essential reason for leaving the home; however, this activity may be essential for those with alcohol use disorders (i.e., to prevent serious outcomes like withdrawal related seizures). Third, the study was cross-sectional, which precluded drawing causal conclusions about my mediational findings. Longitudinal studies are necessary to confirm the hypothesized mediational processes over time. Fourth, I assessed sex differences. Future studies should examine gender roles given COVID-19-related distress may be more acceptable in women, and non-adherence

more acceptable in men, as fear/avoidance tends to be less accepted and bravado more expected in men (McLean & Anderson, 2009). Finally, I focused on following social distancing and stay-at-home advisories as the adherence measures of interest given the emphasis on these public health directives in April 2020. Future studies might incorporate subsequent public health measures like mask wearing or getting vaccinated.

Establishing AS and SS as possible mediating traits linking sex to maladaptive COVID-19-related responses has important clinical implications, since these traits can be effectively targeted in intervention. The CBT-based personality-targeted Preventure program, which targets traits including SS and AS, is effective in reducing risk-taking and general distress (see review by Conrod, 2016). Given its promise for reducing risky non-adherence and COVID-19-related distress, future trials could determine Preventure's efficacy on these COVID-relevant outcomes, and in reducing sex differences in non-adherence and COVID-19 distress.

CHAPTER 3: GENERAL DISCUSSION

My Masters' thesis represents the first study to assess personality traits as mediating variables in the relationship between sex and the COVID-19 pandemic-related outcomes of non-adherence and distress. Given the necessity of adhering to public safety measures to reduce the spread of COVID-19 (CDC, 2020) and the importance of reducing excessive psychological distress in response to the pandemic due to the expected negative impacts of these reactions (Galea et al., 2020), understanding how personality may explain the relationship between sex and maladaptive COVID-19 responses is crucial.

The results of my thesis study partially supported my hypotheses. Partially consistent with my first hypothesis, males showed greater non-adherence on one of my COVID-19 adherence outcomes. Specifically, males reported leaving their homes for non-essential reasons more often than females. Sex differences in this adherence behavior was accounted for by the personality factor of sensation seeking, which was higher in males than females in my sample. However, it was impulsivity, rather than sensation seeking, that was associated with a high frequency of going within 6 feet of others (i.e., not adhering to social distancing guidelines) with no effect of sex on this outcome through sensation seeking.

Consistent with my second hypothesis, compared to males, females scored higher on indices of anxiety sensitivity. Females also experienced greater COVID-19 distress in general, as well as greater distress in response to news about COVID-19, than males. These sex differences in COVID-19 distress were both explained through females' higher levels of anxiety sensitivity in tests of indirect effects.

Personality Mediation of the Relationship of Sex to Non-Adherence

Based on literature describing males as non-adherent to public health measures (Litton et al., 2020), non-adherent people as risk-taking (Nowak et al., 2020) and low in anxiety (Taylor et al., 2020), and males being high in the sensation seeking trait, characterized by risk-taking behaviors (Cross et al., 2013), I hypothesized that sensation seeking would act as a mediator in the expected relationship between male sex and non-adherence to public health COVID-19 containment protocols. Results partially supported this hypothesis with sensation seeking explaining the relationship between male sex and more frequent leaving the home for non-essential reasons during the pandemic (i.e., poorer adherence to stay-at-home advisories). These findings extend previous literature by identifying a specific trait, sensation seeking, which contributes to males being less likely than females to adhere to public health measures (Nivette et al., 2021). Sensation seekers have been described as boredom-prone with a high need to take part in new, exciting, and possibly risky experiences (Woicik et al., 2009). Staying home, even at the benefit of the community, may be difficult for those high in sensation seeking, who are typically low in risk-aversion (Galasso et al., 2020), a characteristic attributed to non-adherent individuals (Galasso et al., 2020).

Interestingly, the expected relationship between male sex and non-adherence to social distancing protocols (i.e., going within six feet of others) was not explained by males' high scores on indices of sensation seeking. Instead, the trait impulsivity was associated with non-adherence to social distancing; however, there was no sex difference in this trait. While this effect was not predicted, it falls in line with prior research on the COVID-19 pandemic. For example, Nivette and colleagues (2021) characterized those

who do not adhere to public health measures as low in self-control, in addition to several other characteristics. Furthermore, Nowak et al. (2020) identified impulsivity as a contributing factor in making up the "dark triad" personality traits, which were found to be related to non-adherence behaviors. Indeed, individuals high in the trait of impulsivity are known to have difficulty inhibiting any immediately rewarding behaviors (Woicik et al., 2009). Perhaps individuals high in impulsivity, rather than sensation seeking, are less likely to adhere to social distancing due to their responsivity to immediate rewards. In the context of the COVID-19 pandemic, rewards could refer to close social contact, or simply not waiting their turn to retrieve a desired item in a crowded grocery aisle, failing to inhibit behavior with possible negative consequences (i.e., contracting COVID-19).

Personality Mediation of the Relationship of Sex to COVID-19 Distress

Prior research has identified females as experiencing heightened and excessive pandemic-related distress in comparison to their male counterparts. This effect has been shown for prior pandemics (see review by Taylor, 2019) and the current COVID-19 pandemic (Liu et al., 2020; Statistics Canada, 2020). Furthermore, in both pandemic and non-pandemic times, the trait anxiety sensitivity has been associated with excessive distress and fear (Blakey et al., 2015; McKay et al., 2020; Woicik et al., 2009). This effect has been shown to be related to vigilance toward bodily sensations that are often interpreted by anxiety sensitive individuals as indicating the presence of potentially serious health conditions, and in the case of the pandemic, may be associated with the development of COVID-19 (Warren et al., 2021). Females typically score higher on indices of anxiety sensitivity compared to males (Stewart et al., 1997), furthering my reasoning for my hypothesis that anxiety sensitivity would act as a possible mediating

variable in the relationship between female sex and COVID-19 related psychological distress.

Results showed support for my second hypothesis: females experienced greater distress in response to news about COVID-19 and this sex difference was explained by females' higher anxiety sensitivity levels, in tests of indirect effects. This finding extends work summarized in a systematic review by Xiong and colleagues (2020), which identified frequent exposure to social media and news about COVID-19 as a factor contributing to psychological distress and anxiety symptoms, by showing who is most susceptible to this form of distress and why. The results of the present study also supported anxiety sensitivity as a mediator in explaining the relationship between female sex and greater COVID-19 related distress in general. This further corroborates prior findings that females experience greater pandemic-related distress overall compared to males (Statistics Canada 2020; Xiong et al., 2020) and identifies a trait, anxiety sensitivity, as an important influencing factor in this relationship. This also extends previous research describing anxiety sensitivity as a predictor of pandemic-related distress across pandemics (Blakey et al., 2015; McKay et al., 2020).

Clinical Implications

This research has extended previous literature by establishing anxiety sensitivity and sensation seeking as possible mediators in the relationship between sex and maladaptive COVID-19 responses. These results are important to consider for the development of clinical interventions which have potential to reduce maladaptive reactions to the pandemic. For example, the four-factor vulnerability model (Woicik et al., 2009) used in the present study underlies the rationale for Preventure, a CBT-based

personality-targeted program created to reduce addictive behaviors associated with four-factor personality traits, including anxiety sensitivity and sensation seeking (Conrod et al., 2006). While Preventure was designed to prevent or intervene early with substance misuse and was designed primarily for youth, the program has potential as an intervention which could target anxiety sensitivity and sensation seeking to reduce pandemic-related distress and non-adherence behaviors. A review by Conrod (2016) identified eight randomized trials which all report a consistent and moderate effect identifying Preventure as effective in reducing risk taking behaviors and general distress.

As Preventure is a CBT-based intervention, psychoeducation is typically the starting point of this program. Perhaps in the context of the pandemic, this psychoeducation could focus on the maladaptive patterns of behavior which are influenced by anxiety sensitivity and sensation seeking, respectively, with a practical focus on why behaviors of increased distress and non-adherence to the pandemic and public health protocols arise. This falls in line with research by McKay and colleagues (2020) who suggested that education opportunities concerning COVID-19 symptoms and possible false alarms would benefit individuals high in anxiety sensitivity for reducing distress surrounding COVID-19. This would allow for potential differentiation between actual symptoms or signs of COVID-19 infection and benign bodily sensations.

However, while psychoeducation is useful and can increase adherence to treatment (Gonzalez-Pinto et al., 2004), some studies have found the addition of CBT provides greater benefits than just psychoeducation alone (Berardelli et al., 2018; Zaretsky et al., 2008). For example, a CBT-based Preventure strategy for an individual high in anxiety sensitivity aims to challenge reactions of excessive distress in response to

bodily cues and strategize how reduce avoidance of those cues (Conrod, 2016; see also Watt & Stewart, 2008). For those high in sensation seeking, CBT-based exercises are used to identify 'exciting' situations with negative consequences and strategies for pursuing less risky means of satisfying their need for stimulation. In contrast, individuals high in impulsivity work on strategies promoting control of their behavior and improving their response inhibition (Conrod, 2016). These strategies could be used in the context of COVID-19 to reduce pandemic-related maladaptive behaviors associated with each personality factor.

Indeed, understanding how one's personality style may influence maladaptive emotional and behavioral responses is important for examining possible interventions with potential to minimize the negative psychological impact of the pandemic and reducing the spread of COVID-19. Psychoeducation could allow individuals high in anxiety sensitivity and sensation seeking to learn effective coping skills, reducing engagement with maladaptive behaviors and/or troubling distress reactions. CBT-based skills building would allow these individuals to build on those skills by implementing effective strategies designed to reinforce and solidify these new coping abilities. Because Preventure is primarily targeted at youth and substance misuse, the program may require adaptation to effectively target maladaptive reactions to the pandemic. A study by Castellanos and Conrod (2009) supports this, as their results demonstrated only behaviors explicitly covered in the intervention were reduced. This suggests a specific focus on COVID-19 responses may be needed for the program to effectively reduce maladaptive responses specific to COVID-19.

However, it is crucial to note that while the above-described personality-targeted intervention may be efficacious, such interventions may be difficult to implement during pandemic-times, particularly when considering the challenges associated with screening and then providing such services to at-risk individuals quickly enough and with sufficient penetrance for public health impact. Future trials could determine Preventure's efficacy in reducing sex differences in non-adherence and COVID-19 distress through targeting the intervening personality factors of sensation seeking and anxiety sensitivity, with adaptions specific to COVID-19 content and context made where necessary. Furthermore, future research should examine the feasibility of implementing this type of intervention during future pandemics.

In addition to the possible clinical intervention described above, the results of the present study have important clinical implications for those who use substances. While not the focus of the present study, the research described in this thesis was part of a larger study collecting data on substance use and misuse. Baptist-Mohseni and colleagues (under review) found an association between alcohol use and non-adherence to COVID-19 health protocols. Furthermore, this effect was most prominent among individuals high in the trait impulsivity, and this finding was partially explained through problem drinking. These results suggest those high in impulsivity have difficulty controlling their drinking behaviors, possibly resulting in increased instances of non-adherence to public health guidelines. While the results of Baptist-Mohseni et al. (under review) go beyond the scope of this thesis, problematic substance use should be considered as a possible maladaptive response to the COVID-19 pandemic, particularly in relation to the SURPS framework used in this research.

Strengths and Limitations.

The findings of the current study should be interpreted cautiously with several potential limitations kept in mind. First, the indices of non-adherence and distress (see Appendix C) used in the present study were single item measures. Thus, my assessment of the magnitude of the relations of sex and/or personality to these COVID-19 related outcomes may have been underestimated, as single-item measures can be prone to error and may not accurately capture the predictors'/mediators' relations with the outcome. Single-item measures were used due to the timing in which the current study was conducted; at the onset of the pandemic and of state of emergency declarations in North America, validated measures of COVID-19 psychological distress and non-adherence did not yet exist. To confirm my findings, additional research is needed using the validated measures that are now available. For example, Taylor and colleagues (2021) utilized existing health anxiety scales to develop the COVID-19 Stress Scale (CSS). The CSS assesses contamination fears, economic fears, compulsive checking and reassurance, symptoms of traumatic stress, and xenophobic beliefs in relation to COVID-19. Furthermore, these researchers have developed a scale to assess what they refer to as the 'COVID-19 Disregard Syndrome' (Taylor et al., 2021). This latter scale measures beliefs about COVID-19 being exaggerated, belief that one's health is robust against COVID-19, and non-adherence to social distancing guidelines. These scales have been found to be reliable and valid (Taylor et al., 2021) and would be excellent measures for capturing COVID-19 distress and non-adherence in future studies of sex differences and/or personality relations. Nonetheless, the present study has shown initial evidence for personality traits sensation-seeking and anxiety sensitivity as possible mediators in the

relationship between sex and maladaptive COVID-19 outcomes. Future research should aim to replicate these results with the validated measures described above.

Second, my measure of non-adherence to stay-at-home advisories examined essential and non-essential reasons for leaving one's home. My co-authors and I had to make decisions as a team about which reasons for leaving the home were essential, and these decisions may have each been prone to bias or error. For example, the item 'to pick up alcohol' was coded as non-essential. However, the act of picking up alcohol may be essential to some, as individuals with alcohol use disorders could suffer from withdrawal if forced to go without alcohol, and such withdrawal symptoms can be detrimental to one's physical and mental wellbeing and can even be lethal (Becker, 2008).

Third, data from the present study were cross-sectional in nature, which did not allow for any causal conclusions to be made in relation to my findings. Moreover, it has been argued that cross-sectional approaches to investigating mediation may generate biased estimates of the parameters in both full (Maxwell & Cole, 2007) and partial mediation (Maxwell, Cole, & Mitchell, 2011) models. The authors argue that indirect effects found during cross-sectional analyses may not be true; cross-sectional mediators may not be a mediator at all in longitudinal analyses (Maxwell et al., 2011). Conversely, other academics argue that cross-sectional mediation should be allowed when the theoretical rationale behind the proposed mediational processes is strong and meaningful (Disabato, 2016). Indeed, while the merit of the present study's mediational findings is controversial, longitudinal research examining these processes over time would strengthen the results. Nonetheless, my findings represent an important first step in

investigating mediational pathways between sex and COVID-19 responses via personality.

Fourth, the age group of the present study may have limited my results. Specifically, while the age range of participants was broad (18 – 74), younger adults are particularly non-adherent to public health measures (Nivette et al., 2021; Park et al., 2020) and experience greater COVID-19 distress (Glowacz & Schmits, 2020; Park et al., 2020) in comparison to older individuals, as outlined in the general introduction. While the present study did not aim to focus on this age group, research suggests this group should be further examined to understand why they are disproportionately psychologically affected by COVID-19 and why they are disproportionately non-adherent. For example, Cohen, Hoyt, and Dull (2020) suggest young adults have vast social connections, perhaps relating to their non-adherence to stay-at-home orders and social distancing guidelines. In terms of psychological distress, other researchers suggest high consumption of COVID-19 related media may lead to rumination and fear about COVID-19 (Glowacz & Schmits, 2020; Huang & Zhao, 2020). Furthermore, the SURPS is primarily validated in a youth population (Woicik et al., 2009) which points to an adolescent and/or emerging adult population as the most appropriate sample for mymodelling. Future work may aim to examine my research questions in such populations to determine if my results hold in this more at-risk developmental phase for both COVID-19 distress and non-adherence.

Fifth, the present study examined responses to both the COVID-19 pandemic broadly, as well as reactions to COVID-19 containment measures. However, responses in the present study cannot be attributed solely either to the pandemic itself and/or to

containment measures. At the time this study was conducted, at the beginning of the pandemic in Canada, COVID-19 and containment measures occurred simultaneously, making it difficult to separate which effects could be attributed to the pandemic generally and/or to related public health protocols. Nonetheless, with extant research on quarantine measures during prior pandemics suggesting an association between quarantine, symptoms of depression, and post-traumatic stress disorder (Brooks et al., 2020), an inquiry into differences in pandemic vs. quarantine reactions is warranted. To parse apart reactions to each facet of the pandemic, future research could examine jurisdictions with COVID-19 outbreaks which implemented containment measures at different times.

Sixth, the current study did not assess higher-order variables, nor did it assess past psychiatric history. Recent research in the context of the COVID-19 pandemic has outlined that pre-existing mental health issues (i.e., anxiety and mood disorders) exacerbate COVID-19 related psychological distress (Asmundson et al., 2020). Similarly, Neelam and colleagues (2021) identified those with pre-existing psychiatric conditions (i.e., anxiety disorder, depression) as prone to more hospitalizations, as well as worsening of the symptoms of their psychiatric disorder, during prior pandemics, as well as during the current COVID-19 pandemic. Furthermore, while the personality traits examined within the present study are an important first step in understanding how such traits may influence non-adherence behaviors and COVID-19 related distress through sex, the role of higher-order variables, which often at least partially encompass the personality traits examined in this thesis, cannot be ruled out in accounting for such results over and above personality (e.g., are AS effects accounted for by neuroticism or trait anxiety?). Indeed, based on this extant research, perhaps the sex differences and personality mediation

captured in the present study would have been stronger, or better accounted for, if measures of psychiatric disorders and/or higher-order personality variables had been included in my modelling.

Seventh, the effect sizes observed in the results were relatively small. These smaller effect sizes might call into question the clinical applicability of my findings. Nonetheless, my study did reveal effect sizes of similar magnitude to other studies in the context of COVID-19 which aimed to examine similar processes (e.g., O'Brien, Tourigny, & Manser Payne, 2021; Shokrkon & Nicoladis, 2021). In addition, my results identify links of personality to general patterns of behavior which can be effectively reduced with personality-targeted intervention (i.e., general distress and risk-taking; Conrod, 2016) pointing to their potential for intervening with COVID-specific distress and risk-taking (i.e., non-adherence). This lends some strength to the clinical applicability of my results. Nonetheless, it is important to continue to examine my research questions to determine if the effects observed in the present study are clinically important. Future researchers examining these processes should include multi-item outcomes, as this would increase the robustness of the results and perhaps increase the magnitude of the effects observed. Moreover, it is important to test the clinical applicability of the results by targeting personality in intervention and observing, in a randomized controlled trial, whether this exerts beneficial effects on COVID-19-specific distress and/or adherence behavior.

Eighth, the degree to which the sample of the present study was adequately powered to detect any effects smaller than those observed may also be considered a limitation. No a priori power analysis was conducted to determine an appropriate sample

size to detect small effect sizes. Instead, sample size was determined through the general rule-of-thumb that no fewer than ten, but preferably twenty participant responses are included per parameter (i.e., observed item; Barbeau et al., 2019). My sample size did fall within this general guideline which speaks to the presumed adequacy of my sample to detect real effects. However, without a formal a priori power analysis, the results of the present study may have been limited in that it may have been underpowered. For example, it is possible that there is a real relationship between gender and hopelessness (perhaps hopelessness is higher in women than men) or perhaps there is a real relationship between hopelessness and COVID-19-related distress, but my sample of N=400 was not sufficiently large to detect small effects. However, it could be argued that effects smaller than those detected with my sample of N=400 may be too small to be clinically meaningful. Nonetheless, future work should aim to address this potential limitation by replicating my findings with a larger sample size (where the sample size is determined via a priori power analysis) to increase confidence in the results.

Despite the above-listed limitations, the present study also boasts several strengths. Firstly, the sample contained a roughly equal split of male and female subgroups, increasing the power to detect sex differences. Second, unlike university samples, which may limit generalizability, community members were recruited in the present study to broaden the sample. Third, the measure of personality used in the present study, the Substance Use Risk Profile Scale (Woicik et al., 2009), is widely used and validated across several populations (Kaminskaite et al., 2020; Long et al., 2018). Furthermore, this personality measure, as well as the personality traits of anxiety sensitivity and sensation-seeking, are based on the well-established personality theory,

the four-factor vulnerability model (Conrod et al., 2000). Fourth, sophisticated data analytic methods were used, allowing for correlated mediators and correlated outcomes, increasing confidence in the unique contributions of each trait as mediators of observed sex differences in a given COVID-19 pandemic-related outcome. Fifth, more than one measure of each outcome was used, increasing the rigor of the study and helping determine whether each trait mediated specific or more general COVID-19 distress and adherence outcomes. Finally, both non-adherence and psychological distress were outcomes in the present study, whereas most research in the context of COVID-19 has focused on only one or the other.

Future Directions

Future research may wish to re-examine the questions addressed in my thesis but examining gender rather than sex differences; gender could be examined categorically or continuously (using measures of masculinity and femininity, for example). Pre-pandemic research has found fear and avoidance are generally behaviors less accepted in men, whereas bravado is more expected in men (McLean & Anderson, 2009). This suggests the possibility that COVID-19 distress may be seen as more acceptable in women, and non-adherence more acceptable in men, from the perspective of societally sanctioned gender roles. In addition, while women have been found to report greater fear and avoidance when faced with a frightening stimulus in comparison to men, high levels of masculinity, regardless of gender, were associated with low avoidance of the frightening stimulus (McLean & Hope, 2010). In the context of COVID-19, this identifies those high in masculinity as possibly non-adherent to health protocols because avoiding the virus would perhaps serve as an affront to their masculinity. Indeed, an examination of the

present research question across gender groups or in relation to continuously assessed gender roles would allow us to determine generalizability of the present results to gender differences as well as sex differences. Gender non-conforming individuals could also be considered in future research, as research has shown non-binary individuals reported higher COVID-19 distress during the pandemic (Prout et al., 2020).

Additionally, the current study focused on social distancing and stay-at-home advisories as measures of adherence. These protocols were most widely enforced during April 2020, when the study was conducted. More recently, however, mask-wearing and obtaining vaccinations have become endorsed as most protective against COVID-19 (CDC, 2021). Despite the endorsement of mask-wearing by public health agencies, some individuals are choosing not to wear masks (Pew Research Center, 2020) with some even protesting their choice not to wear a mask (CTV News, 2020). Furthermore, some protests have formed surrounding vaccinations; in the US, protesters gathered outside a mass vaccination site imploring individuals not to be vaccinated against COVID-19 (The Washington Post, 2021). Indeed, with some strongly against mask-wearing and vaccinations, future work could examine willingness to be vaccinated and adherence to mask-wearing protocols in relation to both sex and personality. Perhaps individuals high in anxiety sensitivity could be vaccine-hesitant due to the physical sensations which sometimes accompany vaccinations. Further, sensation seeking individuals are often extroverted (Aluja, Garcia, & Garcia, 2003); perhaps the lack of social cues, such as a smile, during social interactions while wearing a mask would be bothersome to a sensation seeker. Impulsivity may also be related to non-adherence to mask-wearing and vaccinations, perhaps due to poor planning or impulsively leaving home without a mask.

Furthermore, when examining more recent public health guidelines, future research may wish to examine whether personality will predict adherence to such guidelines as the pandemic restrictions are easing. For some, the easing of public health guidelines may be interpreted as COVID-19 no longer being a threat, potentially leading to a drop in adherence to public health guidelines, such as getting vaccinated. Indeed, with new health measures already being disregarded by some, and the easing of such measures taking place in many jurisdictions, investigations into the demographic and personality predictors of non-adherence to mask-wearing and vaccinations is warranted.

Conclusion

My thesis was novel in its aim to explore the role of personality as a potential mediator in the relationship between sex and maladaptive responses to COVID-19. Results from my research implicate anxiety sensitivity as a possible mediator between female sex and greater reactions of psychological distress in response to news about COVID-19 and the pandemic in general. In addition, these results suggest sensation seeking may mediate the relationship between male sex and greater non-adherence to COVID-19 health protocols, specifically, non-adherence to stay-at-home orders. Interestingly, it was impulsivity, not sensation seeking, that was related to non-adherence to social distancing protocols. These findings have extended prior work by identifying mediational models which may help explain the process by which sex exerts its effects on maladaptive responses to the COVID-19 pandemic. Furthermore, my thesis results may aid in the development of novel interventions which aim to reduce the impact of personality on maladaptive behavioral and emotional responses to COVID-19, and which may thereby reduce the observed sex differences in these maladaptive outcomes.

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APPENDIX A: COPYRIGHT PERMISSION TO INCLUDE CHAPTER 2

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APPENDIX B: THE SUBSTANCE USE RISK PROFILE SCALE (Woicik et al., 2009)

1. I am content.*
2. I often don't think things through before I speak.
3. I would like to skydive.
4. I am happy.*
5. I often involve myself in situations that I later regret being involved in.
6. I enjoy new and exciting experiences even if they are unconventional.
7. I have faith that my future holds great promise.*
8. It's frightening to feel dizzy or faint.
9. I like doing things that frighten me a little.
10. It frightens me when I feel my heart beat change.
11. I usually act without stopping to think.
12. I would like to learn how to drive a motorcycle.
13. I feel proud of my accomplishments.*
14. I get scared when I'm too nervous.
15. Generally, I am an impulsive person.
16. I am interested in experience for its own sake even if it is illegal.
17. I feel that I'm a failure.
18. I get scared when I experience unusual body sensations.
19. I would enjoy hiking long distances in wild and uninhabited territory.
20. I feel pleasant.*
21. It scares me when I'm unable to focus on a task.
22. I feel I have to be manipulative to get what I want.
23. I am very enthusiastic about my future.*

Items marked with an asterisk are reverse-coded. Each item is rated on the scale below.

1	2	3	4
Strongly Disagree	Disagree	Agree	Strongly Agree

APPENDIX C: MEASURES OF ADHERENCE AND DISTRESS

1. **In the past month (30 days)**, how many times a week are you leaving your residence on average?

a) 0 – I have not left my residence in the past month
b) 1
c) 2-3
d) 4-5
e) 6-10
f) 10-20
g) 21+

[If greater than 1] What sorts of things have you left your residence for in the past month (check all that apply)?

a. To go to work (mandatory/essential)
b. To go to work (voluntary/non-essential)*
c. To shop for groceries or other essentials
d. To pick up take out food*
e. To pick up alcohol*
f. To pick up cannabis*
g. For exercise (solitary)
h. For exercise or sports with others you do not live with*
i. Just to get out for a drive or walk
j. To check in or bring essential items to vulnerable family member/friend/neighbor
k. To visit family that does not live with you (non-essential reason)*
l. To go on a date or to visit a romantic partner that does not live with you (non-essential reason)*
m. To visit friends that do not live with you (non-essential reason)*
n. Other, specify:

Note: Items marked with an asterisk were coded as non-essential. Two items assessed participants adherence to COVID-19 health protocols. Question one assessed the frequency of leaving one's residence in the past month. On question two (i.e., "What sorts of things have you left your residence for in the past month?"), participants who had left their home in the past month were asked to indicate yes (=1) or no (=0) to leaving their home for each activity, and a sum score was created for the non-essential reason items (possible range 0-9). Higher sum scores reflected poorer adherence to the guideline of leaving one's home only for essential reasons during the early stages of the COVID-19 lockdown.

2. **IN THE PAST MONTH (30 Days)**, since COVID-19 Emergency was declared in your area, how often have you engaged in a social activity that involved going within 2 meters of someone you did not live with (e.g., going to a party, indoor or outdoor social gathering, visiting friends or family or having them over).

a) Never

b) 1
c) 2-3
d) 4-5
e) 6-10
f) 10-20
g) 21+

Note: The second item assessed the degree to which participants violated the social distancing guideline. Participants were asked, "IN THE PAST MONTH (30 Days), since COVID-19 Emergency was declared in your area, how often have you engaged in a social activity that involved going within 2 meters of someone you did not live with (e.g., going to a party, indoor or outdoor social gathering, visiting friends or family or having them over)?" Responses ranged from 0=never to 6=21+ times. Higher scores on this item reflected greater non-adherence to the social distancing guideline during the initial stages of the COVID-19 lockdown.

3. In general, how worried are you about COVID-19?

Not at all Worried			Moderately Worried			Extremely Worried
1	2	3	4	5	6	7

4. On the following scale of 1 – 7, how anxious/worried does reading news or updates on the COVID-19 emergency make you feel?

Not at all Anxious/ Worried			Moderately Anxious/ Worried			Extremely Anxious/ Worried
1	2	3	4	5	6	7

Note: Questions three and four assessed general worry about COVID-19 and levels of worry in response to COVID-19 related news, respectively. Participants responded on scales from 1 – 7 (pictured above). Scores reflected participants' general worry about COVID-19 and worry in response to COVID-19 related news/updates, respectively.

APPENDIX D: TABLE OF DESCRIPTIVE STATISTICS

Table 1

Descriptive Statistics by Sex.

Variable	Sex		Independent t-tests	
	Male (n = 219)	Female (n = 181)		
Age (in years) *M* (SD)	30.06 (10.26)	31.80 (12.56)	$t_{(398)}$ = -1.52,	p = .129
Current Student Status				
No	74%	76%		
Yes Part-Time	11%	6%		
Yes Full-Time	15%	18%		
Job Status (Pre-COVID)				
No	6%	19%		
Yes Part-Time	31%	25%		
Yes Full-Time	63%	56%		
Household Income (Pre-COVID)				
$0				
Less than $20,000	9%	1%		
$20,000 - $39,000	14%	8%		
$40,000 - $59,000	13%	13%		
$60,000 - $79,000	13%	13%		
$80,000 - $99,000	19%	18%		
$100,000 - $149,000	21%	23%		
$150,000 - $199,000	7%	5%		
Over $200,000	3%	6%		
Hopelessness *M* (SD)	12.21 (3.27)	12.53 (3.13)	$t_{(398)}$ = -0.99,	p = .321
Anxiety Sensitivity *M* (SD)	12.35 (2.68)	13.24 (3.57)	$t_{(398)}$ = -3.37,	p = .001
Sensation Seeking *M* (SD)	15.24 (3.49)	14.00 (3.52)	$t_{(398)}$ = 3.51,	p < .001
Impulsivity *M* (SD)	10.45 (2.58)	10.09 (2.50)	$t_{(398)}$ = 1.39,	p = .165
Leaving Residence for Non-Essential Reasons *M* (SD)	1.80 (1.10)	0.95 (1.05)	$t_{(398)}$ = 2.32,	p = .019
Going within 6-feet of Other People *M* (SD)	1.93 (1.31)	0.78 (1.35)	$t_{(398)}$ = 2.81,	p = .005
News Anxiety *M* (SD)	4.11 (1.32)	4.42 (1.29)	$t_{(398)}$ = -2.30,	p = .020
Overall COVID-anxiety *M* (SD)	4.09 (1.39)	4.48 (1.33)	$t_{(398)}$ = -2.81,	p = .005

Note: A negative t-value indicates a higher value in females; a positive t-value indicates a higher value in males. Hopelessness, Anxiety Sensitivity, Sensation Seeking, and Impulsivity assessed with the Substance Use Risk Profile Scale (SURPS; Woicik et al., 2009).

APPENDIX E: CORRELATION MATRIX

Table 2

Descriptive Statistics and Bivariate Correlations.

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
1. Sex (male=0; female=1)	-	.05	.17**	-.07	-.17**	.11*	.14*	.01	-.06
2. Hopelessness		-	.20**	.20**	-.14**	.05	.03	-.07	-.06
3. Anxiety Sensitivity			-	.28**	-.16**	.31**	.24**	-.01	.00
4. Impulsivity				-	.19**	.08	-.02	.08	.15**
5. Sensation Seeking					-	-.13**	-.09	.17**	.13**
6. News Anxiety						-	.70**	-.10	-.12*
7. COVID-19 Anxiety							-	-.13**	-.12*
8. Leaving home for non-essential reasons								-	.36**
9. Going within 6-feet of other people									-
M	45.3%F	12.36	12.75	10.29	14.68	4.25	4.27	1.64	.86
SD	-	3.21	2.67	2.55	3.56	1.32	1.38	1.37	1.33
Range	-	6-24	5-20	5-19	6-21	1-7	1-7	0-9	0-6

Note. * $p < .05$, ** $p < .01$.

APPENDIX F: FIGURE 1

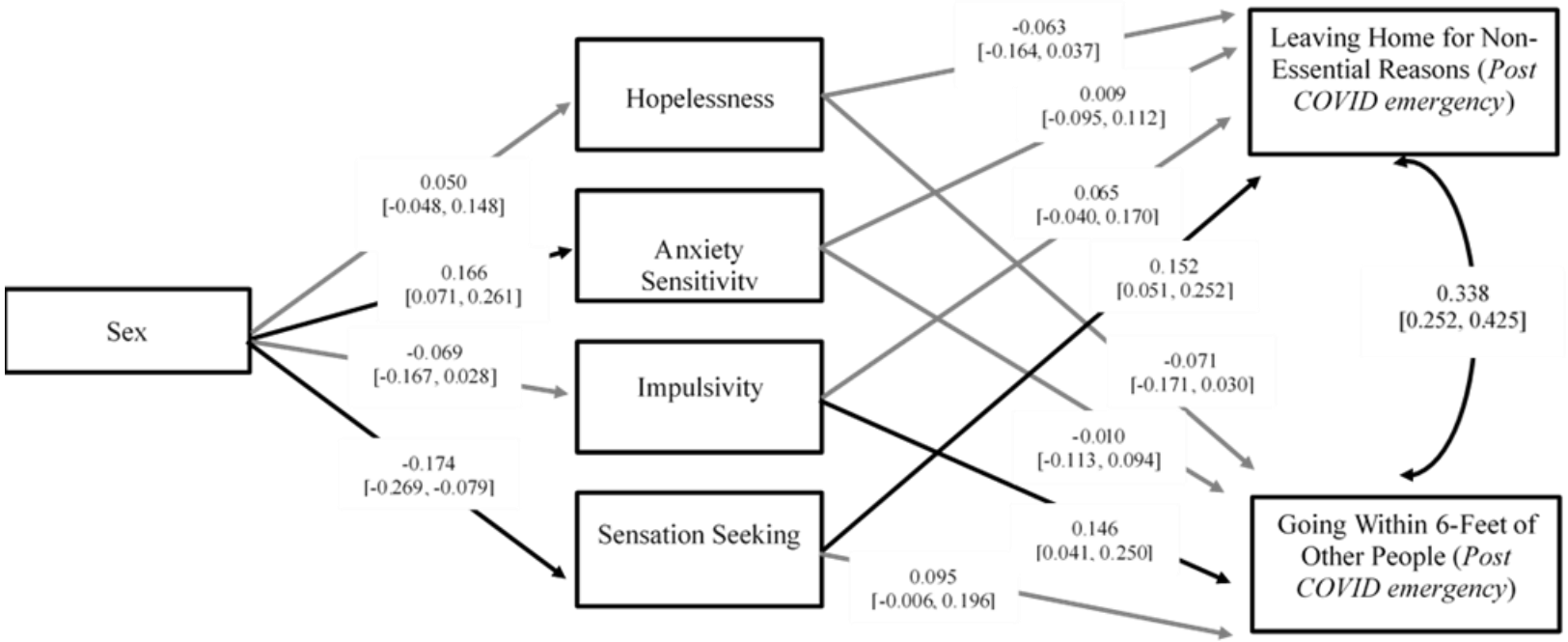

Figure 1. The final path model for pathways from sex to non-adherence behaviours via personality traits. Unstandardized parameter estimates are presented with 95% *CIs*. Dark lines are specified paths that were supported (i.e., the 95% *CI* did not include zero) and grey lines are specified paths that were not supported (i.e., the 95% *CI* included zero).

APPENDIX G: FIGURE 2

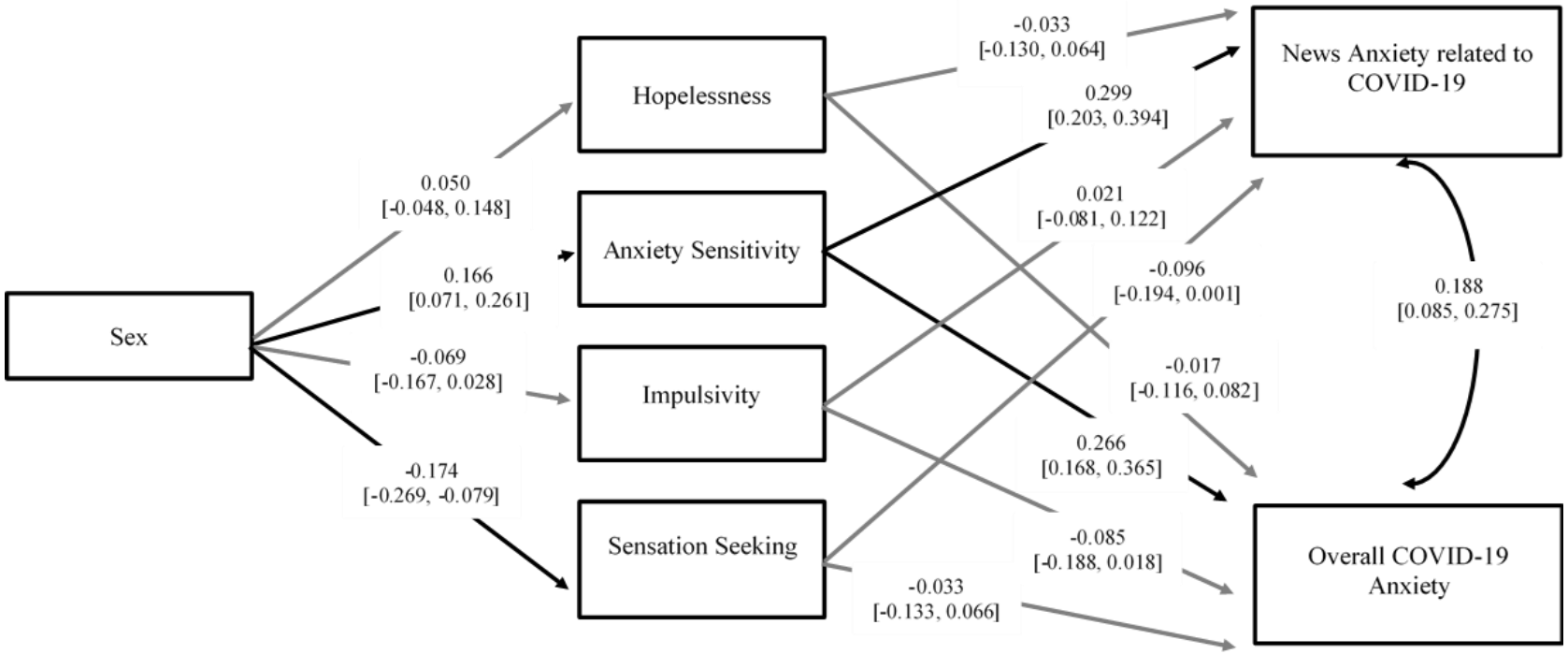

Figure 2. The final path model for pathways from sex to COVID-related distress via personality traits. Unstandardized parameter estimates are presented with 95% *CIs*. Dark lines are specified paths that were supported (i.e., the 95% *CI* did not include zero) and grey lines are specified paths that were not supported (i.e., the 95% *CI* included zero).