Short Communication

Sex differences in maladaptive emotional and behavioral responses to COVID-19: What is the role of personality?

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ABSTRACT

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. We 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, we 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.

1. 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 compliance with 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

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differences in these traits: males score higher in SS (Cross et al., 2013), females higher in AS (Stewart et al., 1997).

We 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. We 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].

2. Method

2.1. 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. Our data were collected as part of a larger study (Wardell et al., 2020); only measures relevant to our sub-study are described.

2.2. Materials

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

2.2.2. 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). Participants rated items on a 4-point scale (*1 = strongly disagree; 4 = strongly agree*). 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).

2.2.3. Non-adherence
Two questions (Appendix A) 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 non-essential (e.g., *to pick up alcohol*) and were summed (range = 0–9). The second asked: *"How often have you engaged in a social activity that involved going within 2 metres of someone you did not live with?"*. Response options ranged from *0 = never* to *6 = 21+ times.*[1]

2.2.4. COVID-19 Distress
Two questions (Appendix A) 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?"), answered on a 7-point scale (1 = not at all; 7 = extremely).[2]

2.3. 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 (Fig. 1a). In Model 2, COVID-19 news anxiety and COVID-19 general anxiety were correlated distress outcomes (Fig. 1b).

The following indices/cutoffs were used to assess model fit: comparative fit index (CFI) ≥0.95, root mean square error of approximation (RMSEA) ≤0.06, and standardized root mean residual (SRMR) ≤0.08 (Hu & Bentler, 1999). Standardized 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 not include zero, then the pathways/indirect effects were considered significant (Fritz & MacKinnon, 2007).

3. Results

3.1. Descriptive statistics

Descriptive statistics are shown in supplementary Table 1 as a function of sex (see Appendix B). 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.

3.2. Model results

Model 1 (Fig. 1a) 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-ft 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 (Fig. 1b) 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],

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[1] 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* = 0.36, *p* < .01), suggesting face and construct validity, respectively.

[2] 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* = 0.70, *p* < .01), suggesting face and construct validity, respectively.
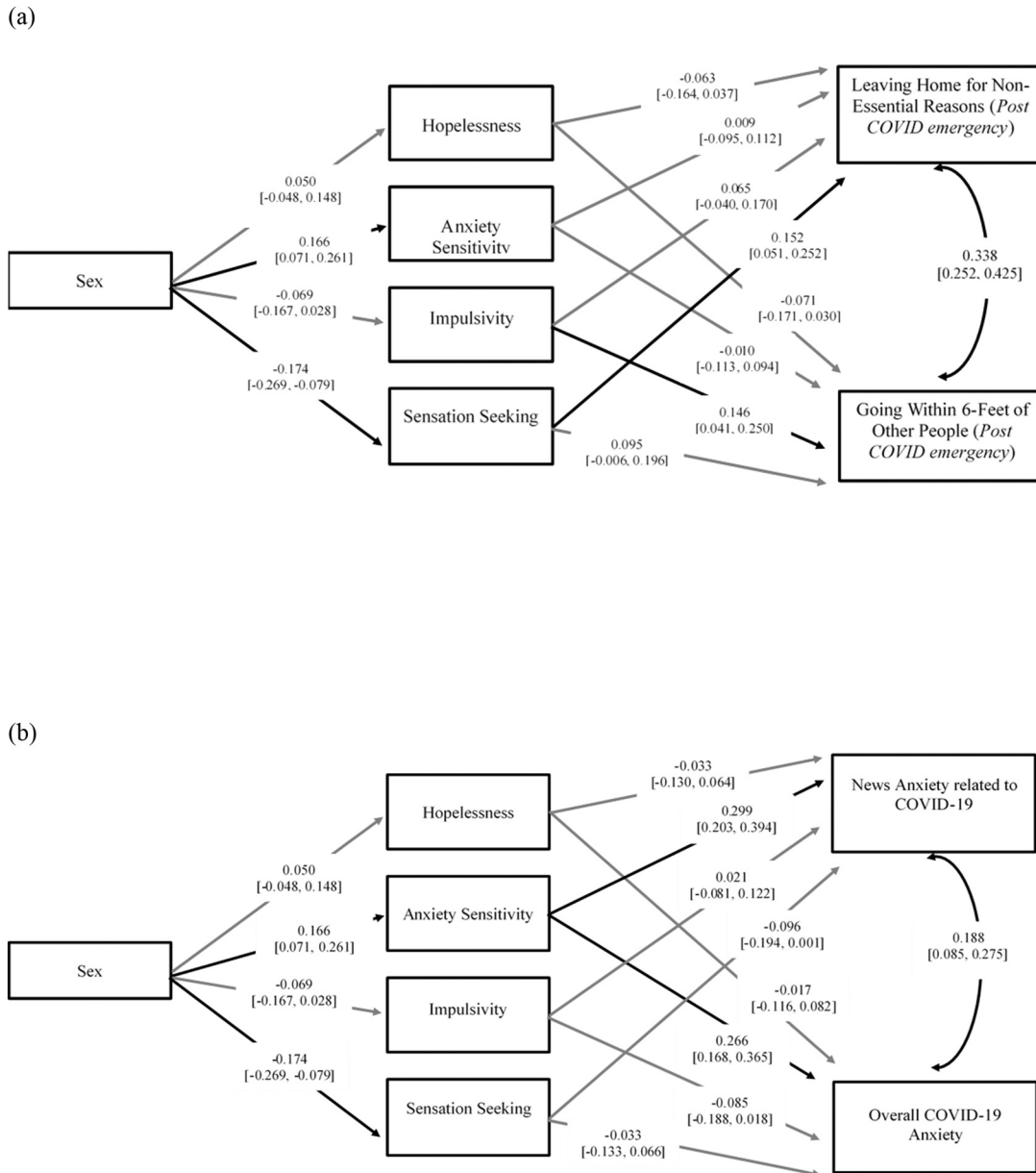
(a)

(b)

Fig. 1. Pathways from sex to COVID-19 outcomes (a: adherence; b: distress) via personality. Standardized 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). Covariances modelled between personality mediators are not presented for clarity.

respectively). No other personality-mediated pathways proved significant in either model.[3]

4. Discussion

Partially consistent with H1, our 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

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[3] 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 sex differences in COVID-19-related adherence and distress. Thus, for simplicity, we opted to present the original models in the text.

less adherent to public health protocols for reducing COVID-19 viral spread (Litton, 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-ft 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, 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, our 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

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.

Our 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, our study has several potential limitations. First, our non-adherence and COVID-19 distress outcomes were assessed using single-item measures which can be prone to error, leading to underestimation of predictors'/mediators' relations with the outcomes. Moreover, our 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 our preliminary results using validated non-adherence and distress outcomes (e.g., Taylor et al., 2021). Second, our 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. Third, our study was cross-sectional, which precluded drawing causal conclusions about our mediational findings. Longitudinal studies are necessary to confirm the hypothesized mediational processes over time. Fourth, we 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, we focused on following social distancing and stay-at-home advisories as our adherence measures given the emphasis on these public health directives in April 2020. Future studies might incorporate subsequent public health measures like mask wearing.

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 (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.

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CRediT authorship contribution statement

Sarah DeGrace: Conceptualization, Writing original manuscript draft. **Natasha Baptist-Mohseni**: Conceptualization, writing sections of original manuscript draft. **Alanna Single**: Data Analysis and Write-Up. **Matthew T. Keough**, **Jeffrey D. Wardell, and Sherry H. Stewart**: Conceptualization, Methodology, Secured Project Funding, Contributed to data analysis, Provided feedback on the manuscript, and Supervised lead author.

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