Examining Risk and Protective Factors for Psychological Health during the COVID-19 Pandemic

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Abstract

Background: The coronavirus disease 2019 (COVID-19) pandemic has impacted the lives of people globally, and the significant mental health consequences of this pandemic are beginning to be documented. In addition to sociodemographic and COVID-19 specific factors, psychological risk and protective mechanisms likely influence individual differences in mental health symptoms in the context of the COVID-19 pandemic. We examined associations between a broad set of risk and protective factors with symptoms of depression, anxiety, alcohol problems, and eating pathology, and investigated interactions between objective stress due to COVID-19 and risk/protective variables in predicting psychopathology. **Methods:** Participants were 877 adults (73.7% female) recruited via internet sources from around the globe, but primarily residing in North America (87.4%). **Results:** Structural equation modelling revealed that certain risk and protective factors (e.g., loneliness, latent protective factor, mindfulness) were broadly related to psychopathology, whereas others showed unique relations with specific forms of psychopathology (e.g., greater repetitive thinking and anxiety; low meaning and purpose and depression). COVID-19 objective stress interacted with risk factors, but not protective factors, to predict greater anxiety symptoms, but not other forms of psychopathology. **Limitations:** This is a cross-sectional study of non-randomly recruited participants who reported high levels of income and education. Rates of problematic alcohol use were low. **Conclusions:** Findings contribute to our understanding of psychological mechanisms underlying individual differences in psychopathology in the context of a global stressor. Strategies that reduce loneliness and increase mindfulness will likely impact the greatest number of mental health symptoms.

Keywords: COVID-19 pandemic, mental health symptoms, risk factors, protective factors

The coronavirus disease 2019 (COVID-19) is one of the largest global pandemics in history. As of August 2020, there have been over 20 million cases and over 700,000 deaths from COVID-19 across more than 200 countries (World Health Organization, 2020). The COVID-19 disease and efforts to prevent its spread have profoundly affected the lives of people worldwide. Individuals have significantly restricted their routines and reduced social contact due to stay-at-home and social distancing orders; many people are out of work due to economic fallout; families are without childcare and separated at borders; and there is substantial fear and uncertainty surrounding the possibility of infection and the timeline for return to "normal" life. Not surprisingly, the COVID-19 pandemic has had a profound impact on mental health, and clinical science research is necessary to better understand and treat the associated mental health burden (Gruber et al., 2020).

Mental health consequences of the COVID-19 pandemic are beginning to be documented. In a nationally representative Irish sample surveyed during the first week of government-imposed quarantine, 22.77% of people screened positive for depression, 20.00% screened positive for generalized anxiety, and 27.67% screened positive for both depression and anxiety (Hyland et al., 2020). Similarly, in Italian residents surveyed at the height of the pandemic, 32.8%, 18.7%, and 27.2% of people reported high or very high levels of depression, anxiety, and stress, respectively (Mazza et al., 2020). A study of people from 190 Chinese cities found moderate-to-severe levels of stress, anxiety, and depression during the initial outbreak that were maintained four weeks later (Wang et al., 2020). Finally, a study of Swiss college students reported a significant increase in depression, anxiety, stress, and loneliness from pre- to post-pandemic (Elmer et al., 2020).

Importantly, however, not everyone is similarly at risk for mental health problems during

the COVID-19 pandemic. Well-established diathesis-stress models of psychopathology posit that stressful life events may only lead to psychopathology in individuals with pre-existing diatheses, which can include genetic, psychological, and environmental risk (Zuckerman, 1999). Similarly, dispositional and behavioural protective factors may buffer some individuals from the psychological impact of the COVID-19 pandemic. There is a need to examine individual difference variables that influence mental health symptoms during the pandemic to develop targeted preventions and interventions aimed at those most vulnerable.

Most research thus far has focused on the influence of sociodemographic or COVID-19 specific factors in predicting differences in psychological responses to the pandemic. For example, several studies suggest that female sex and lower income predict greater psychological symptoms (Cao et al., 2020; Flesia et al., 2020; Hyland et al., 2020; Mazza et al., 2020; Őzdin et al., 2020). In addition, knowing someone infected with COVID-19, being at high risk of being infected, working outside of the home, or being under a stay-at-home order have emerged as factors related to poorer mental health in one or more studies (Cao et al., 2020; Mazza et al., 2020; Tull et al., 2020). Only a handful of studies have examined psychological risk and protective factors and their associations with COVID-19-related mental health. One study found that higher levels of emotional stability, self-control, positive coping style, and internal locus of control protected against perceived stress (Flesia et al., 2020). COVID-19-related fear was positively related to disgust sensitivity, anxiety sensitivity, body vigilance, contamination concerns, and general distress (Hongbo et al., 2020). Finally, of several maladaptive personality traits, negative affectivity and detachment were related to more depression, anxiety, and stress (Mazza et al., 2020). Although these initial results are important, findings are limited by the focus on a narrow set of risk factors, protective factors, and psychopathology symptoms.

This study examined associations between a broad set of risk and protective factors with psychopathology in the context of the COVID-19 pandemic. We assessed symptoms of depression, anxiety, alcohol use problems, and eating disorders to capture the psychological impact of the COVID-19 pandemic on a range of mental health symptoms. Associations with both general and specific risk and protective factors were considered. Finally, interactions between COVID-19-related objective stress and risk and protective variables were examined as predictors of psychopathology. We hypothesized that, while risk factors would be related to greater psychopathology and protective factors to less psychopathology, there would be important risk and protective factor-specific and psychopathology-specific associations that would inform our understanding of individualized pathways towards mental health difficulties during the COVID-19 pandemic.

Method

Participants and Procedure

Data were collected from April 13th to June 30th, 2020. Participants were recruited via: 1) social media pages of study investigators and subsequent snowball sampling; 2) forums (e.g., Reddit) for research participants; 3) organizations related to psychiatric disorders (e.g., Academy for Eating Disorders listserv; and 4) organizations for underrepresented minorities (e.g., Black Students' Network of McGill). Recruitment posts stated that adults with and without a history of mental conditions were being recruited for a study of the COVID-19 pandemic and psychological health.

The survey was administered via Qualtrics survey software, and all participants provided electronic informed consent. They completed investigator-designed demographics and COVID-19 measures as well as several validated questionnaires. Participants were given a "prefer not to

answer" option for all study questions. Given issues with internet robots and fraudulent survey completions during a previous version of this survey, participants ended the study by creating a validation "code" in an attempt to verify the validity of their data (e.g., enter age, first two letters of occupation, number of people in social isolation pod). They were given the option of providing their email address to be entered into a draw where they had a 1/20 chance of winning an $100 electronic gift card.

The survey was started by 1353 people, but data from were only retained for 877 (64.8%) participants. Excluded participants were those who did not complete at least demographic and COVID-19 measures; who very clearly failed the validation attempt at the end of the survey; who had long strings of repetitive responses on non-mental health questionnaires; and who provided inconsistent responses on measures asking the same question. All data were verified by one of three student investigators who conferred when one recommended rejection of data. The principal investigator resolved cases of disagreement.

The 877 included participants ranged in age from 18 to 82 years, with a mean of 30.58 years (SD = 11.31). Participants identified mostly as female (73.7% female; 23.2% male; 3% gender non-binary/gender fluid/other) and cis-gender (97.7%). Most identified as heterosexual (72.3%), with 12% identifying as bisexual, 3.3% as pansexual, 3.0% as questioning or unsure, 2.6% as asexual, 2.2% as queer, 2.1% as lesbian, 1.8% as gay, and 0.8 % as other or prefer not to answer. Regarding race/ethnicity, participants could select as many options as applied: 80% identified as White, 6.0% as Hispanic or Latin American, 5.7% as Chinese, 3.1% as South Asian, 2.4% as Arab, 2.2% as Black, 1.6% as Southeast Asian, 1.5% as West Asian, 0.9% as Filipino, 0.8% as First Peoples/Indigenous/Aboriginal, 0.6% as Japanese, 0.6% as Korean, 0.1% as Native Hawaiian or Other Pacific Islander, and 3.9% as Other. Participants were mostly from North

America (61.2% Canada, 26.2% United States), with 5.8% of participants from Europe, 4.7% from Asia, 1.0% from South America, 0.8% from Australia and New Zealand, and 0.2% from Africa. Over a third (38.4%) of participants reported currently being a student, and 24.5% indicated they had children. Participants were well-educated, with most (62.6%) reporting at least a Bachelor's degree. Median family income was $76,000-$100,000 for both participant's own family income and the family income of students' parent/guardians.

Most participants indicated that they had received a formal diagnosis of a mental health condition (44.2%) or had symptoms consistent with a mental health condition, even if not formally evaluated and diagnosed (22.1%). Of the total sample, 56.4% of people reported symptoms or a diagnosis of an anxiety disorder, 33.1% reported major depression, 14.8% reported an eating disorder, and 3.6% reported an alcohol or substance use disorder.

Measures

Internal consistency estimates for each measure in the current sample are presented in Table 1.

Psychopathology.

Depression Anxiety and Stress Scale (*DASS-21; Henry & Crawford, 2005; LoviBond & LoviBond, 1995*). The DASS-21 is a 21-item self-report measure that assesses depression, anxiety, and stress over the past week; only the depression and anxiety subscales were examined in the current study. Both subscales contain seven items rated using a Likert scale ranging from 0 (*did not apply to me at all*) to 3 (*applied to me very much or most of the time*). The DASS-21 has demonstrated good psychometric properties with excellent internal consistency (depression α = .88, anxiety α = .82; Henry & Crawford, 2005). The DASS-21 has shown good convergent and discriminant validity, as the subscales correlate strongly with independent measures of anxiety

and depression, and the depression subscale relates negatively to positive affect (Henry & Crawford, 2005). Recommended cut-off scores for depression are normal (0-9), mild (10-13), moderate (14-20), severe (21-27), and extremely severe (28+), while cut-off scores for anxiety are normal (0-7), mild (8-9), moderate (10-14), severe (15-19), and extremely severe (20+).

***Patient-Reported Outcomes Measurement Information System (PROMIS) Alcohol Use Short Form 7a* (Pilkonis et al., 2013).** The PROMIS Alcohol Use Short Form examines individual's alcohol use and related problems in the past 30 days. Items for the short form were drawn from a larger bank of 37 alcohol use items based on item characteristics (Pilkonis et., 2013). Each item is rated on a five-point Likert scale from 0 (*never*) to 5 (*almost always*). Participants who had not drank alcohol in the past 30 days were given the lowest score on all items and included in analyses. The PROMIS Alcohol Use Short Form showed excellent internal consistency ($\alpha = .95$) and association with the full item bank ($r = .93$; Pilkonis et al., 2013). The correlation between the PROMIS Alcohol Use Short Form and the Alcohol Use Disorders Identification Test-Consumption questions was $r = .62$ in people living with HIV (Gibbons et al., 2016). A PROMIS Alcohol Use Short Form *T*-score of about 60 is a marker of risk equivalent to conventional thresholds for clinical concern (Pilkonis et al., 2016).

***Eating Disorder Examination Questionnaire* (*EDE-QS*; Gideon et al., 2016).** The EDE-QS is a 12-item short form of the EDE-Q which evaluates cognitive and behavioural eating disorder symptoms. The 28-item EDE-Q was abbreviated using Rasch analysis of factors identified by means of principal component analysis and expert opinions (Gideon et al., 2016). Participants report the frequency of eating disorder symptoms in the past week using a response scale ranging from 0 (*0 days*) to 3 (*6 - 7 days*). The EDE-QS has demonstrated excellent internal consistency ($\alpha = .91$) and test re-test reliability over 7 days (ICC = .93; Gideon et al., 2016).

EDE-QS scores strongly correlate with original EDE-Q Global Scores (r = .91 for people without eating disorders; r = .82 for people with eating disorders; Gideon et al., 2016). A score of 15 had good sensitivity (.83) and specificity (.85) for predicting the presence of a self-reported eating disorder diagnosis (Prnjak et al., 2020).

Risk factors.

Brief Version of the Difficulties in Emotion Regulation Scale (DERS-18;* Victor & Klonsky, 2016*). The DERS-18 is an 18-item measure of emotion dysregulation across six domains: 1) lack of emotional clarity; 2) lack of emotional awareness; 3) non-acceptance of emotions; 4) difficulties controlling impulsive behaviors when distressed; 5) difficulties engaging in goal-directed behaviors; 6) limited access to emotion regulation strategies (Gratz & Roemer, 2004). Participants rate items using a five-point Likert scale from 1 (*almost never* [0-10%]) to 5 (*almost always* [91-100%]). DERS-18 Total and subscale scores correlated strongly with the 36-item DERS Total and subscale scores (all rs > .90; Victor & Klonsky, 2016). DERS-18 subscales have shown good-to-excellent internal consistency in a combined sample of community and clinical participants (αs = .77-.90; Victor & Klonsky, 2016). The DERS-18 has also demonstrated adequate construct and predictive validity, as reflected by correlations with borderline personality disorder symptoms and emotion regulation reported via daily diary (Victor & Klonsky 2016).

***Intolerance of Uncertainty-Short Form* (IUS-SF; Carleton et al., 2007**). The IUS-SF is a 12-item questionnaire that measures responses to uncertainty, ambiguous situations, and the future. The IUS-SF contains two subscales: prospective anxiety (i.e., fear and anxiety based on future events; seven items) and inhibitory anxiety (i.e., uncertainty inhibiting action or experience; five items). Responses are scored on a five-point Likert scale ranging from 1 (*not at*

all characteristic of me) to 5 (*entirely characteristic of me*). The IUS-SF has excellent internal consistency (α = .91) and a high correlation with the full 27-item version (*r* = .96; Carleton et al., 2007).

Short Form UCLA Loneliness Scale **(ULS-6; Neto, 2014).** The ULS-6 is a six-item questionnaire examining subjective feelings of loneliness. Items are scored on a four-point Likert scale ranging from 1 (*never*) to 4 (*always*). The ULS-6 has good internal consistency (α = .82) and high correlations with the original Revised UCLA Loneliness Scale (*r* = .92) and relevant constructs, such as self-esteem (*r* = -.66), satisfaction with life (*r* = -.43), and positive affect (*r* = -.56; Neto, 2014).

Repetitive Negative Thinking Questionnaire **(RTQ-10; McEvoy et al., 2010).** The RTQ-10 is a short version of the original 44-item RTQ designed to evaluate repetitive negative thinking, such as rumination and worry. Each question is answered using a five-point Likert scale ranging from 1 (*not at all true*) to 5 (*very true*). The RTQ-10 has shown good internal consistency (α = .89) and was very highly correlated with the full scale (*r* = .95; McEvoy et al., 2010).

Protective Factors.

PROMIS Short Form v1.0 - General Self-Efficacy 4a. **(GSE-SF; Salsman et al., 2019).** The GSE-SF includes four items selected from the larger 10-item PROMIS GSE based on information function and content considerations. The PROMIS GSE items are nearly identical to those from the Generalized Self-Efficacy Scale (Scharwzer & Jerusalem, 1995) with minor wording changes. In addition, the response scale was changed in the PROMIS to refer to confidence, with items rated on a scale from 1 (*I am not at all confident*) to 5 (*I am very confident*). The PROMIS GSE-SF has shown good internal consistency (α = .85) and strong

correlations with other self-efficacy and health measures (Salsman et al., 2019).

***PROMIS Short Form v1.0 - Meaning and Purpose Short Form 4a*. (MPS-SF; Salsman et al., 2020).** The PROMIS MPS-SF includes four items selected from the larger 37-item PROMIS MPS based on information function and content considerations. Items are rated from 1 (*not at all*) to 5 (*very much*). The PROMIS MPS-SF demonstrated excellent internal consistency ($\alpha = .90$), a very large correlation with the original item bank ($r > .94$), and strong correlations with related constructs (e.g., life engagement: $r = .75$, positive affect: $r = .65$; Salsman et al., 2020).

***PROMIS Short Form v.10 – General Life Satisfaction Scale Short Form 5a* (GLSS-SF; Vaughan et al., 2020).** The GLSS-SF includes five items selected from the 10-item GLSS and are based on the Satisfaction with Life Scale (Diener et al., 1985). Items are scored on a seven-point scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). The GLSS-SF demonstrated acceptable measurement proprieties and correlated highly with a single-item measure of life satisfaction ($r = .70$; Vaughan et al., 2020).

***Mindfulness: Mindful Attention Awareness Scale* (MAAS; Brown & Ryan, 2003**). The MAAS is a 15-item measure designed to assess trait mindfulness. Participants indicate the frequency of certain experiences on a scale from 1 (*almost always*) to 5 (*almost never*). The MAAS has demonstrated excellent internal consistency in both student ($\alpha = .82$) and general adult samples ($\alpha = .87$; Brown & Ryan, 2003). The MAAS has also shown good test-retest reliability over four weeks ($\rho I = .81$; Brown & Ryan, 2003). The MAAS correlates strongly with indicators of both positive and negative well-being (Brown & Ryan, 2003).

COVID-19 Objective Stress. Responses of "yes" to the following items from the investigator-designed COVID-19 survey were combined into a count variable to index objective

stress: 1) Are you in social isolation alone (i.e., without pets, partner, family, roommates)?; 2) Have you been laid off or fired due to COVID-19?; 3) Are you a healthcare professional currently in contact with people who may or may not have COVID-19?; 4) Have you had symptoms consistent with COVID-19?; 5) Has anyone you know been diagnosed with COVID-19? (only immediate family member's or close friend's diagnoses were included).

Statistical Analyses

Analyses were conducted in Mplus version 8.0 (Muthén & Muthén, 2017) using full information maximum likelihood estimation with robust standard errors. Missing data rates were $\leq$ 6% for all items. Model fit was evaluated using several absolute indices of goodness of fit: Comparative Fit Index (CFI) and Tucker-Lewis Index (TLI) values $\geq$.90 and $\geq$.95 were considered evidence of acceptable and excellent fit, respectively; standardized root-mean-square-residual (SRMR) values $\leq$.08 were considered evidence of excellent fit; and root-mean-square error of approximation (RMSEA) values $\leq$.10 and $\leq$.06 were considered evidence of acceptable and excellent fit, respectively (Hu & Bentler, 1999). Chi-square values are reported but not interpreted, given the large sample size. Akaike information criterion (AIC) and Bayseian information criterion (BIC) were consulted as indices of relative model fit, with lower values indicating a better fitting model.

First, confirmatory factor analyses (CFAs) were conducted to examine the structure of each individual scale. Consistent with validation studies and past research, one-factor structures were tested for all scales with the exception of a six-factor structure for the DERS-18 and a two-factor structure for the IUS-SF. Second, the following models were compared to evaluate the best structure underlying the risk factors, protective factors, and psychopathology symptoms: 1) correlated factors model; 2) hierarchical one-factor model (i.e., a common latent factor

influencing individual scale latent factors, which influence individual scale observed items); and 3) bifactor model (i.e., a common latent factor influencing individual scale observed items, and specific latent factors influencing individual scale observed items; Markon, 2019). Third, associations between risk and protective factors with psychopathology were tested in structural models. When a bifactor model was used for at least one set of variables, structural models used the residualized approach described by Koch et al. (2018). Using this approach, two separate models are run to test associations with the common factor residualized on the specific factors and the specific factors residualized on the common factor. Fourth, interactions between common and specific risk factors and COVID-19 objective stress in the prediction of psychopathology were tested using latent moderated structural equation modelling (LMS; Klein & Moosbrugger, 2000) via the XWITH command in Mplus. One latent interaction term per model was included due to the effects of multicollinerarity on parameter estimates when more than one interaction term is included (Kelava et al. 2011). The Benjamini-Hochberg procedure was used to decrease the false discovery rate (Benjamini & Hochberg, 1995).

Results

Descriptive Statistics

Descriptive statistics are presented in Table 1. A substantial proportion of participants reported at least moderate levels of depression (48.3%) and anxiety (40.1%). A large number (25.8%) also had a possible eating disorder based on EDE-QS scores. The mean level of COVID-19 related objective stress was relatively low; 12.2% of people reported living alone; 18.2% indicated they had been laid off or fired; 5.4% reported working as a healthcare professional; 13.5% endorsed having symptoms of COVID-19; and 10.8% stated that an immediate family member or close friend had been diagnosed with COVID-19.

Confirmatory Factor Analyses

Fit indices are presented in Table 2. With few exceptions, fit indices suggested that the individual CFAs for the various scales provided an acceptable or excellent fit to the data. RMSEA values for depression, alcohol, and rumination CFAs were above .10. High RMSEA values can occur when models have high factor loadings and omitted residual covariances (Browne et al., 2002). Indeed, these scales had mean factor loadings from .77-.84 and item correlations >.75 for which modification indices suggested adding correlated errors terms. However, without a theoretical reason to add correlated error terms, we kept the models as is for subsequent tests. Unlike in a previous study (He et al., 2020), a one-factor structure for the EDE-QS did not provide a good fit to the data. An exploratory factor analysis suggested that a four-factor structure provided the best balance of fit and parsimony (see Supplemental Table 1). We used two of the four factors in subsequent analyses: cognitive eating disorder symptoms (i.e., fear of weight gain, strong desire to lose weight, weight/shape overvaluation, weight/shape dissatisfaction) and binge eating (i.e., loss of control over eating, consuming an unusually large amount of food at once).

For psychopathology variables, the correlated factors model fit best according to absolute fit indices, whereas the bifactor model fit best according to relative fit indices. Examination of bifactor model results suggested that depression items had particularly strong loadings on the common factor, whereas alcohol items had non-significant loadings on the common factor, suggesting that the common factor did not adequately reflect general liability to psychopathology (see Markon, 2019 for discussion). This, combined with data suggesting that bifactor models often provide a better fit to the data compared to competing models even when the true population model follows a different or random structure (Bonifay & Cai, 2017; Murray &

Johnson, 2013), led us to retain the correlated factors models for psychopathology. Risk factors were also best modelled as correlated factors. Notably, DERS Awareness was uncorrelated with the remaining risk factors and removed from the final model. In contrast, the bifactor model was best-fitting for the protective factors across all fit indices. All items loaded significantly on the common protective factor and on their respective specific factor, suggesting an appropriate use of the bifactor model. Figures 1-3 depict the final measurement models with factor loadings.

Structural Equation Modeling: Main Effects

Table 3 presents results from the structural models examining risk and protective factors as predictors of psychopathology. Forty-five associations were tested in the risk factor model, and the smallest original *p* value considered significant was .005. Loneliness and difficulties employing effective emotion regulation strategies related to greater depressive symptoms, whereas difficulty controlling impulses when upset was associated with less depression. Greater repetitive negative thinking predicted greater anxiety symptoms, whereas more difficulty controlling impulses when upset predicted greater alcohol use and problems. Loneliness was associated with both cognitive eating disorder symptoms and binge eating, the prospective anxiety component of intolerance of uncertainty predicted cognitive eating disorder symptoms, and difficulties controlling impulses when upset related to binge eating.

For the protective factor model, 25 associations were tested, and the smallest original *p* value considered significant was .011. The common protective latent factor was negatively associated with all psychopathology symptoms except alcohol use. Regarding specific factors, lower mindfulness related to greater symptoms of all forms of psychopathology except alcohol use, lower meaning and purpose predicted higher depressive symptoms, and lower self-efficacy was related to greater anxiety symptoms.

Structural Equation Modeling: Interactions

A series of LMS models examined interactions between each risk and protective factor with COVID-19-related objective stress in the prediction of psychopathology. The main effect of COVID-19 objective stress was included and was significantly associated with anxiety symptoms (*p*s = .002-.015 across models). Forty-five interactions between risk factors and COVID-19 objective stress were tested, and the smallest original *p* value that was significant was .007. Interactions between objective stress and all risk factors except intolerance of uncertainty: prospective anxiety predicted anxiety symptoms. No interactions between COVID-19 objective stress and protective factors were observed.

Discussion

The first goal of this study was to examine associations between psychological risk and protective factors with depression, anxiety, alcohol use and problems, and eating pathology during the COVID-19 pandemic. Some risk and protective factors were broadly associated with mental health symptoms: loneliness, the common latent protective factor, and mindfulness were significantly related to most forms of psychopathology. Loneliness is a presumed negative consequence of the COVID-19 pandemic, although a surprising longitudinal study of US adults found no significant increase in loneliness from pre- to post-pandemic (Luchetti et al., 2020). Our findings extend previous work (e.g., Killgore et al., 2020; Okruszek et al., 2020) by suggesting that individuals who do experience greater loneliness during the pandemic have worse mental health, and this is true for not only depression but also cognitive and behavioral eating disorders symptoms. Our findings are consistent with those suggesting that mindfulness is a transdiagnostic protective factor and potentially an important target for prevention and intervention programs (Galante et al., 2018; van Gordon et al., 2019). Individuals who are more

mindful in their daily lives may be better able to focus on the smaller joys and uplifts present in everyday life over the larger unknowns associated with living through a global pandemic.

Regarding specific associations between risk/protective mechanisms and psychopathology, our results largely replicate research conducted in non-pandemic times. Impulse control difficulties when upset were related to both alcohol use and problems and binge eating behaviors. Alcohol use and binge eating are impulsive behaviors that are more likely to occur in response to negative emotions and may function as maladaptive emotion regulation strategies (Cooper et al., 1995; Haedt-Matt et al., 2011). Indeed, of the emotion regulation difficulties, impulse control problems have been most strongly related to these mental health symptoms (Dvorak et al., 2014; Racine & Horvath, 2018). Repetitive negative thinking was uniquely related to greater anxiety symptoms. Repetitive negative thinking encompasses both worry and rumination, and its association with anxiety (and depression) symptoms and diagnoses is well-documented (McEvoy et al., 2013; Spinhoven et al., 2018). Individuals who spend a disproportionate amount of time thinking about the COVID-19 pandemic, a situation completely outside of one's control, may be less likely to engage in healthy coping to mitigate its mental health effects. Lower self-efficacy related to greater anxiety symptoms, suggesting that individuals who are not confident in their ability to handle unexpected events (e.g., COVID-19 pandemic) are likely to experience greater anxiety symptoms. Finally, lower meaning and purpose related to greater depression symptoms. A sense of meaning and purpose has been shown to buffer against the development of depression in individuals who encounter stressful life events (e.g., cancer diagnosis; Vehling et al., 2011). In addition, anhedonia may impact an individual's ability to experience meaning and purpose in everyday activities.

The second study goal was to examine whether COVID-19 objective stress, and interactions between objective stress and risk/protective factors, predict psychopathology. COVID-19 objective stress was associated with anxiety symptoms, both on its own and in interaction with psychological risk factors. Individuals who experienced objectively stressful events due to the pandemic, such as loss of employment or a COVID-19 diagnosis in a close family member or friend, reported more physical and cognitive symptoms of anxiety over the past week. This association was even stronger for people who had greater levels of psychological traits that place them at risk for mental health problems, such as difficulties regulating emotions, intolerance of uncertainty, and repetitive negative thinking. Why was COVID-19 objective stress not associated with other mental health symptoms? Perhaps anxiety is the first and most noticeable mental health symptom experienced by individuals dealing with objective stressors. Symptoms of depression may not predominate until a longer period living alone or being unemployed, and emotional distress may take time to manifest as problematic alcohol use or disordered eating. Regarding interaction effects, the transdiagnostic risk and protective mechanisms examined in this study may not be the most relevant for predicting the occurrence of alcohol problems and disordered eating in response to stress. Instead, disorder-specific risk factors such as sensitivity to the calming effects of alcohol or pre-existing weight and shape concerns may help explain divergent mental health trajectories in response to a common stressor (Nolen-Hoeksema & Watkins, 2011).

Strengths of this study include the large sample and broad measurement of risk and protective factors and psychopathology symptoms. Limitations of this study are that the sample was not representative of the regions from which it was drawn. Although attempts were made to recruit participants globally, most (87.4%) lived in North America. Further, like many

psychology studies, our sample was WEIRD – Western, Educated, Industrialized, Rich, and Democratic. Thus, we must be careful to generalize to populations not well-represented in our data. Despite an interest in predicting psychopathology during the COVID-19 pandemic, our data were cross-sectional. We cannot say whether the examined risk and protective mechanisms relate to an increase in mental health symptoms from pre- to post-pandemic. Finally, despite high levels of depression, anxiety, and eating disorder symptoms in the sample, rates of problematic alcohol use were low. Limited variability on this outcome variable may explain why few risk and protective factors significantly predicted alcohol use and problems.

This study has important clinical implications. Attempts to increase social connection in lonely individuals and improve mindfulness abilities may have the widest ranging mental health impacts during the COVID-19 pandemic. In contrast, strategies to reduce impulsive behavior in response to emotions may aid in preventing alcohol problems and binge eating, while strategies to reduce repetitive negative thinking and increase self-efficacy may help prevent anxiety symptoms. Our data suggest that individuals who experience COVID-19-related objective stress are at increased risk for anxiety, particularly if they have pre-existing psychological tendencies that place them at risk for mental health problems. Programs to support individuals who are out of work, who work in healthcare, or who have had someone close to them diagnosed with COVID-19 should pay particular attention to anxiety as a consequence of these experiences and aim to reduce some of the negative psychological traits (e.g., poor emotion regulation) likely to exacerbate this anxiety.

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Table 1

Descriptive Statistics

Scale/subscale	*M (SD)*	Range	% above cut-off score (cut-off score)	Cronbach's alpha
DASS-21 Depression	15.41 (11.94)	0.00 - 42.00	48.3 (14)	.92
DASS-21 Anxiety	9.48 (9.26)	0.00 - 42.00	40.1 (10)	.84
PROMIS Alcohol	45.63 (8.30)	38.90 - 76.70	6.3 (60)	.93
EDE-QS Eating Disorder	9.60 (7.71)	0.00 - 36.00	25.8 (15)	.89
DERS-18 Clarity	6.51 (2.77)	3.00-15.00		.84
DERS-18 Awareness	7.08 (3.01)	3.00 - 15.00		.83
DERS-18 Non-acceptance	7.41 (3.64)	3.00-15.00		.91
DERS-18 Impulse	5.85 (3.24)	3.00-15.00		.93
DERS-18 Goals	9.84 (3.62)	3.00-15.00		.92
DERS-18 Strategies	6.75 (3.42)	3.00-15.00		.86
IUS-SF Prospective Anxiety	20.81 (6.25)	7.00 - 35.00		.87
IUS-SF Inhibitory Anxiety	12.65 (5.26)	5.00-25.00		.89
ULS-6 Loneliness	1.98 (0.84)	1.00 - 5.00		.85
RTQ-10 Repetitive Negative Thinking	31.88 (10.76)	10.00 - 50.00		.94
PROMIS General Self-Efficacy	47.35 (10.60)	18.60 - 64.70		.91
PROMIS Meaning & Purpose	46.38 (11.61)	21.20 - 65.50		.92
PROMIS Life Satisfaction	46.25 (10.87)	19.90 - 74.70		.87

MAAS Mindfulness	3.76 (0.90)	1.33 - 5.93	.90
COVID-19 Objective Stress	0.60 (0.74)	0.00-4.00	--

Note. DASS = Depression, Anxiety, and Stress Scales; PROMIS = Patient-Reported Outcome Measurement Information System; EDE-QS = Eating Disorder Examination – Questionnaire Short Form; DERS-18 = Difficulties in Emotion Regulation Scale 18 Item version; IUS-SF = Intolerance of Uncertainty-Short Form; RTQ-10 = Repetitive Thinking Questionnaire 10 item version; MAAS = Mindful Attention Awareness Scale. Cut-off scores for the DASS-21 represent moderate levels of depression and anxiety. All PROMIS scores are presented as T-scores.

Table 2

Fit Statistics for Measurement Models

Model	χ^2 (df)	CFI	TLI	SRMR	RMSEA [90% CIs]	AIC	Sample size adjusted BIC
Individual Scales							
DASS Depression	157.41 (14)	.94	.92	.033	.110 [.095, .126]	13591.65	13624.37
DASS Anxiety	91.13 (14)	.95	.92	.037	.081 [.066, .097]	13476.31	13509.02
PROMIS Alcohol	155.74 (14)	.93	.90	.037	.110 [.095, .126]	10211.39	10244.03
EDE-QS Eating‡	746.39 (54)	.79	.74	.072	.124 [.116, .132]	22394.21	22450.12
DERS-18	391.07 (120)	.97	.96	.039	.052 [.046, .058]	37575.01	37681.83
IUS-SF	439.47 (53)	.92	.90	.052	.093 [.085, .102]	27172.70	27230.11
UCLA Loneliness	37.06 (9)	.98	.97	.024	.061 [.041, .082]	11424.65	11452.63
RTQ-10 Repetitive Negative Thinking	376.23 (35)	.92	.90	.041	.108 [.098, .118]	23054.24	23100.72
General Self-Efficacy	3.63 (2)	1.00	1.00	.006	.03 [.000, .08]	7627.46	7646.12
Meaning & Purpose	14.54 (2)	.99	.97	.012	.087 [.049, .131]	8426.37	8445.02
Life Satisfaction	28.22 (5)	.99	.97	.016	.075 [.049, .102]	14100.46	14052.73

MAAS Mindfulness	410.52 (90)	.92	.91	.041	.065 [.059, .072]	39201.41	39271.13
Psychopathology							
Correlated Factors	**1113.13 (314)**	**.92**	**.91**	**.043**	**.058 [.054, .061]**	**48343.99**	**48485.77**
Hierarchical One-Factor	1305.95 (319)	.91	.90	.058	.061 [.058, .065]	48494.99	48628.83
Bifactor Model	1181.20 (298)	.92	.91	.059	.059 [.055, .062]	48312.86	48481.43
Risk Factors							
Correlated Factors	**2303.34 (824)**	**.93**	**.93**	**.046**	**.046 [.044, .048]**	**91234.67**	**91495.18**
Hierarchical One Factor	2690.27 (851)	.92	.91	.063	.050 [.048, .052]	91609.34	91827.23
Bifactor Model	2330.89 (817)	.93	.93	.052	.046 [.044, .049]	91275.93	91547.50
Protective Factors							
Correlated Factors	1019.88 (344)	.94	.94	.054	.048 [.045, .051]	68308.35	68450.34
Hierarchical One Factor	1020.03 (346)	.94	.94	.054	.048 [.044, .051]	68304.66	68443.50
Bifactor Model	**771.74 (322)**	**.96**	**.96**	**.030**	**.040 [.037, .044]**	**68071.15**	**68247.85**

Note. χ^2 = chi-square statistic; df = degrees of freedom; CFI = comparative fit index; TLI = Tucker-Lewis Index; SRMR = standardized root-mean-square-residual; RMSEA = root-mean-square error of approximation; AIC = Akaike Information Criterion; BIC = Bayesian Information Criterion; DASS = Depression, Anxiety, and Stress Scales; PROMIS = Patient-Reported Outcome Measurement Information System; EDE-QS = Eating Disorder Examination – Questionnaire Short Form; DERS-18 = Difficulties in

Emotion Regulation Scale 18 Item version; IUS-SF = Intolerance of Uncertainty-Short Form; RTQ-10 = Repetitive Thinking Questionnaire 10 item version; MAAS = Mindful Attention Awareness Scale. The best-fitting retained model is bolded

Table 3

Standardized Estimates from Structural Models Examining Main and Interaction Effects of Risk and Protective Factors in Predicting Psychological Symptoms

Variable	Depression		Anxiety		Alcohol use		Cognitive eating disorder symptoms		Binge eating	
Main Effects	β	*p*	β	*p*	β	*p*	β	*p*	β	*p*
Risk Factors										
DERS-18 Clarity	.044	.32	.109	.03	-.015	.81	.078	.15	.061	.32
DERS-18 Non-acceptance	.061	.19	.095	.06	.105	.09	.070	.22	.042	.50
DERS-18 Impulse	**-.123**	**.005**	.074	.17	**.201**	**.001**	-.052	.40	**.198**	**.002**
DERS-18 Goals	-.062	.15	-.089	.05	-.073	.20	-.080	.15	-.118	.04
DERS-18 Strategies	**.434**	**<.001**	.194	.02	-.121	.19	.197	.03	.127	.19
IUS-SF Prospective Anxiety	-.024	.70	.023	.74	.044	.60	**.249**	**.003**	.064	.45
IUS-SF Inhibitory Anxiety	.186	.01	.176	.04	-.009	.93	-.211	.03	.056	.58
ULS-6 Loneliness	**.299**	**<.001**	.030	.48	-.026	.60	**.247**	**<.001**	**.167**	**.001**
RTQ-10 Repetitive Negative Thinking	.096	.02	**.281**	**<.001**	.074	.19	.121	.04	.006	.93

Protective Factors										
Common Protective Factor	**-.480**	**<.001**	**-.745**	**<.001**	-.113	.05	**-.382**	**<.001**	**-.315**	**<.001**
PROMIS General Self-Efficacy	-.032	.55	**-.192**	**<.001**	.045	.38	-.008	.88	-.050	.33
PROMIS Meaning & Purpose	**-.192**	**.004**	.004	.95	-.049	.47	-.036	.60	-.066	.33
PROMIS Life Satisfaction	-.178	.05	-.139	.12	.051	.54	-.052	.56	-.043	.60
MAAS Mindfulness	**-.252**	**<.001**	**-.311**	**<.001**	-.084	.04	**-.211**	**<.001**	**-.209**	**<.001**
Interaction Effects with COVID-19										
Objective Stress										
Risk Factors										
DERS-18 Clarity	.016	.48	**.089**	**.002**	.021	.68	.025	.40	.019	.67
DERS-18 Non-acceptance	.015	.48	**.096**	**.001**	-.009	.84	.020	.49	.010	.80
DERS-18 Impulse	-.004	.86	**.094**	**.001**	.071	.20	-.001	.98	.020	.67
DERS-18 Goals	.043	.07	**.093**	**.002**	.024	.60	.024	.45	-.016	.70
DERS-18 Strategies	.018	.42	**.105**	**<.001**	.038	.47	-.005	.88	-.014	.74
IUS-SF Prospective Anxiety	.030	.19	.067	.03	.021	.68	.028	.36	.014	.74
IUS-SF Inhibitory Anxiety	.017	.40	**.079**	**.007**	.026	.61	.033	.28	.005	.90

ULS-6 Loneliness	-.003	.87	**.079**	**.006**	-.006	.91	.028	.37	-.045	.31
RTQ-10 Repetitive Negative Thinking	.027	.20	**.085**	**.001**	.00	.99	.024	.40	-.007	.84
Protective Factors										
Common Protective Factor	.023	.54	.007	.88	-.034	.54	-.011	.77	.041	.31
General Self-Efficacy	.023	.63	.026	.57	-.019	.70	.001	.98	.011	.80
Meaning & Purpose	.010	.86	-.037	.53	.059	.31	-.024	.63	.056	.35
Life Satisfaction	-.010	.90	-.014	.88	-.010	.89	-.073	.19	-.090	.11
MAAS Mindfulness	-.014	.76	-.074	.08	.007	.84	-.054	.11	-.005	.90

Note. DERS-18 = Difficulties in Emotion Regulation Scale 18 Item version; IUS-SF = Intolerance of Uncertainty-Short Form; RTQ-10 = Repetitive Thinking Questionnaire 10 item version; PROMIS = Patient-Reported Outcome Measurement Information System; MAAS = Mindful Attention Awareness Scale. Bolded values are significant after applying Benjamini-Hochberg procedure to decrease false discovery rate. Each interaction effect was tested in a separate model

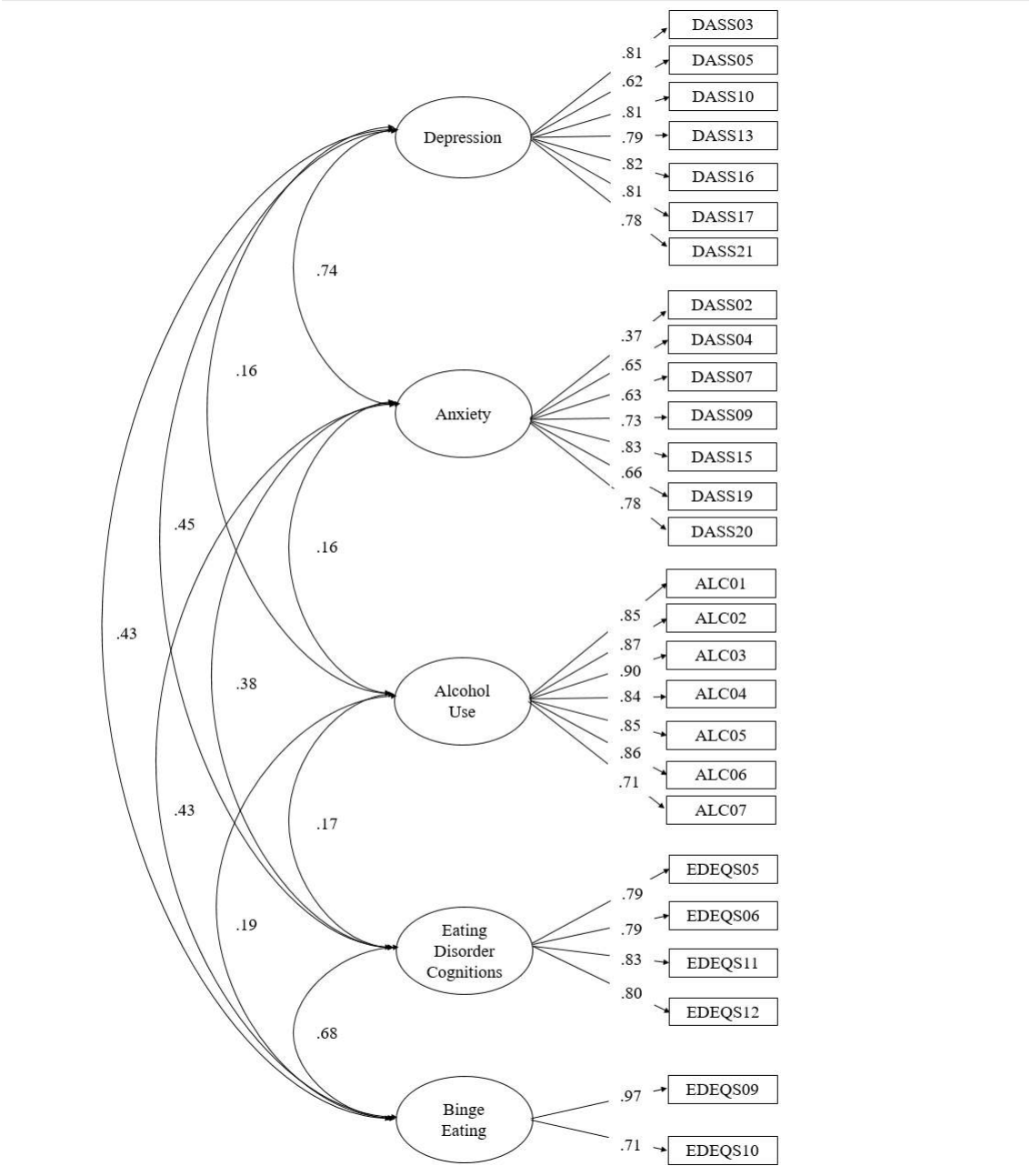

Figure 1. *Correlated Factors Model for Psychopathology Symptoms.* DASS = Depression, Anxiety, and Stress Scale; EDEQS = Eating Disorder Examination Questionnaire – Short

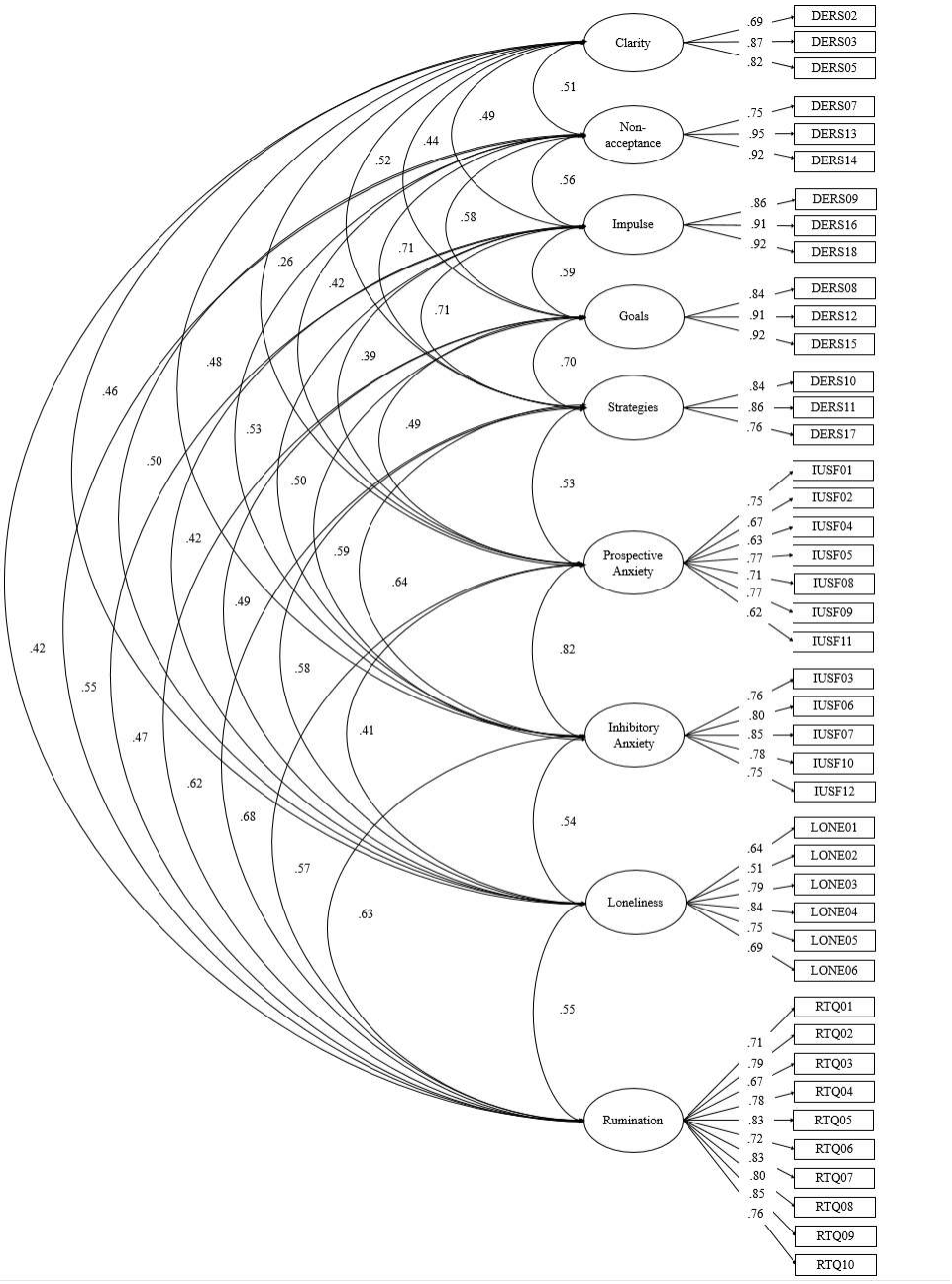

Figure 2. *Correlated Factors Model for Risk Factors.* DERS = Difficulties in Emotion Regulation Scale. IUS = Intolerance of Uncertainty Scale; RTQ = Repetitive Thinking Questionnaire

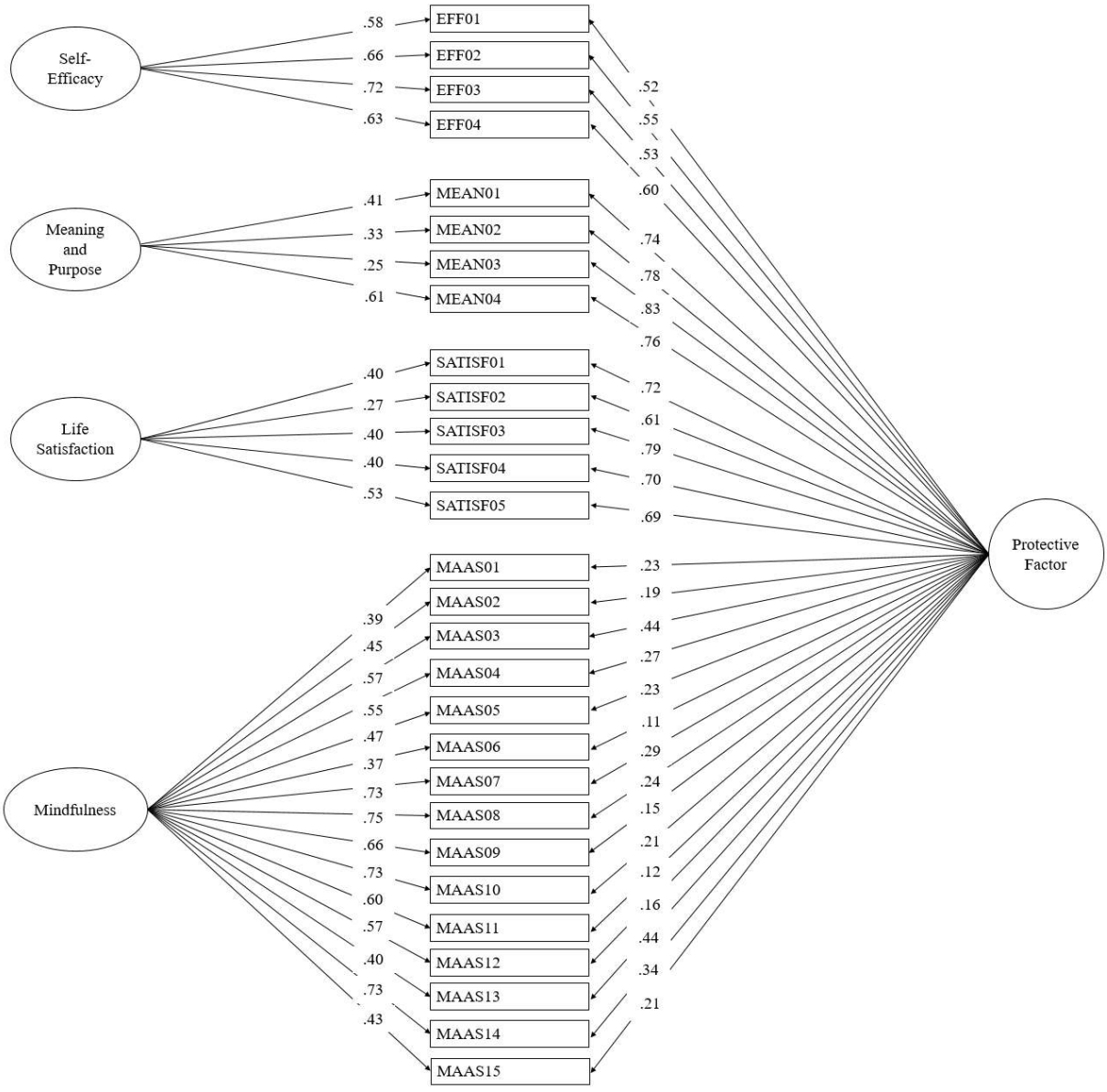

Figure 3. *Bifactor Model for Protective Factors*. MAAS = Mindful Attention Awareness Scale.