

# The role of fortitude, loneliness, and depression in the association between risk perception of contracting COVID-19 and life satisfaction: serial mediation analysis

Anita Padmanabhanunni   
and Tyrone Pretorius 

## Abstract

Recently, the COVID-19 pandemic has been found to have a negative impact on both physical wellbeing and mental health. Increased risk perception of contracting the virus has been associated with adverse psychological outcomes and reduced life satisfaction. However, susceptibility to psychological distress is influenced by personality-related characteristics. This study focuses on fortitude as a potential protective factor. The aim of this study is to investigate the parallel and serial mediating roles of fortitude, loneliness, and depression in the relationship between risk perception and life satisfaction. The participants were young adults ( $N = 337$ ) who have completed five self-report questionnaires: University of California Los Angeles Loneliness Scale, Centre for Epidemiological Studies Depression Scale, Fortitude Questionnaire, Satisfaction with Life Scale, and COVID-19 Risk Perception Scale. Descriptive statistics were generated, and structural equation modelling was used to examine the parallel and serial mediating roles of loneliness, depression, and fortitude. Positive associations were found between risk perception and loneliness and depression, and fortitude was found to mediate the relationship between risk perception and life satisfaction, between loneliness and life satisfaction, and between depression and life satisfaction. The overall serial mediation was also found to be significant, thereby supporting the hypothesis that those who perceive themselves to be at a risk of contracting COVID-19 have higher loneliness scores, which in turn is associated with higher depression scores. These findings confirm that fortitude is a salient protective factor and suggest that improving the perception of the ability to manage the risk of infection can enhance psychological wellbeing.

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Department of Psychology, University of the Western Cape, South Africa

## Corresponding author:

Tyrone Pretorius, Department of Psychology, University of the Western Cape, Robert Sobukwe Rd., Cape Town 7535, South Africa.

Email: [tpretorius@uwc.ac.za](mailto:tpretorius@uwc.ac.za)

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According to the World Health Organization (WHO), the novel coronavirus disease (COVID-19) outbreak of December 2019 represents a global public health emergency (WHO, 2020a). Not only does this disease have negative consequences on physical wellbeing, but many of the measures used to contain its spread have been shown to significantly impact mental health (Talevi et al., 2020). These measures included the mandatory closure of schools and universities, suspension of non-essential commercial activities, work-from-home directives, physical distancing policies, social isolation and quarantine, and strict travel restrictions (Rosenberg et al., 2020). Several cross-sectional studies that have been performed during the pandemic have documented a high prevalence of mental health disorders among the general population, most notably loneliness and depression (Lee et al., 2020; Padmanabhanunni & Pretorius, 2021b; Rosenberg et al., 2020).

Even prior to the pandemic, loneliness and depression were identified as significant public health problems and associated with a range of adverse outcomes, including substance use, suicidality, cognitive decline, and reduced life satisfaction (Chang, 2018; Horigian et al., 2020; Lamis et al., 2014). Loneliness is also a predictor of depression and is characterised by a feeling of lacking needed social connections (Lee et al., 2020). According to the social-cognitive theory of loneliness (Beck et al., 1974), the feeling of loneliness typically motivates people to reengage with their social networks; however, in the context of a pandemic, social contact may be appraised as potentially dangerous because of the perceived risk of contagion. Risk perception has been identified as a significant factor impacting mental health in the context of the current pandemic (Gorini et al., 2020). It is defined as an individual's subjective appraisals of the likelihood of being infected by a disease (Xie et al., 2020). Several studies (Lam et al., 2020; Xie et al., 2020) have confirmed that worrying about contracting the virus and transmitting it to significant others is associated with heightened psychological distress. Such worrying may lead to increased physical or social distancing and prolonged isolation (Gorini et al., 2020). The absence of meaningful connections with others and limited participation in pleasurable social activities can have an adverse impact on mood and precipitate depression (Padmanabhanunni & Pretorius, 2021a).

Despite such increased vulnerability to adverse mental health outcomes as a result of the pandemic, some studies (e.g., Sun et al., 2021) have also confirmed that psychological reactions to stressful and unpredictable life events differ between individuals and depend upon intrinsic characteristics (e.g., temperament, willingness to access social support, and self-esteem) and social factors (e.g., socioeconomic status). This underscores the role of protective factors that can mitigate negative mental health outcomes. In this study, we focus on fortitude as an intrinsic protective factor. The construct of fortitude (Pretorius, 1997) is grounded in Antonovsky's (1987) theory of salutogenesis and is defined as the strength to manage stress and stay well. This psychological strength to manage adversity is believed to be derived from fortigenic or positive cognitive appraisals of the self, family, and other important sources of social support (Pretorius, 1997). The role of fortitude in coping with adversity has been studied among various vulnerable populations, including university students who have been exposed to trauma (Padmanabhanunni & Wiid, 2021), adolescents living in contexts characterised by community violence (Pretorius et al., 2016), and health workers caring for patients with Alzheimer's disease (Heyns et al., 2003). These studies have confirmed that positive cognitive appraisals of the self and significant others can act as a salient protective factor in psychological outcomes.

The aim of this study is to investigate the parallel and serial mediating roles of loneliness, depression, and fortitude in the relationship between risk perception and life satisfaction. It can be argued that those who perceive themselves as being at a higher risk of contracting COVID-19 may engage in more self-isolating behaviours (Xie et al., 2020), which may lead to higher levels of loneliness and, in turn, higher levels of depression. We therefore hypothesise that a higher perception of the risk of contracting COVID-19 is associated with higher levels of loneliness, which in turn are associated with higher levels of depression. Furthermore, we hypothesise that fortitude mediates the relationship between risk perception and life satisfaction, as well as the relationship between the negative indices of psychological wellbeing and life satisfaction.

## Method

### Participants

Participants were drawn from the University student population. A random sample ( $N=337$ ) completed the survey online during the initial lockdown phase from March to June 2020. Given the length of the survey, limited demographic information was included. The majority of the participants resided in an urban area (75.4%) and were female (77.2%). The sample ranged in age between 18 and 28 years and had a mean age of 21.95 years (standard deviation [ $SD$ ]=4.7). With respect to COVID-19 status, 74.5% of the participants indicated that they had not been infected at that stage, whereas 3.9% ( $n=13$ ) either suspected or confirmed that they had been infected. A large proportion of the sample (42.4%) knew people or relatives who had been infected.

### Instruments

All the participants completed a brief demographic questionnaire as well as five other instruments: University of California Los Angeles Loneliness Scale (UCLA-LS; Russell et al., 1978), Centre for Epidemiological Studies Depression Scale (CES-D; Radloff, 1977), Fortitude Questionnaire (FORQ; Pretorius, 1998), Satisfaction with Life Scale (SWLS; Diener et al., 1985), and COVID-19 Risk Perception Scale (COVID-19 RPS), which is a subscale of the WHO COVID-19 Behavioural Insights Tool (WHO, 2020b).

The UCLA-LS consists of 20 items measured on a 4-point Likert-type scale that ranges from *I often feel this way* (1) to *I never feel this way* (4) and represents a measure of general loneliness. The theoretical range of scores is 20–80, with higher scores reflecting higher levels of loneliness. Examples of items include *I do not feel alone* and *I am an outgoing person*. The alphas reported for this scale typically range from .92 to .96 (Doğan et al., 2011). This scale has been used in the South African context with acceptable levels of reliability ( $\alpha=.77$ ; Pretorius, 1993).

The CES-D is a measure of depressive symptoms and consists of 20 items measured on a 4-point scale ranging from 0 (*Rarely or none of the time*) to 3 (*Most or all of the time*). The theoretical range of scores is 0–60, with higher scores reflecting higher levels of depression. Examples of items include *I felt sad* and *I had crying spells*. In the original validation study, this scale was tested in both psychiatric and general settings. Moreover, for this scale, Radloff (1977) reported coefficient alphas ranging from .85 to .90. Validity was also established by correlations with other self-report measures, as well as correlations with clinical ratings of depression. This scale has been used in the South African context (Pretorius, 1991), and a satisfactory coefficient alpha of .90 has been reported. Baron et al. (2017) used a shortened 10-item version of the CES-D in South Africa and reported alphas ranging between .69 and .89.

The FORQ consists of 20 items measured on a 4-point scale ranging from *Does not apply* (1) to *Applies very strongly* (4). This instrument measures appraisals in three domains: self, family, and support by others. The sum of these appraisals constitutes fortitude. The theoretical range of scores is 20–80, with higher scores indicating higher levels of fortitude. Examples of items include *I always feel pretty sure of myself*, *I rely on my family for emotional support*, and *Friends often have good advice to give*. In the original validation study, Pretorius (1998) reported a coefficient alpha of .85. This scale has been used in more than 50 studies. A review of these studies (Pretorius & Padmanabhanunni, 2020) has indicated that this scale has been used in various contexts, with different samples across lifespan, and that generally this scale has satisfactory reliability ( $\alpha = .75-.80$ ). The FORQ has also demonstrated satisfactory reliability in Canadian ( $\alpha = .89$ ; Beattie et al., 2016) and Indonesian ( $\alpha = .76-.90$ ; Yuwanto & Atmadji, 2019) samples.

The SWLS is a 5-item scale scored on a 7-point scale ranging from *Strongly disagree* (1) to *Strongly agree* (7) and measures the cognitive judgement of an individual's satisfaction with life in general. The theoretical range of scores is 5–35, with higher scores reflecting higher life satisfaction. Examples of items include *So far, I have gotten the important things I want in life* and *If I could live my life over, I would change almost nothing*. In a multinational study involving 21 countries, including South Africa, satisfactory reliability coefficients ranging between .59 and .74 have been reported (Alhajj et al., 2020). In another South African study, a coefficient alpha of .70 has been reported (Pretorius, 1997).

The COVID-19 RPS consists of three items scored on a 5-point scale ranging from *Extremely unlikely* (1) to *Extremely likely* (5) and measures the extent to which the participants perceive themselves to be at a risk of contracting the virus. The theoretical range of scores is 5–15, with higher scores reflecting a higher risk perception of contracting COVID-19. An example item is *What do you consider your own probability of getting infected by the novel coronavirus?* No reliability data have been reported.

## Procedure

Google Forms was used to develop an electronic version of the five scales as well as a brief demographic questionnaire. Permission was obtained from the registrar of the university to circulate the link to the questionnaire. The registrar's office also circulated the link to a random sample of 1200 students. A total of 337 responses were received over a 4-month period, representing a return rate of approximately 28%.

## Ethical considerations

This study was approved by the Humanities and Social Sciences Research Committee of the University of the Western Cape. Participation was voluntary, and all the participants completed the survey anonymously. The first item in the survey provided an opportunity for the participants to provide informed consent, whereas the last item provided the contact details of the South African Anxiety and Depression Group and the Centre for Student Support Services. All participants were encouraged to make use of these services if they experienced any distress while completing these questionnaires.

## Data analysis

IBM SPSS Statistics for Windows (version 26; IBM Corp., Armonk, NY, USA) was used to determine the descriptive statistics and intercorrelations between the study variables as well as reliabilities.

**Table 1.** Intercorrelations, descriptive statistics, and reliabilities of variables.

Variable	1	2	3	4	5
1. Risk perception	–				
2. Loneliness	.13*	–			
3. Depression	.16**	.58***	–		
4. Fortitude	–.02	–.64***	–.54***	–	
5. Life satisfaction	–.09	–.56***	–.51***	.57***	–
Mean	8.4	49.1	27.5	53.8	20.0
SD	2.1	11.6	13.4	11.5	7.7
Alpha	.57	.92	.92	.91	.89
Omega	.62	.93	.92	.91	.89

SD: standard deviation.

\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ .

Both Cronbach's alpha and McDonald's omega are reported for reliabilities due to concerns regarding coefficient alpha underestimating true reliability in multi-item measurement scales (Deng & Chan, 2017; Hayes & Coutts, 2020). The OMEGA macro, written by Hayes and Coutts (2020) for SPSS, was used for this purpose.

Structural equation modelling with IBM SPSS Amos (version 26; IBM Corp.) was used to examine the parallel and serial mediating roles of loneliness, depression, and fortitude. In this regard, Amos was used to determine the indirect effects of the predictor variables as well as bootstrapping of confidence levels and  $p$ -values. In contemporary analysis, indirect effects are regarded as a measure of mediation, and their value indicates the amount of mediation. In addition, confidence intervals are used to determine whether the indirect effects are different from zero. If zero does not fall within the confidence interval, the indirect effects are said to be significant (Kenny, 2018).

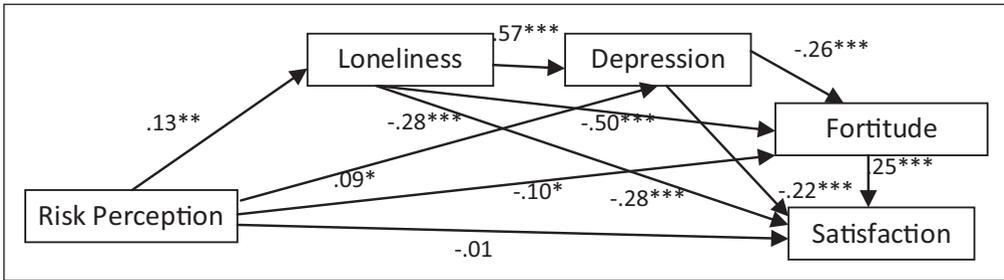
## Results

All the descriptive statistics, intercorrelations, and reliabilities (alpha and omega) are reported in Table 1.

Table 1 shows that risk perception was positively related to depression ( $r_{335} = .16, p = .015$ ) and loneliness ( $r_{335} = .13, p = .003$ ) and that depression also had a positive relationship with loneliness ( $r_{335} = .58, p < .001$ ). These negative indices of psychological wellbeing were negatively related to fortitude (loneliness:  $r_{335} = -.64, p < .001$ ; depression:  $r_{335} = -.54, p < .001$ ) and life satisfaction (loneliness:  $r_{335} = -.56, p < .001$ ; depression:  $r_{335} = -.51, p < .001$ ). In terms of reliability, all scales, with the exception of risk perception, were found to have satisfactory reliability coefficients in terms of both alpha and omega ( $\alpha = .89-.92$  and  $\omega = .89-.93$ ). The risk perception scale was also found to have low reliability in terms of coefficient alpha, but an acceptable level of reliability in terms of coefficient omega (Ursachi et al., 2015).

Figure 1 shows the serial mediation model tested.

In this model, it was presumed that the perception of being at a risk of contracting COVID-19 may lead to stricter self-isolation and, thus, be associated with higher levels of loneliness, which in turn are associated with higher levels of depression. The association between risk perception as well as these negative indices of psychological wellbeing and life satisfaction is mediated by fortitude.



**Figure 1.** Path analytical model of the interrelationship between the study variables.

The regression coefficients are standardised estimates.

\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ .

**Table 2.** Direct and indirect effects for the study variables.

Variable	Beta	SE	$\beta$	95% CI	$p$
<b>Direct effects</b>					
Risk perception → loneliness	.000	.00	.13	[.05, .21]	.006
Risk perception → depression	.075	.03	.09	[.01, .17]	.053
Risk perception → fortitude	-.109	.04	.10	[.02, .17]	.044
Risk perception → satisfaction	-.075	.04	-.01	[-.10, .07]	.801
Loneliness → depression	.000	.00	.57	[.50, .63]	.001
Loneliness → fortitude	-.148	.03	-.50	[-.57, -.42]	.001
Loneliness → satisfaction	-.281	.05	-.28	[-.38, -.16]	.001
Depression → fortitude	.000	.00	-.26	[-.34, -.18]	.001
Depression → satisfaction	-.064	.02	-.22	[-.31, -.12]	.001
Fortitude → satisfaction	.000	.00	.25	[.14, .35]	.001
<b>Indirect effects</b>					
Risk perception → fortitude → satisfaction	.085	.05	.02	[.18, .78]	.024
Loneliness → fortitude → satisfaction	-.081	.02	-.12	[-.12, -.04]	.001
Depression → fortitude → satisfaction	-.037	.01	-.06	[-.06, -.02]	.001
Risk perception → loneliness → depression → fortitude → satisfaction <sup>a</sup>	-.017	.01	.08	[-.04, -.01]	.004

<sup>a</sup>Overall serial mediation model as depicted in Figure 1.

Table 2 outlines the direct and indirect effects obtained in this path analysis.

Table 2 shows that, with the exception of the association between risk perception and life satisfaction, all of the direct effects were significant since zero did not fall within the confidence interval. In this regard, the results show a positive association between risk perception and loneliness ( $\beta = .13$ , 95% confidence interval [CI] = [.05, .21]), a positive association between risk perception and depression ( $\beta = .09$ , 95% CI = [.01, .17]), a positive association between risk perception and fortitude ( $\beta = .10$ , 95% CI = [.02, .17]), a positive association between loneliness and depression ( $\beta = .57$ , 95% CI = [.50, .63]), a negative association between loneliness and fortitude ( $\beta = -.50$ , 95% CI = [-.57, -.42]), a negative association between loneliness and life satisfaction ( $\beta = -.28$ , 95% CI = [-.38, -.16]), a negative association between depression and fortitude ( $\beta = -.26$ , 95% CI = [-.34, -.18]), a negative association between depression and life satisfaction ( $\beta = -.22$ , 95% CI = [-.31, -.12]), and finally a positive association between fortitude and life satisfaction ( $\beta = .25$ , 95% CI = [.14, .35]).

This implies that a higher risk perception is associated with increased loneliness and depression, whereas higher levels of loneliness and depression are associated with lower levels of fortitude and life satisfaction.

The indirect effects were all significant since zero did not fall within the confidence interval in all instances. These indirect effects show that fortitude mediates the relationship between risk perception and life satisfaction ( $\beta = .02$ , 95% CI = [.18, .78]), the relationship between loneliness and life satisfaction ( $\beta = -.12$ , 95% CI = [-.12, -.04]), and the relationship between depression and life satisfaction ( $\beta = -.06$ , 95% CI = [-.06, -.02]). In addition, Table 2 also shows that the overall serial mediation was significant ( $\beta = .08$ , 95% CI = [-.04, -.01]). This supports the hypothesis that those who perceive themselves to be at a risk of contracting COVID-19 have higher loneliness scores, which in turn are associated with higher depression scores. In addition, fortitude was found to mediate the serial relationship between risk perception and loneliness, depression, and life satisfaction.

## Discussion

In this study, we examined the parallel and serial mediating roles of loneliness, depression, and fortitude in the relationship between risk perception and life satisfaction. Several important findings can be pointed out. First, positive associations were found between risk perception and loneliness and depression, whereas negative associations were found between loneliness, depression, and fortitude and life satisfaction. This implies that a higher risk perception is associated with increased levels of loneliness and depression, whereas higher levels of loneliness and depression are associated with lower levels of fortitude and life satisfaction. This confirms prior research (e.g., Lam et al., 2020) demonstrating that increased fear of contracting the virus leads to social withdrawal, which in turn precipitates feelings of loneliness and depression. However, the findings are also in contrast with other studies (e.g., Li et al., 2021) that have demonstrated that a higher risk perception is associated with increased active coping, which reduces psychological distress. Adverse life events typically prompt individuals to activate or access protective resources; however, in the context of a pandemic, it is probable that these resources (e.g., social support) may be perceived as being under threat (Li et al., 2021). This can potentially dampen fortigenic appraisals regarding the availability and accessibility of family and friends in times of need. It has also been established (e.g., Li et al., 2021) that reduced appraisals of social support can adversely impact problem-focused coping. This may further account for the negative association between the indices of psychological distress and fortitude. Uncertainty regarding the course of the pandemic, the absence of a vaccine at the time, and limited access to personal protective equipment may have an impact on the positive appraisals of the self as competent and capable of managing adversity and increase mental health problems.

Second, fortitude was found to mediate the relationship between risk perception and life satisfaction, the relationship between loneliness and life satisfaction, and the relationship between depression and life satisfaction. This lends support to the protective role of fortitude against mental health problems during a pandemic. Fortigenic appraisals of the self are similar to the construct of coping self-efficacy, which has been found to promote effective coping in the context of traumatic life events (Shahrour & Dardas, 2020).

Third, the overall serial mediation was found to be significant, which confirms the hypothesis that those who perceive themselves to be at a risk of contracting COVID-19 have higher loneliness scores, which in turn are associated with higher depression scores. In addition, fortitude was found to mediate the serial relationship between risk perception and loneliness, depression, and life satisfaction. This has important implications for interventions and suggests that improving the

perceptions of the ability to manage the risk of infection can enhance psychological wellbeing. Increased knowledge of the symptoms and routes of transmission of COVID-19 can also enhance appraisals of the ability to cope with the pandemic (Li et al., 2021). Online psychological self-help programmes, such as cognitive-behavioural therapy and mindfulness-based interventions, can be used to challenge cognitive biases related to the overestimation of the risk of infection and, thereby, enhance confidence in the ability to cope (Heath et al., 2020; Xiong et al., 2020). Cognitive restructuring techniques, psychoeducation, and skills building can also be used to enhance positive appraisals of the self and others and, thereby, facilitate coping.

This study has some limitations. A cross-sectional survey design was used and the questionnaires were of a self-report type, which may lead to recall and reporting biases. Hence, causal relationships should be interpreted with caution and future longitudinal studies would be beneficial in corroborating the study's findings.

## Conclusion

This study was exploratory in nature and provided important insights into the role of protective factors, such as fortitude, in influencing psychological outcomes during the COVID-19 pandemic. It also offered insights into the potential pathways among indices of psychological distress and wellbeing. The study also provides suggestions for interventions aimed at enhancing fortitude.

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## ORCID iDs

Anita Padmanabhanunni  <https://orcid.org/0000-0001-7733-7486>

Tyrone Pretorius  <https://orcid.org/0000-0002-6325-6623>

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