

The interplay between anxiety, fear, protective behaviors, compassion, and resilience among older adults during a COVID-19 lockdown: a structural equation modeling study

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Abstract

The implementation of lockdown measures to curb the transmission of Coronavirus disease-2019 (COVID-19) has brought about significant psychological impacts and older adults have been identified as one of the vulnerable groups. In the current COVID-19 context among older adults in the community, the fear of COVID-19, anxiety symptoms, compassion, resilience, and the practice of protective behaviors are possibly related to each other in several ways. How these factors relate to each other would have important implications in managing the spread of the disease and its mental health consequences. To this end, we modeled their interrelationships using a structural equation model. Older adults ($N = 421$), aged 60 and above completed various questionnaires—COVID-19 Fear Inventory, Short form of the Geriatric Anxiety Inventory, COVID-19 Risky and Protective Behaviours, Resilience Appraisals Scale, and Compassion Scale during a COVID-19 lockdown. The relationships between these variables were assessed within a structural equation model. The findings showed that older adults who are more compassionate engage in protective behaviors more frequently. Additionally, frequent practice of protective behaviors and greater resilience predicted lower anxiety among older adults. Greater fear predicted higher anxiety levels but did not significantly influence an individual's engagement in protective behaviors. Mental health services are crucial in fostering resilience and supporting older adults psychologically. Social services are also necessary in maintaining and enhancing social support for older adults. Importantly, these findings suggest that public health communications could promote compassion and avoid using a fear-based approach to increase engagement in protective behaviors.

Keywords

COVID-19, Older adults, Protective behavior, Anxiety, Mental health, Psychosocial

INTRODUCTION

The emergence of Coronavirus disease-2019 (COVID-19) has caused an unprecedented global health crisis. World Health Organization's recommendations on lockdown measures have been implemented in most countries to break the chain of transmissions [1]. In Singapore, a nation-wide circuit breaker (CB) measure was implemented from April 7, 2020 to July 1, 2020 to contain the community spread of COVID-19. This lockdown measure

Implications

Practice: Psychological interventions such as mindfulness practice and social services focusing on enhancing social support are important avenues for cultivating and strengthening resilience among older adults to support their mental health during and post the COVID-19 pandemic.

Policy: Public health communications should employ positive framing to effectively increase engagement in protective behaviors without arousing negative emotions and include messages that promote feelings of unity to foster a sense of compassion.

Research: Future research analyzing longitudinal data is needed to further examine the relationship between anxiety and protective behaviors.

Lay Summary

This study focused on the interrelations between various psychosocial factors (i.e., fear of COVID-19, compassion, and resilience) and the behavioral (i.e., engagement in protective health behaviors) and psychological responses (i.e., anxiety) to COVID-19 among community-dwelling older adults. The study analyzed self-reported data from 421 older adults who are aged 60 and above. The findings showed that older adults who are more compassionate engage in protective behaviors more frequently. Additionally, older adults who showed greater resilience and engage in protective health behaviors more frequently reported lower anxiety levels. Lastly, greater fear of COVID-19 predicted greater anxiety among older adults but did not significantly influence their engagement in protective health behaviors.

allowed people to leave their homes only for essential goods and services such as grocery shopping but prohibited social activities [2].

Recently, the psychological impact of social distancing during the COVID-19 pandemic has been rigorously discussed [3–5]. With most efforts currently being channeled to understanding and

treating COVID-19 infections, mental health impacts were initially overlooked and surfaced as a secondary health concern of COVID-19 [6]. Older adults have been highlighted as a vulnerable group to psychological impacts and one psychological health concern that has been recognized is anxiety [6]. They have more to fear from COVID-19 since they are at greater risk of morbidity and mortality due to the greater likelihood of having existing health conditions and weaker immune systems [7, 8]. Other than affecting an individual's mental health, anxiety could potentially affect a larger population as increased anxiety could lead to maladaptive behaviors among individuals, such as panic-buying and over-burdening of community resources due to a disproportionate increase in help-seeking behaviors [9, 10].

At both the society and individual level, building resilience has been shown to be important in striving during uncertainties and in coping with pandemic-related psychological stress [11]. Studies conducted during the COVID-19 quarantine period reported that individuals with higher levels of trait resilience were protected from psychological distress [12] and showed that lower psychological resilience was associated with adverse mental outcomes such as severe anxiety [13].

In addition, the practice of protective behaviors could be useful in reducing anxiety levels; as greater engagement in protective behaviors may reassure people that they are more protected from being infected with COVID-19, thus easing their anxiousness. Reassurance helps control our sense of threat and is a useful mechanism to regulate anxiety [14]. A study on Influenza A(H1N1) showed a negative relationship between state anxiety and some recommended health behaviors such as hygiene practices but a positive relationship with other health behaviors such as social distancing [15].

During a pandemic, fear could increase the healthy individual's anxiety and stress levels and exacerbates anxiety symptoms in those with preexisting psychiatric conditions [16]. Positive correlations between fear and anxiety have been found in the general population [17, 18]. A US study reported that fear of COVID-19 is associated with mental

health outcomes such as anxiety and has shown that Asians reported significantly higher fear of COVID-19 than non-Asians [19]. This could be due to cultural differences as a study showed that Asians, who practice collectivism culture, showed significantly greater fear and greater acceptance toward fear-related advertising messages than Americans, who practice individualistic culture [20]. This may be relevant to the local context as Confucianism which is commonly practised in Singapore, promotes collective norms [21, 22].

Compassion has recently gained attention for its potential role in helping people understand others' feelings and sufferings due to COVID-19; this in turn, motivates them to reduce public health burden by practising protective health behaviors to alleviate the spread of infection [23–26]. Public adoption of recommended protective health behaviors is a crucial requisite to curbing the spread of COVID-19 and facilitating the resumption of usual activities. Studies during H1N1 showed strong associations between fear and health behaviors [27, 28]. Furthermore, several studies have found that compliance with COVID-19 preventive measures was determined by an individual's fear of COVID-19 [29, 30]. It has been suggested that negative emotions may serve adaptive and protective functions, such as encouraging health-promoting behaviors [31].

These previously documented associations have significant implications on managing the spread of COVID-19 as well as its mental health consequences. However, it is unclear if such associations can adequately describe the current COVID-19 context, especially among community-living older adults. To this end, we attempted to model these previously documented associations into a structural equation model (SEM), and tested this model with data collected from community-dwelling older adults during a COVID-19 lockdown. Specifically, we tested the following hypotheses within a single SEM (Fig. 1):

H1: Older adults who are more compassionate may engage in more protective health behaviors.

H2: Older adults who are more fearful of COVID-19 may engage in more protective health behaviors.

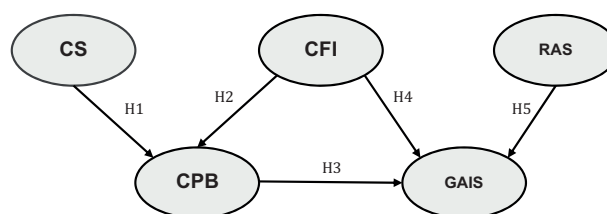


Fig 1 | Proposed structural equation model based on the five hypotheses. *CFI* Fear of COVID-19; *CPB* Protective Health Behaviours; *CS* Compassion; *GAIS* Geriatric Anxiety Inventory Short Form; *RAS* Resilience; *H1–5* Hypotheses 1–5. [H1: Older adults who are more compassionate may engage in more protective health behaviors. H2: Older adults who are more fearful of COVID-19 may engage in more protective health behaviors. H3: Older adults who engage in more protective health behaviors may have lower anxiety states. H4: Older adults who are more resilient may have lower anxiety states. H5: Older adults who are less fearful of COVID-19 may have lower anxiety states.]

H3: Older adults who engage in more protective health behaviors may have lower anxiety states.

H4: Older adults who are more resilient may have lower anxiety states.

H5: Older adults who are less fearful of COVID-19 may have lower anxiety states.

METHODS

Participants and procedure

Six hundred and fourteen participants who had previously participated in the “Intergenerational Study on Ageing and Mental Health: The CHI Study” were contacted during the CB period for this study [32]. The inclusion criteria were older adults who are literate in English or Mandarin and not diagnosed with dementia. Recruitment was conducted via phone calls and consent was taken either verbally or online, depending on whether participants choose to complete the questionnaires offline or online, respectively. Accordingly, participants either received the hardcopy questionnaire via mail or were invited by email to complete the questionnaire on Qualtrics (Qualtrics, Provo, UT). A reimbursement fee of \$10 was given upon completion. A total of 421 participants completed the questionnaires and their data were analyzed. Table 1 shows the demographic characteristics of participants. The data collection was during the CB period between May 11 and June 25, 2020. The study had ethics board approval from the Institutional Review Board National University of Singapore (NUS-IRB Reference code: S-20-118E).

Measures

COVID-19 Fear Inventory

Although there is an existing 7-item Fear of COVID-19 scale to study individual’s fear toward COVID-19 [34], this scale or other similar scales were not available at the time this study was conceived. Hence, we constructed the 13-item COVID-19 Fear Inventory (CFI) from scratch, with references to measures that assessed fear of previous pandemics such as Ebola [35] and Swine Flu(H1N1) [36] (see [Supplementary Material](#)). Using a 5-point Likert scale (0 = Not at all to 5 = Very much), it was used to assess participants’

fear of COVID-19. Our scale shares some similarity with that of Ahorsu et al.’s [34] in terms of assessing the psychological consequence of COVID-19. Additionally, our scale also assessed items relating to the fear of other COVID-19 related consequences such as fear of health, unknowingly infecting others, broader socioeconomic consequences, losing loved ones as well as supply shortage. The Cronbach’s alpha for CFI is .89. Higher CFI scores indicate greater fear toward COVID-19.

Short form of the Geriatric Anxiety Inventory

The 5-item Geriatric Anxiety Inventory-Short Form (GAIS) was used to assess participants’ general anxiety during the CB period. This scale has been validated in nonclinical older adult samples [37, 38]. The Cronbach’s alpha for GAIS is .78. Higher GAIS scores represent greater anxiety.

COVID-19 Risky and Protective Behaviours

The 12-item COVID-19 Risky and Protective Behaviours (CPB) was constructed from scratch based on recommendations by World Health Organisation [39] and relevant health organizations and authorities in Singapore [40, 41]. Some existing sources that measured behavioral responses toward previous pandemics such as H1N1 [15, 42] and SARS [43] were also considered (see [Supplementary Material](#)). Using a 5-point Likert scale (0 = Never to 5 = All the time), it was used to understand participants’ actual health behaviors over the past week by indicating their frequency of engagement in risky and protective health behaviors. The Cronbach’s alpha for CPB is .63. Though this alpha value is acceptable (i.e., >.60) [44], it is relatively low compared with those of other measures. Nevertheless, this is not unusual given that this scale assesses a range of behaviors in very diverse situations; we do not expect the items to be very highly correlated with each other. Higher CPB scores indicate greater engagement in protective behaviors.

Resilience Appraisals Scale

The 12-item Resilience Appraisals Scale (RAS) was used to assess participants’ resilience in the areas of emotional coping, social support and problem solving through a 5-point Likert scale (0 = Strongly disagree to 5 = Strongly agree) [45]. This scale was used to assess psychological resilience among local community-dwelling older adults [46]. The Cronbach’s alpha for RAS is .88. Higher RAS scores represent greater resilience.

Compassion Scale

The 10-item Compassion Scale (CS) was used to measure five dimensions of compassion: generosity, hospitality, objectivity, sensitivity, and tolerance across social networks and relationships [47]. A 7-point Likert scale (0 = None to 7 = All) was

Table 1 | The demographic characteristics of 421 participants in this study

Characteristics	Range	Mean \pm SD/ frequency (%)
Age (years)	60–87	69.1 \pm 5.5
Male, n (%)	—	146 (34.7%)
Year of Schooling	1–30	13.4 \pm 3.9
Mini Mental State Examination (MMSE)	20–30	28.3 \pm 1.6

Note. Values represent mean with standard deviation or number of participants. The optimal suggested cutoff point for detecting early cognitive impairment among older adults aged 60 and above is 26/27 [33].

employed. The Cronbach’s alpha for this scale is .74. Higher CS scores indicate greater sense of compassion. The means and standard deviations of all measures used are shown in Table 2.

Data analysis

SEM was performed using R package lavaan [48]. The parameter estimation was analyzed by using the Robust maximum likelihood. The Root Mean Square Error of Approximation (RMSEA), Comparative Fit Index, Standardised Root Mean square Residual (SRMR), Akaike Information Criterion (AIC), and Bayesian Information Criterion (BIC) were used to assess model fit. To evaluate the model fit, RMSEA <.10 [49], Comparative Fit Index >.90 [50], and SRMR <.10 [49] were considered. Missing data were handled with full information maximum likelihood available data. Statistical significance was set at $p < .05$. All analyses were performed in R version 4.0.2. The R code for executing these analyses are available at https://osf.io/dqmb4/?view_only=0dfc6ed82d52401390594a437cb80314.

RESULTS

Confirmatory factor analysis and Pearson correlation

A one-factor confirmatory factor analysis model was used to obtain the best-fit measurement model

for each variable. Each measurement model was improved by removing low loading indicators and including residual covariances to obtain satisfactory fit indices. The final Comparative Fit Index for each studied latent variable ranged from .917 to .99 (see Supplementary Table S1). Pearson correlations between all latent variables were also calculated (see Supplementary Table S2).

Evaluation of proposed model

The proposed model was tested to examine the hypothesized associations between the latent variables (Fig. 2a). Model fit indices demonstrated a reasonable fit ($\chi^2(837) = 1,478.166, p < .001$; Comparative Fit Index = .909; RMSEA = .044; SRMR = .061) showing that the model fitted the data adequately. Greater compassion positively and significantly predicted greater engagement in protective behaviors ($p < .05$). Individuals’ fear of COVID-19 did not have a significant effect on their engagement in protective behaviors ($p > .05$) but it positively and significantly associated with higher levels of anxiety ($p < .001$). Greater engagement in protective behaviors ($p < .05$) and higher levels of resilience ($p < .01$) significantly and negatively predicted anxiety.

Since fear of COVID-19 is not a significant predictor of engagement in protective behaviors, we removed it as a predictor of engagement in protective

Table 2 | The mean and standard deviation of all measures used in this study

Measures	Maximum score	Mean ± standard deviation
COVID-19 Fear Inventory (CFI)	50	31.2 ± 12.7
Short form of the Geriatric Anxiety Inventory (GAIS)	5	0.5 ± 1.5
COVID-19 Risky and Protective Behaviours (CPB)	40	36.3 ± 6.0
Resilience Appraisals Scale (RAS)	55	36.5 ± 5.9
Compassion (CS)	63	28.3 ± 9.0

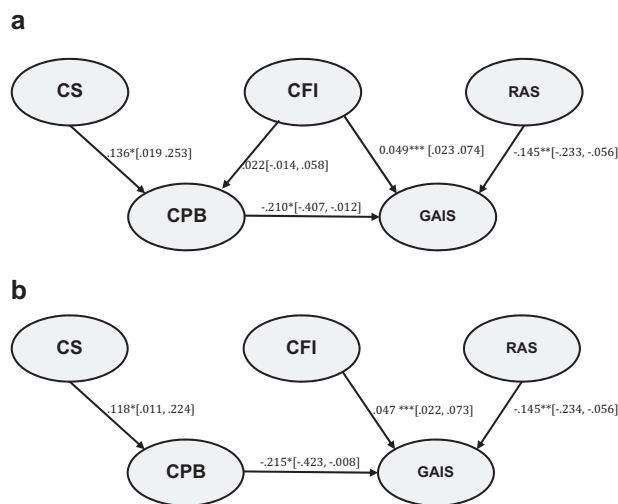


Fig 2 | (a) Results of the proposed structural equation model. (b) Results of the final structural equation model. Note. Comparative Fit Index = .909. The numbers represent unstandardized path coefficients and values within the square brackets indicate the 95% confidence interval. CFI Fear of COVID-19; CPB Protective Health Behaviours; CS Compassion; GAIS Geriatric Anxiety Inventory Short Form; RAS Resilience. * $p < .05$, ** $p < .01$, *** $p < .001$.

behaviors. Model fit indices showed a satisfactory fit for the second model ($\chi^2(838) = 1,480.695, p < .001$; Comparative Fit Index = .909; RMSEA = .044; SRMR = .062). A chi-square test of difference ($\Delta\chi^2(1) = 2.423, p = .120$) indicated that there was no significant difference between the proposed model and second model. Hence, the second and more parsimonious model was chosen as the final model and Fig. 2b shows the evaluated final model with unstandardized coefficient for each pathway.

DISCUSSION

This cross-sectional study explored the effect of psychosocial factors on protective behaviors and anxiety state of community-dwelling older adults during the isolation period of the COVID-19 pandemic in Singapore. Firstly, the results indicated that compassion positively predicted protective behaviors. In addition, resilience and protective health behaviors negatively predicted anxiety among older adults. Lastly, fear of COVID-19 positively predicted anxiety among older adults but did not significantly influence individuals' engagement in protective behaviors. Overall, these findings provide important and timely perspectives on managing the spread of the disease (via facilitating protective behaviors) and its mental health consequences.

Surprisingly, fear did not significantly relate to individuals' engagement in protective health behaviors even though previous studies suggest that fear motivates people to increase protective behaviors [30, 31]. The difference in results could be due to the unintended consequence of fear—the sense of hopelessness [51, 52]. This may result in fatalistic thinking, where individuals accept the threat instead of coping with it [52]. Thus, feeling hopeless may lead to acceptance of the threat (i.e., accepting the possibility of being infected with COVID-19), which then translates to inaction (i.e., not practising protective health behaviors). Another possible supporting evidence could be the idea that fear appeals are loss-framed messages (emphasize the costs of not performing a behavior) and loss-framed messages induce greater intentions to perform a detection behavior instead of prevention behavior [53]. For example, screening for infection is a detection behavior while using masks is a prevention behavior. Protective health behaviors in this paper fall into the prevention or promotion behaviors category, which could potentially explain why fear did not predict protective behaviors.

An interesting finding of this study is that protective health behaviors negatively predicted anxiety. While this result supports our hypothesis, it differs from previous results suggesting that anxiety positively predicts protective health behaviors [42, 54, 55], but nevertheless is consistent with some findings [15]. Moreover, our result aligns with a recent study which has found that precautionary measures against COVID-19, such as hand washing, mitigate anxiety levels [56]. The cross-sectional association between anxiety and protective behaviors may reflect effects in both causal

directions, which we are unable to tease apart from a cross-sectional dataset. Nevertheless, a positive association between anxiety and protective behaviors might be consistent with the notion that anxiety triggers protective behaviors, whereas a negative association would be consistent with the idea that protective behaviors would offer a sense of reassurance, thus relieving anxiety. In the current study, it appears that the latter explanation applies better to the current context. Perhaps, the relationship between anxiety and protective behaviors is complex and a longitudinal study could further examine this relationship. Nonetheless, this result is worth-noting as it sheds light on the psychological impact contributed by behavioral responses to COVID-19.

We also observed that compassion significantly predicted protective behaviors and resilience significantly predicted anxiety. Research on compassion and resilience is an emerging field and there are gradually more calls for compassion [23–26] and resilience during the COVID-19 pandemic [7, 8, 11, 57] due to their positive influence on behaviors and psychological health. Our results aligned with the findings of some existing studies. For example, a study conducted on Slovene adults which included older adults, reported that people with higher resilience levels would have better psychological functioning to cope with COVID-19 as resilience potentially buffers the negative effects of demographic characteristics and health factors on their mental health [57]. Additionally, a study on compassion among older adults highlighted that compassion contributes to prosocial behaviors and older adults with greater resilience are more likely to have higher levels of compassion [58]. It is also interesting to note that compassion is related to Confucianism and is in fact, one of the key ideas of Confucian teachings [59]. Given that Confucian traditions are highly salient in the local cultural context, public health messages have at times been framed as being compassionate to others. Our findings extend the results of the few existing studies, further highlighting the important role of compassion and resilience during the COVID-19 situation.

Our study presents major implications for the clinical and larger societal context. Seniors with lower resilience are at higher risk of developing anxiety symptoms and are a vulnerable group that should be given more care and attention. Psychosocial interventions could be implemented to foster and strengthen resilience among older adults to maintain good psychological health or support them in coping with any potential adverse psychological effects during the pandemic and facilitate recovery during the post-pandemic period. To enhance psychological resilience, mental health professionals could guide and encourage older adults to practise mindfulness [60–62] as well as promote emotion regulation through consistent and active emotional self-care [63]. As social support is also critical to the psychological resilience of older adults during

pandemics [57], it is necessary for older adults to build and maintain social relationships. Since this may be harder to execute when social distancing is required, social services, friends and family members of older adults could make use of information and communications technology to maintain social contact. Moreover, it is beneficial for older adults to maintain positive thoughts (e.g., accepting change and staying optimistic) as well as find purpose (e.g., setting and striving toward a goal) while staying at home [57].

Considering the finding that fear does not motivate protective health behaviors and may undermine psychological health, public health communications could perhaps avoid using a fear-based approach. Furthermore, fear-based approach could lead to greater anxiety, which may translate to poorer mental health outcomes for the older adults. As such, positive framing may be more adaptive as it could educate and inform older adults to promote public health behaviors without arousing negative emotions [64]. Our findings also suggest the importance of fostering a sense of compassion for others in order to keep everyone safe from the pandemic. It may be useful for public health communications to include messages that promote feelings of unity, as a shared sense of identity has been shown to underlie compassion during crises and could promote pro-social and cooperative behaviors [25].

The study is limited by its cross-sectional nature, which prevents causal inferences to be made. As the questionnaire ratings are self-reported, there may be social desirability bias. We are also unable to study other relevant factors such as self-efficacy [65, 66]. While our self-constructed fear of COVID-19 scale encompassed several major dimensions of fear such as fear of health, supply shortage, broader socioeconomic and psychological consequences of COVID-19, it is limited in not covering other types of fear such as fear of fake news [67].

In conclusion, we studied the interrelationships between psychosocial factors and the behavioral as well as psychological responses of older adults to COVID-19. Our results demonstrated that the more compassionate an individual is, the more the individual engages in protective COVID-19 health behaviors. Furthermore, greater engagement in protective health behaviors and greater resilience are related to lower anxiety. On the other hand, greater fear predicts greater anxiety but is not associated with individuals' engagement in protective health behaviors. Our findings present pertinent information for efforts by governmental, mental health and social services in supporting older adults during and post the COVID-19 pandemic.

SUPPLEMENTARY MATERIAL

Supplementary material is available at *Translational Behavioral Medicine* online.

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Compliance with Ethical Standards

Conflict of Interest: The authors declare that they have no conflicts of interest.

Authors' Contributions: XYL and ACY designed some of the questionnaires, collected, entered and analysed the data, conceived the study, conducted literature review and drafted the manuscript. JY is the Principal Investigator who conceptualised the study, analysed the data, reviewed the results, advised on the manuscript preparation and reviewed the manuscript. RM assisted in reviewing the manuscript. All authors read and approved the final text.

Ethical Approval: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. This study was approved by the Institutional Review Board, National University of Singapore.

Informed Consent: All participants provided informed consent verbally through a phone call or online before they completed the questionnaires.

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