Self-Affirmation Buffers COVID-19 Pandemic-Induced Anxiety Responses: A Randomized Controlled Trial

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Abstract

When individuals perceive threats in their environment, it automatically triggers their stress response. Chronic stress can cause individuals to develop a range of serious psychological and physical health problems. Numerous studies have found that affirming self-worth can buffer the negative emotional and physical responses triggered by stress. This study experimentally examined whether affirming self-worth can reduce anxiety and depression emotional responses triggered by the COVID-19 pandemic. Two hundred twenty participants were randomly assigned to either a self-worth affirmation task group or a control task group, and completed anxiety and depression measurements before the intervention (February 2) and one week later (February 9). The results revealed that while the control group exhibited increased anxiety severity one week later compared to pre-test, the self-worth affirmation group showed no significant change in anxiety between pre-test and one week later; this effect persisted after controlling for gender, age, education level, and annual family income. These results indicate that a brief (approximately 10-minute) reflection on self-worth can help individuals buffer anxiety emotional responses triggered by the pandemic. This finding provides important scientific evidence for pandemic prevention from a psychosocial perspective.

Full Text

Self-Affirmation Buffers Anxiety Responses Triggered by COVID-19: A Randomized Controlled Study

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Abstract

When individuals perceive threats in their environment, they automatically trigger stress responses. Chronic stress can lead to a series of serious psychological and physical health problems. Numerous studies have found that affirming self-worth can buffer the negative emotional and physiological responses triggered by stress. This study experimentally examined whether affirming self-worth could reduce anxiety and depression triggered by the COVID-19 pandemic. Two hundred twenty participants were randomly assigned to either a self-worth affirmation task group or a control task group, and completed anxiety and depression measures before the intervention (February 2) and one week later (February 9). The results showed that, compared with the control group, which exhibited more severe anxiety after one week than at pretest, the self-worth affirmation group showed no significant change in anxiety between pretest and one-week follow-up. This effect remained after controlling for gender, age, education level, and annual family income. These findings indicate that brief (approximately 10 minutes) reflection on self-worth can help individuals buffer pandemic-triggered anxiety responses. This discovery provides important scientific evidence for pandemic prevention from a psychosocial perspective.

Keywords: COVID-19; stress; self-affirmation; anxiety; depression

1 Introduction

COVID-19 was first identified in December 2019 following the discovery of multiple cases of viral pneumonia in Wuhan, Hubei Province (Wuhan Municipal Health Commission, 2019). On January 30, 2020, the World Health Organization (WHO) declared the outbreak a Public Health Emergency of International Concern (PHEIC). The virus' s main initial clinical features include fever, cough, headache, sore throat, and muscle aches, gradually progressing to breathing difficulties and even death (Chen et al., 2020; Huang et al., 2020). Although the virus likely originated in wildlife (e.g., bats; Lu et al., 2020), it has since acquired human-to-human transmission capability (Chan et al., 2020). Currently, the main sources of infection are confirmed patients, with transmission occurring primarily through contact and respiratory droplets. The general population is susceptible, with an incubation period of 1–14 days (National Health Commission, 2020a). The virus is therefore highly contagious. As of 24:00 on February 9, 2020, there were 40,171 confirmed cases nationwide, 23,589 suspected cases, and 399,487 close contacts under medical observation (National Health Commission, 2020b).

Due to its high transmissibility and the absence of effective antiviral drugs targeting the pathogen, the pandemic' s persistence has triggered a range of

adverse psychological reactions among the public. Li Sijia et al. analyzed word frequency patterns among 17,865 active Weibo users during the week before and after January 20, 2020, finding significantly increased usage of negative emotion words and anxiety-related terms after January 20, along with increased anger words and risk judgment terms (Li Sijia, Wang Yilin, Zhao Nan, & Zhu Tingshao, 2020). These findings indicate that after the official characterization of the COVID-19 outbreak on January 20—when the National Health Commission classified the disease as a Class B infectious disease subject to Class A prevention and control measures—public attention and anxiety about the pandemic generally increased. Additionally, a research team from Peking University and other institutions conducted a survey on January 26–27, 2020, covering 11,479 people across 31 provinces and autonomous regions. The results showed that most people exhibited varying degrees of anxiety (66.9%), worry (71.7%), and fear (58.2%) in response to the pandemic, with only 3%–4% reporting no anxiety, worry, or fear at all ("Public Cognition and Individual Prevention Behavior Regarding COVID-19" Research Team, 2020).

When individuals perceive environmental threats, they automatically trigger stress responses such as tension, anxiety, and depression (Cohen, Janicki-Deverts, & Miller, 2007). Numerous studies have found that stress-induced negative emotional states (e.g., anxiety and depression) directly affect physiological processes and behavioral response patterns (Koolhaas et al., 2011). These include changes in sympathetic-adrenal medullary axis and hypothalamic-pituitary-adrenal axis function (the brain' s stress management systems) (McEwen, 1998; Miller, Chen, & Zhou, 2007) and excessive attention to stressful events (Waters, Bradley, & Mogg, 2014). Prolonged exposure to threatening situations can cause long-term or permanent changes in emotional, physiological, and behavioral patterns, weaken the immune system, and threaten physical health (Segerstrom & Miller, 2004). Currently, the COVID-19 pandemic constitutes a threatening situation, and individuals exhibit various negative stress emotions such as anxiety, worry, and fear when facing it ("Public Cognition and Individual Prevention Behavior Regarding COVID-19" Research Team, 2020), while also showing increased attention to pandemic-related information (Li Sijia et al., 2020). As the pandemic continues, chronic stress may further worsen individuals' emotional responses and threaten their physical health. Therefore, buffering or reducing the public' s stress responses caused by the pandemic is of great significance for enabling society to respond to pandemic prevention and control with rational, calm, and positive attitudes (Xiang et al., 2020).

Self-affirmation refers to the process of mitigating the negative impact of threatening situations on the self by viewing oneself as generally competent, excellent, and effective when facing challenging or threatening circumstances (Steele, 1988; Sherman & Cohen, 2006). Self-affirmation theory posits that people have a motivation to maintain self-integrity (Cohen & Sherman, 2014), where self-integrity refers to the belief that one is competent and effective (Taylor, Lerner, Sherman, Sage, & McDowell, 2003; Steele, 1988; Sherman & Cohen, 2006). Stress trig-

gered by events or information that threaten self-integrity activates individuals' self-defense mechanisms, causing them to allocate more cognitive resources to psychologically threatening events or information. Since everyone' s cognitive resources are limited, individuals have fewer cognitive resources available for performance and problem-solving, thereby hindering objective and fair cognition and coping with threats (Cohen & Sherman, 2014).

Research shows that affirming important values can increase psychological resources for facing threats (Creswell, Dutcher, Klein, Harris, & Levine, 2013; Cohen & Sherman, 2014; Goyer et al., 2017). With this reinforced cognition of self-resources, individuals can view a focal threat from a broader perspective. When individuals consider a threatening event from a more general, higher-level perspective, the negative impact of this threat on the overall self is greatly reduced (Sherman, 2013). The core of affirmation theory is that the self-system is flexible, and people have many responses available in their "psychological immune system" (Gilbert, Pinel, Wilson, Blumberg, & Wheatley, 1998). When people confirm that their overall self is intact, their self-perception is capable and adaptive, and they do not need to rationalize threatening information (Sherman & Cohen, 2006; Steele, 1988). Reminding them of who they are and what is important to them, and incorporating such self-affirmation into their self-narrative, can effectively reduce stress caused by threats. Numerous empirical studies support the positive effects of self-affirmation. At the physiological level, studies have found that self-affirmation groups have lower cortisol and cardiovascular responses under stress compared with control groups (Creswell et al., 2005; Derks, Scheepers, Van Laar, & Ellemers, 2011). At the psychological level, affirming self-worth can reduce perception of threatening information (Sherman & Cohen, 2002) and its resulting negative emotional responses (Morgan & Harris, 2015). Self-affirmation changes individuals' self-cognition, producing a series of positive adaptive outcomes that touch upon a series of mutually reinforcing interactions between the self-system and social system, thereby promoting a virtuous cycle (Cohen & Sherman, 2014).

In the health domain, self-affirmation theory suggests that most individuals consider themselves safe and healthy (Cohen & Sherman, 2014). Therefore, when individuals face threats to safety and health such as disease or death, or uncontrollable situations, these pose severe challenges to adaptation (Greenberg, Solomon, & Pyszczynski, 1997), reduce self-control, and threaten self-integrity (Keough & Markus, 1998). Although self-affirmation cannot change objective threat situations and information, it can buffer the depletion of self caused by threatening situations by increasing self-resources, expanding cognitive perspective, and reducing the association between self and threat, thereby alleviating stress triggered by threats. For example, Schmeichel and Martens (2005) found that self-affirmation can reduce individuals' perception of threat from mortality salience information. A study of early-stage breast cancer patients found that self-affirmation expressive writing could reduce subjectively perceived stress responses and self-reported clinical symptoms (Creswell et al., 2007). Additionally, related research has confirmed that self-affirmation can effectively reduce

cognitive bias (Whitson & Galinsky, 2008) and stress responses (Wiesenfeld, Brockner, Petzall, Wolf, & Bailey, 2001) caused by uncontrollability.

Currently, the outbreak and persistence of the pandemic create a sense of unpredictability and uncontrollability for individuals—not knowing where the virus is hidden, whether they will be infected, and having no effective treatment if infected. This sense of unpredictability and uncontrollability places individuals in a state of chronic stress, manifesting as high attention to the pandemic and generating anxiety and panic (Li Sijia et al., 2020; "Public Cognition and Individual Prevention Behavior Regarding COVID-19" Research Team, 2020). Moreover, after the number of daily confirmed cases exceeded one thousand on January 27, 2020 (1,771 cases), large numbers of cases have been confirmed daily. As of February 2, when this study was implemented, there were 17,205 confirmed cases and 21,558 suspected cases nationwide (Figure 1 [Figure 1: see original paper], National Health Commission, 2020b). As the pandemic develops and persists, the continuously rising number of confirmed and suspected cases may trigger higher anxiety, panic, and other negative emotional reactions. Therefore, this study examined whether self-worth affirmation could buffer or reduce anxiety and depression triggered by the COVID-19 pandemic. Based on existing research and the current pandemic development, we expected that self-affirmation would buffer or reduce the continuously increasing negative emotional responses caused by the persistent pandemic, while control group participants would show increased anxiety and depression as the pandemic continued.

Figure 1 Pandemic development from January 22 to February 9, 2020. Data obtained from the official website of the National Health Commission.

1.1 Participants

Figure 2 [Figure 2: see original paper] shows the flowchart of this study. The study initially included 220 participants recruited through convenience sampling by 22 experimenters (students). Participants came from 16 provinces and autonomous regions nationwide, with Gansu accounting for 37.7%, Shandong 13.2%, Fujian 11.8%, Shanxi 10.5%, Hebei 8.2%, Henan 5%, Sichuan 4.5%, Liaoning 3.2%, Tianjin and Xinjiang each 1.4%, Zhejiang 0.9%, and Shaanxi, Shanghai, Hubei, Anhui, and Yunnan each 0.5%. All participants first completed a background information questionnaire and baseline anxiety and depression measures on February 2 (T1). They were then randomly assigned to either the self-worth affirmation intervention group or the control group based on pre-assigned numbers (001–220), with odd numbers as the intervention group and even numbers as the control group, each with 110 participants. One week after the intervention (February 9: T2), participants completed post-test anxiety and depression assessments. At post-test, 12 participants were lost from the self-affirmation group and 18 from the control group. Before final analysis, 2 participants with extreme age distributions were excluded from the self-affirmation group and 1 from the control group. The final sample for analysis consisted of 187 participants aged 16–50 years ($M = 23.98 \pm 7.39$), including 96 in the

self-affirmation group and 91 in the control group.

Before the study, we used G*Power 3.1 software (Faul et al., 2007) to estimate the required sample size. Assuming a medium effect size of f = 0.25, power = 0.95, and 2 measurement points (estimated correlation of 0.70), a minimum of 34 participants (17 per group) was needed to detect a significant interaction effect between within-subjects and between-subjects factors in repeated measures ANOVA. We also estimated the minimum sample size requirement based on the effect size (^{2} = 0.07) obtained from Morgan and Harris' s (2015) study on self-affirmation interventions for anxiety. With ^{2} = 0.07 (converted to f = 0.27; Lenhard & Lenhard, 2016), power = 0.80, and 2 measurement points (estimated correlation of 0.70), a minimum of 20 participants (10 per group) was needed to detect a significant ($p < 0.05$) interaction effect in repeated measures ANOVA. In the final sample of this study, the self-affirmation group had 96 participants and the control group had 91 participants, meeting the basic requirements.

During the pandemic, to minimize contact, the entire study was administered online by 22 experimenters (students). This study employed a double-blind design; all experimenters and participants were unaware of group assignment and study purpose, and none had participated in similar research. The study protocol was approved by the institutional ethics review committee via online review. Due to the quarantine situation, which made printing and signing written informed consent forms inconvenient, all participants provided verbal informed consent before testing.

2.1 Intervention and Measures

Intervention. In the intervention, both the self-worth affirmation group and the control group were asked to complete a values selection scale and write about their chosen values. The only difference was that the self-affirmation group was asked to select their most important value and describe why it was important to them, while the control group was asked to select a value they considered least important and describe why it might be important to others. During writing, participants were asked to express all their thoughts as completely as possible. After writing, to further strengthen the intervention effect, participants completed a 4-item judgment scale about the selected value: (1) This value deeply affects my/others' life; (2) Overall, I/others strive to practice this value; (3) This value is an important component of my/others' self-identity; (4) I/others would care very much about this value. Responses were rated on a 6-point scale from 1 ("strongly disagree") to 6 ("strongly agree").

All intervention procedures were strictly based on previous research (Cohen, Garcia, Apfel, & Master, 2006; Goyer et al., 2017). However, to make the values list more suitable for Chinese characteristics, this study selected the 6 most recognized values among Chinese people based on Jin Shenghua, Zheng Jianjun, and Xin Zhiyong' s (2009) research on the structure and characteristics of contemporary Chinese values: self-discipline and character, ability and talent,

public interest, family and kinship, money and wealth, and fame and status.

Measures. This study used the Self-Rating Anxiety Scale (SAS) and Beck Depression Inventory (BDI) to assess participants' anxiety and depression states one week before and after the experimental manipulation. We also collected demographic variables including age, gender, education level, and annual family income at pretest.

Self-Rating Anxiety Scale (SAS). Originally developed by Zung (1971), this scale is primarily used to assess subjective anxiety symptoms in healthy or clinical individuals and is currently the most widely used self-rating anxiety scale. The revised Chinese version also has good reliability and validity (Tao & Gao, 1994). It includes 20 items rated on a 4-point scale, with total scores ranging from 20 to 80. Higher scores indicate higher anxiety levels. In this study' s sample, the scale' s internal consistency coefficients were 0.750 (T1) and 0.724 (T2).

Beck Depression Inventory (BDI). Originally developed by Beck et al. (1961), this scale is primarily used to assess subjectively experienced depressive symptoms. The revised Chinese version has good reliability and validity (Wang, Wang, & Ma, 1999). It includes 21 items rated on a 4-point scale from 0 to 3, with total scores ranging from 0 to 63. Higher scores indicate higher depression levels. In this study' s sample, the scale' s internal consistency coefficients were 0.857 (T1) and 0.850 (T2).

Education Level. This study assessed participants' education level using a 7-point Likert scale: 0 = illiterate, 1 = primary school, 2 = junior high school, 3 = high school or technical secondary school, 4 = junior college, 5 = bachelor' s degree, 6 = graduate degree or above.

Annual Family Income. This study assessed participants' annual family income using an 8-point Likert scale: 1 = below 5,000 RMB, 2 = 5,000-10,000 RMB, 3 = 10,000-20,000 RMB, 4 = 20,000-50,000 RMB, 5 = 50,000-100,000 RMB, 6 = 100,000-200,000 RMB, 7 = 200,000-500,000 RMB, 8 = above 500,000 RMB.

3.1 Comparison of Background Information and Baseline Levels Between Groups

To examine whether the two groups were matched on background information and baseline levels, we conducted a multivariate analysis of variance (MANOVA) with age, gender, education level, annual family income, and T1 anxiety and depression scores as dependent variables and group as the independent variable. The MANOVA results showed no significant overall group effect, Wilks' Lambda = 0.993, $F(5, 181) = 0.246$, $p = 0.942$, partial $^2 = 0.007$. Further univariate analyses revealed no significant differences between groups in age, education level, annual family income, or T1 anxiety and depression scores, $Fs(1,185) < 0.544$, $ps > 0.462$ (see Table 1). Additionally, a chi-square test on gender

distribution showed no significant difference between groups, $^{2}(1) = 0.016$, p = 0.898.

Table 1 Comparison of background variables and baseline levels between groups

Variable	Self-Affirmation (n = 96)	Control (n = 91)	Test
Gender (Male/Female)	35/61	34/57	$^{2}(1) = 0.016$, p = 0.898
Age	24.14 (7.56)	23.81 (7.25)	F(1,185) = 0.089, p = 0.766
Education Level	4.78 (1.22)	4.85 (1.07)	F(1,185) = 0.181, p = 0.671
Annual Family Income	3.79 (1.81)	3.99 (1.85)	F(1,185) = 0.544, p = 0.462
Anxiety T1	32.91 (6.35)	32.54 (6.56)	F(1,185) = 0.151, p = 0.698
Depression T1	7.57 (7.28)	7.84 (7.02)	F(1,185) = 0.062, p = 0.804

Note: N = 187; Gender is reported as count and was analyzed with chi-square test.

3.2 Intervention Effect Analysis

To examine the intervention effects of self-worth affirmation, we first conducted repeated measures analysis of covariance (ANCOVA) on anxiety and depression separately, with measurement time (T1 vs. T2) as the within-subjects factor, group (self-affirmation vs. control) as the between-subjects factor, and gender,

age, education level, and annual family income as covariates. For anxiety, results showed no significant main effect of time, F(1, 181) = 0.053, p = 0.818, partial ^{2} = 0.001, and no significant main effect of group, F(1, 181) = 1.590, p = 0.209, partial ^{2} = 0.009. However, the time × group interaction was significant, F(1, 181) = 4.857, p = 0.029, partial ^{2} = 0.026. Further simple effects analysis revealed that the control group showed significantly higher anxiety at one-week follow-up compared with pretest, F(1, 181) = 6.315, p = 0.013, partial ^{2} = 0.034, whereas the self-affirmation group showed no significant change in anxiety between pretest and one-week follow-up, F(1, 181) = 0.338, p = 0.561, partial ^{2} = 0.002 (see Figure 3 [Figure 3: see original paper]). For depression, neither the main effects of time and group nor the time × group interaction were significant, ps > 0.05.

Table 2 Means and standard deviations of anxiety and depression scores at pretest and one-week follow-up

Measure	Self-Affirmation (n = 96)	Control (n = 91)
Anxiety T1	32.91 (6.35)	32.54 (6.56)
Anxiety T2	32.44 (6.48)	34.62 (6.16)
Depression T1	7.57 (7.28)	7.84 (7.02)
Depression T2	7.29 (6.66)	7.31 (6.51)

Note: N = 187; T1 = pretest; T2 = one-week follow-up.

Figure 3 Anxiety levels in self-affirmation and control groups at pretest (T1) and one-week follow-up (T2). Error bars represent standard errors.

Since anxiety and depression are highly correlated (T1: r = 0.56; T2: r = 0.66), to avoid inflating Type I error from multiple analyses in separate models, we conducted multivariate analysis of covariance (MANCOVA) with T2 anxiety and depression scores as dependent variables, group as the independent variable, and gender, age, education level, annual family income, and T1 anxiety and depression scores as covariates. This allowed us to analyze the buffering effect of self-affirmation on both anxiety and depression in a single model. Results showed that after controlling for gender, age, education level, annual family income, and T1 anxiety and depression scores, the overall group effect was significant, Wilks' Lambda = 0.967, F(2, 178) = 3.271, p = 0.040, partial ^{2} = 0.035. Further univariate analyses with corrected p-values (p = 0.05/2) revealed a significant group effect only for anxiety, F(1, 179) = 6.067, p = 0.015 < 0.025, partial ^{2} = 0.033. That is, after controlling for covariates, the self-affirmation group scored significantly lower than the control group on T2 anxiety. However, no significant group effect was found for depression, F(1, 179) = 0.047, p = 0.828, partial ^{2} = 0.001. These results further confirm the findings from the separate repeated measures ANOVAs.

4 Discussion

As the COVID-19 pandemic spreads and persists, public mental health is becoming an increasingly important issue. In the face of the pandemic, many people have experienced a series of negative emotional reactions such as anxiety and panic ("Public Cognition and Individual Prevention Behavior Regarding COVID-19" Research Team, 2020). If individuals remain in this state of stress for a long time, it can seriously damage their psychological and physical health (Cohen et al., 2007). Therefore, how to help individuals cope with the negative emotional responses caused by the pandemic has become an important topic in public pandemic prevention. This study provides the first evidence that a brief self-affirmation intervention can effectively buffer individuals' anxiety responses triggered by the pandemic.

Our findings are consistent with existing research. Previous studies have found that self-affirmation can effectively buffer stress responses triggered by threats induced in laboratory settings (Creswell et al., 2005), real-life situations (Loft et al., 2007; Sherman, Bunyan, Creswell, & Jaremka, 2009), and imagined threats (Pauketat, Moons, Chen, Mackie, & Sherman, 2016). Typically, when threats emerge, people tend to focus their attention on threatening events to cope with dangerous situations—an individual self-protection mechanism (Pratto & John, 1991). In the short term, this stress mechanism is important for effectively dealing with danger, but chronic stress places a serious burden on individuals' physical and mental health. Self-affirmation allows individuals to think about important personal values unrelated to the danger, enabling them to focus not only on the current threat but also to view their current situation from a broader perspective (Sherman & Hartson, 2011). Therefore, self-affirmation can reduce the depletion and psychological threat caused by dangerous situations (Harber, Yeung, & Iacovelli, 2011; Schmeichel & Vohs, 2009).

In this study, the outbreak and persistence of the pandemic formed a natural threatening situation that automatically captured individuals'attention, causing them to focus on pandemic-related information and generating anxiety and fear responses. For example, a recent survey found that 67% of the public reported "high attention" to the pandemic, 22% reported "relatively high attention," and less than 1% reported no attention at all ("Public Cognition and Individual Prevention Behavior Regarding COVID-19" Research Team, 2020). Moreover, the week before and after February 2 was also a period of rapid pandemic development (see Figure 1). Faced with continuously rising numbers of confirmed and suspected cases, people may exhibit higher anxiety and worry. Consistent with this, our results showed that the control group exhibited higher anxiety levels from February 2 to February 9. Through reflection on self-worth, individuals may free their attention from pandemic focus and think about who they are and what is more important to them, thereby reducing the threat posed by the pandemic. For instance, if someone considers family and kinship most important, they may think about how to better accompany and protect their family during the pandemic and put this into practice, rather than just focusing

on the pandemic itself. Consistent with this, Schmeichel and Martens (2005) found that self-affirmation can reduce people' s attention to death information when facing difficult situations. Therefore, compared with individuals who did not engage in self-worth affirmation, self-affirmed individuals did not show more severe anxiety responses as the pandemic persisted.

However, in this study, we found effects of self-affirmation only for anxiety, with no effects on depression. Consistent with this, Morgan and Harris' s (2015) study on employees in the context of mass layoffs found that self-affirmation only buffered anxiety triggered by uncontrollable layoff situations, with no effects on depression. Further observation of the data reveals that both groups had generally low depression scores at pretest and one-week follow-up (see Table 1), with no significant changes. This may suggest that in the current situation, depression may not be a good indicator of emotional changes as the pandemic develops. Although anxiety and depression are highly correlated emotions (in this study, T1: r = 0.56; T2: r = 0.66), anxiety primarily reflects worry and panic about the uncontrollability and unpredictability of specific events or situations, whereas depression primarily reflects decreased self-esteem and vitality, and reduced perception of personal meaning in life (Lovibond & Lovibond, 1995). In the current situation, the outbreak and persistence of the pandemic primarily trigger concerns and panic about not knowing where the virus is hidden, worrying about whether one will be infected, and how to cope with life under quarantine. Therefore, anxiety measures may be more sensitive to the emotional states of participants in this context.

The results of this study have important practical implications for addressing public anxiety and panic caused by the current pandemic. First, self-affirmation procedures do not require professional help and can be completed independently by anyone. Second, self-affirmation has no special environmental requirements and can be performed at home. Additionally, self-affirmation is time-efficient, typically taking about 10 minutes. Therefore, self-affirmation has important practical application value in protecting against large-scale public mental health problems caused by the pandemic.

However, this study has several limitations. First, due to the quarantine situation, we used convenience sampling for participant recruitment—22 student experimenters recruited family members and classmates based on their convenience. Although the sample covered 16 provinces and autonomous regions and ages ranged from 17 to 50 years, the age distribution was primarily university students (72% aged 18–25). This convenience sampling approach limits the generalizability and applicability of our conclusions, and future research should verify our findings in broader populations. Second, self-affirmation theory posits that when encountering challenging or threatening situations, self-worth affirmation can reduce negative impacts on the self by viewing the self as generally competent and effective, thereby breaking vicious cycles (Steele, 1988; Sherman & Cohen, 2006). Therefore, self-affirmation theory predicts that intervention frequency does not affect intervention effects. Consequently, we only adminis-

tered one self-affirmation intervention session. Although studies by Cohen et al. (2006, 2009) and Goyer et al. (2017) also found that intervention dosage (frequency) does not affect final outcomes, future research should further examine the effect of intervention frequency on buffering anxiety in pandemic stress situations. Additionally, because the intervention was administered immediately after pretest, and to avoid practice effects from multiple measurements at the same time, we did not assess immediate intervention effects but rather examined effects after one week. Future research should optimize the timing of intervention and measurement to better detect both immediate and maintenance effects. Furthermore, although our results show that self-affirmation can buffer individuals' anxiety responses during the pandemic, and based on the current sample size (n = 187), the significant effect found for anxiety has high statistical power (power = 0.94), this study only obtained a small-to-medium effect size of ^{2} = 0.026 (Cohen, 1988). Therefore, in practical application, it should be combined with other effective intervention programs based on scientific evidence.

5 Conclusion

This study experimentally examined whether a social-psychological intervention –self-affirmation–could buffer anxiety and depression triggered by the persistent COVID-19 pandemic. Our results demonstrate that brief (approximately 10 minutes) self-worth affirmation can effectively buffer the continuously increasing anxiety responses individuals face during the pandemic.

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References

Beck, A. T., Ward, C. H., Mendelson, M., Mock, J., & Erbaugh, J. (1961). An inventory for measuring depression. *Archives of General Psychiatry*, *4*(6), 561-571.

Chan, J. F. W., Yuan, S., Kok, K. H., To, K. K. W., Chu, H., Yang, J., ···& Tsoi, H. W. (2020). A familial cluster of pneumonia associated with the 2019 novel coronavirus indicating person-to-person transmission: a study of a family cluster. *The Lancet*, *395*(10223), 514-523.

Chen, N., Zhou, M., Dong, X., Qu, J., Gong, F., Han, Y., ···& Yu, T. (2020). Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus

pneumonia in Wuhan, China: a descriptive study. *The Lancet*, *395*(10223), 507-513.

Cohen, G. L., Garcia, J., Apfel, N., & Master, A. (2006). Reducing the racial achievement gap: A social-psychological intervention. *Science*, *313*(5791), 1307-1310.

Cohen, G. L., Garcia, J., Purdie-Vaughns, V., Apfel, N., & Brzustoski, P. (2009). Recursive processes in self-affirmation: Intervening to close the minority achievement gap. *Science*, *324*(5925), 400-403.

Cohen, G. L., & Sherman, S. K. (2014). The psychology of change: Self-affirmation and social psychological intervention. *Annual Review of Psychology*, *65*, 333-371.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Erlbaum.

Cohen, S., Janicki-Deverts, D., & Miller, G. E. (2007). Psychological stress and disease. *JAMA*, *298*(14), 1685-1687.

Creswell, J. D., Dutcher, J. M., Klein, W. M., Harris, P. R., & Levine, J. M. (2013). Self-affirmation improves problem-solving under stress. *PLOS ONE*, *8*(5): e62593.

Creswell, J. D., Lam, S., Stanton, A. L., Taylor, S. E., Bower, J. E., & Sherman, D. K. (2007). Does self-affirmation, cognitive processing, or discovery of meaning explain cancer-related health benefits of expressive writing? *Personality and Social Psychology Bulletin*, *33*(2), 238-250.

Creswell, J. D., Welch, W. T., Taylor, S. E., Sherman, D. K., Gruenewald, T. L., & Mann, T. (2005). Affirmation of personal values buffers neuroendocrine and psychological stress responses. *Psychological Science*, *16*(11), 846-851.

Derks, B., Scheepers, D., Van Laar, C., & Ellemers, N. (2011). The threat vs. challenge of car parking for women: How self- and group affirmation affect cardiovascular responses. *Journal of Experimental Social Psychology*, *47*(1), 178-183.

Faul, F., Erdfelder, E., Lang, A. G., & Buchner, A. (2007). G*Power *3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences.* Behavior Research Methods, 39*(2), 175-191.

Gilbert, D. T., Pinel, E. C., Wilson, T. D., Blumberg, S. J., & Wheatley, T. P. (1998). Immune neglect: A source of durability bias in affective forecasting. *Journal of Personality and Social Psychology*, *75*, 617-638.

Goyer, J. P., Garcia, J., Purdie-Vaughns, V., Binning, K. R., Cook, J. E., Reeves, S. L., ···& Cohen, G. L. (2017). Self-affirmation facilitates minority middle schoolers' progress along college trajectories. *Proceedings of the National Academy of Sciences*, *114*(29), 7594-7599.

Greenberg, J., Solomon, S., & Pyszczynski, T. (1997). Terror management theory of self-esteem and cultural worldviews: Empirical assessments and conceptual refinements. *Advances in Experimental Social Psychology*, *29*, 61-139.

Harber, K. D., Yeung, D., & Iacovelli, A. (2011). Psychosocial resources, threat, and the perception of distance and height: Support for the resources and perception model. *Emotion*, *11*(5), 1080–1090.

Huang, C., Wang, Y., Li, X., Ren, L., Zhao, J., Hu, Y., ···& Cheng, Z. (2020). Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *The Lancet*, *395*(10223), 497–506.

Jing, S. H., Zheng, J. J., & Xin, Z. Y. (2009). The structure and characteristics of contemporary Chinese values. *Acta Psychologica Sinica*, *41*(10), 1000–1014.

Keough, K. A., & Markus, H. R. (1998). The role of the self in building the bridge from philosophy to biology. *Psychological Inquiry*, *9*(1), 49–53.

Koolhaas, J. M., Bartolomucci, A., Buwalda, B., de Boer, S. F., Flügge, G., Korte, S. M., ···& Richter-Levin, G. (2011). Stress revisited: A critical evaluation of the stress concept. *Neuroscience & Biobehavioral Reviews*, *35*(5), 1291–1301.

Lenhard, W. & Lenhard, A. (2016). Calculation of effect sizes. Retrieved from: https://www.psychometrica.de/effect_size.html. Dettelbach (Germany): Psychometrica. DOI: 10.13140/RG.2.2.17823.92329.

Li, S. J., Wang, Y. L., Zhao, N., & Zhu, T. S. (2020). Social psychology influence by 2019-nCoV epidemic declaration: A study on active Weibo users. *chinaXiv*: 202002.00008v1.

Loft, P., Thomas, M. G., Petrie, K. J., Booth, R. J., Miles, J., & Vedhara, K. (2007). Examination stress results in altered cardiovascular responses to acute challenge and lower cortisol. *Psychoneuroendocrinology*, *32*(4), 367–375.

Lu, R., Zhao, X., Li, J., Niu, P., Yang, B., Wu, H., ···& Bi, Y. (2020). Genomic characterisation and epidemiology of 2019 novel coronavirus: Implications for virus origins and receptor binding. *The Lancet*.

McEwen, B. S. (1998). Protective and damaging effects of stress mediators. *New England Journal of Medicine*, *338*, 171–179.

Miller, G. E., Chen, E., & Zhou, E. S. (2007). If it goes up, must it come down? Chronic stress and the hypothalamic-pituitary-adrenocortical axis in humans. *Psychological Bulletin*, *133*(1), 25–45.

Morgan, J. I., & Harris, P. R. (2015). Evidence that brief self-affirming implementation intentions can reduce work-related anxiety in downsize survivors. *Anxiety, Stress, & Coping*, *28*(5), 563–575.

National Health Commission of the People' s Republic of China. (2020a). *Epidemic Prevention and Control Program* (2nd ed). Available at

http://www.gov.cn/zhengce/zhengceku/2020-02/07/5475813/files/9a774a4defee44daa05894138bd0509a.pdf (Retrieved date: 2020-02-09).

National Health Commission of the People' s Republic of China. (2020b). Daily briefing on novel coronavirus cases in China. Available at http://www.nhc.gov.cn/xcs/yqtb/list_gzbd.shtml (Retrieved date: 2020-02-09).

Pauketat, J. V., Moons, W. G., Chen, J. M., Mackie, D. M., & Sherman, D. K. (2016). Self-affirmation and affective forecasting: Affirmation reduces the anticipated impact of negative events. *Motivation and Emotion*, *40*(5), 750–758.

Pratto, F., & John, O. P. (1991). Automatic vigilance: The attention-grabbing power of negative social information. *Journal of Personality and Social Psychology*, *61*(3), 380–391.

"Public Cognition and Individual Prevention Behavior Regarding COVID-19" Research Team. (2020). Pneumonia cognitive survey: Over 70% of general public gave full marks to frontline medical staff. Available at https://m.sohu.com/a/369357183_260616/?pvid=000115_3w_a&from=singlemessage (Retrieved date: 2020-02-09).

Schmeichel, B. J., & Martens, A. (2005). Self-affirmation and mortality salience: Affirming values reduces worldview defense and death-thought accessibility. *Personality and Social Psychology Bulletin*, *31*(5), 658–667.

Schmeichel, B. J., & Vohs, K. (2009). Self-affirmation and self-control: Affirming core values counteracts ego depletion. *Journal of Personality and Social Psychology*, *96*(4), 770–782.

Segerstrom, S. C., & Miller, G. E. (2004). Psychological stress and the human immune system: A meta-analytic study of 30 years of inquiry. *Psychological Bulletin*, *130*(4), 601–630.

Sherman, D. K. (2013). Self-affirmation: Understanding the effects. *Social and Personality Psychology Compass*, *7*(11), 834–845.

Sherman, D. K., Bunyan, D. P., Creswell, J. D., & Jaremka, L. M. (2009). Psychological vulnerability and stress: The effects of self-affirmation on sympathetic nervous system responses to naturalistic stressors. *Health Psychology*, *28*(5), 554–562.

Sherman, D. K., & Cohen, G. L. (2002). Accepting threatening information: Self-affirmation and the reduction of defensive biases. *Current Directions in Psychological Science*, *11*(4), 119–123.

Sherman, D. K., & Cohen, G. L. (2006). The psychology of self-defense: Self-affirmation theory. *Advances in Experimental Social Psychology*, *38*, 183–242.

Sherman, D. K., & Hartson, K. A. (2011). Reconciling self-protection with self-improvement: Self-affirmation theory. In M. Alicke & C. Sedikides (Eds.),

The Handbook of Self-Enhancement and Self-Protection (pp. 128-151). Guilford Press.

Steele, C. M. (1988). The psychology of self-affirmation: Sustaining the integrity of the self. In L. Berkowitz (Ed.), *Advances in Experimental Social Psychology: Vol. 21. Social Psychological Studies of the Self: Perspectives and Programs* (pp. 261–302). San Diego, CA: Academic Press.

Taylor, S. E., Lerner, J. S., Sherman, D. K., Sage, R. M., & McDowell, N. K. (2003). Are self-enhancing cognitions associated with healthy or unhealthy biological profiles? *Journal of Personality and Social Psychology*, *85*, 605–615.

Tao, M., & Gao, J. F. (1994). Revision of self-evaluation of anxiety scale (SAS-CR) reliability and validity. *Chinese Journal of Nervous and Mental Diseases*, *(5)*, 301–303.

Wang, X. D., Wang, X. L., & Ma, H. (1999). *Handbook of Mental Health Assessment Scale*. Beijing: Chinese Mental Health Journal Publishing House.

Waters, A. M., Bradley, B. P., & Mogg, K. (2014). Biased attention to threat in paediatric anxiety disorders (generalized anxiety disorder, social phobia, specific phobia, separation anxiety disorder) as a function of 'distress' versus 'fear' diagnostic categorization. *Psychological Medicine*, *44*(3), 607–616.

Whitson, J. A., & Galinsky, A. D. (2008). Lacking control increases illusory pattern perception. *Science*, *322*(5898), 115–117.

Wiesenfeld, B. M., Brockner, J., Petzall, B., Wolf, R., & Bailey, J. (2001). Stress and coping among layoff survivors: A self-affirmation analysis. *Anxiety, Stress and Coping*, *14*(1), 15–34.

Wuhan Municipal Health Commission. (2019). Briefing on COVID-19 situation in Wuhan. Available at http://wjw.wuhan.gov.cn/front/web/showDetail/2019123108989 (Retrieved date: 2020-02-09).

Xiang, Y. T., Yang, Y., Li, W., Zhang, L., Zhang, Q., Cheung, T., & Ng, C. H. (2020). Timely mental health care for the 2019 novel coronavirus outbreak is urgently needed. *The Lancet Psychiatry*.

Zung, W. W. (1971). A rating instrument for anxiety disorders. *Psychosomatics*, *12*(6), 371–379.

Note: Figure translations are in progress. See original paper for figures.