



Relations between anxiety sensitivity's cognitive concerns and anxiety severity: brooding and reflection as serial multiple mediators

Haibo Yang^{1,2} · Xiaoyu Zhao³ · Jianwen Fang³ · Jon D. Elhai^{4,5}

Accepted: 4 August 2021

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Abstract

The outbreak of COVID-19 has caused a major impact on productivity and life functioning, and also led to adverse emotional reactions. In the face of this public health event, increased anxiety is one of the most common emotional reactions. Previous studies have shown that anxiety sensitivity, rumination and anxiety are closely related. Various dimensions of anxiety sensitivity have different effects on anxiety. Also, rumination can be divided into brooding and reflection. To explore the relationships among anxiety sensitivity's cognitive concerns, anxiety and different types of rumination, we conducted an online survey during the outbreak of coronavirus (February 17–25, 2020), using the Anxiety Sensitivity Scale-3 (ASI-3), Ruminative Responses Scale (RSS), and Depression Anxiety Stress Scale-21 (DASS-21). The results showed significant positive correlations among anxiety sensitivity's cognitive concerns, anxiety, brooding and reflection. Furthermore, brooding and reflection had a chain mediation effect between cognitive concerns and anxiety, and the mediation effect of reflection was even stronger. Results suggest that anxiety sensitivity's cognitive concerns may not only affect anxiety directly, but also affect anxiety through rumination, especially reflection.

Keywords Covid-19 · Anxiety · Anxiety sensitivity · Rumination · Multiple mediation

Introduction

The novel coronavirus disease (COVID-19) has caused worldwide impact on health and safety of individuals and communities. These effects may translate into a series of emotional responses and behavioral problems (Pfefferbaum & North, 2020). In such a situation, psychological influences

posed by the pandemic cannot be neglected. To date, a large number of studies have investigated public mental health, and anxiety is one of the most common responses to such an outbreak. Data from several studies suggest that high anxiety is prevalent among people (Qiu et al., 2020). At the initial stage of the outbreak, a survey including 1210 participants was conducted in China, showing that about one-third of respondents had moderate-to-severe anxiety (Wang et al., 2020). Yet little is known about other psychopathology-related constructs that may be associated with anxiety from COVID-19.

Faced with the same public health event, different individuals have diverse levels of anxiety. In addition to differences caused by factors such as personal experience with an epidemic, media information consumed, and perceived risk of the situation, susceptibility to anxiety is also a crucial factor. One factor that cannot be ignored is anxiety sensitivity. Anxiety sensitivity refers to fear of anxiety-related feelings, including physical, social or cognitive impact aspects, causing anxiety, fear and worry (McNally, 2002; Reiss, 1997).

Anxiety sensitivity is a susceptibility factor leading to anxiety and related disorders, including posttraumatic stress disorder (PTSD), generalized anxiety disorder (GAD), and panic disorder (Naragon-Gainey, 2010). Anxiety sensitivity can be

✉ Haibo Yang
yanghaibo@tjnu.edu.cn

¹ Academy of Psychology and Behavior of Tianjin Normal University, No. 393 Binshuixi Road, Tianjin 300387, Xiqing District, China

² Tianjin Social Science Laboratory of Students' Mental Development and Learning, No. 393 Binshuixi Road, Tianjin 300387, Xiqing District, China

³ Faculty of Psychology, Tianjin Normal University, No. 393 Binshuixi Road, Tianjin 300387, Xiqing District, China

⁴ Department of Psychology, University of Toledo, 2801 West Bancroft Street, Toledo, OH 43606, USA

⁵ Department of Psychiatry, University of Toledo, 3000 Arlington Avenue, Toledo, OH 43614, USA

seen as an amplifier which may improve the level of existing anxiety symptoms (Olatunji & Wolitzky-Taylor, 2009). The severity of anxiety symptoms depends on the degree of actual symptoms perceived, whereas severity of anxiety sensitivity refers to a misunderstanding/misinterpretation of these symptoms (Greenberg & Burns, 2003; Taylor, 1999). That is, anxiety symptoms are considered harmful and can produce adverse reactions, and this misconception may make anxiety symptoms worse. When people with high anxiety sensitivity become anxious, they often panic about the feelings associated with arousal, which further exacerbates their anxiety (Taylor et al., 1992).

The Anxiety Sensitivity Index (ASI) is one of the most commonly used scales to measure anxiety sensitivity. It was once thought to be uni-dimensional, but gradually, researchers found that anxiety sensitivity can be divided into a three-dimensional structure (Taylor et al., 2007), which contains physical concerns (ASPC), cognitive concerns (ASCC) and social concerns (ASSC). Anxiety sensitivity's physical concerns refer to focusing on physical reactions caused by one's anxiety, such as fear of cardiac arrest caused by heart palpitations; cognitive concerns refer to fear of uncontrolled cognition and psychological incompetence, with the belief that inability to concentrate will lead to insanity; social concerns are associated with the thought that anxiety reactions like tremors will cause social exclusion or ridicule.

Anxiety sensitivity's different dimensions are related to distinct anxiety disorders. Physical concerns are related to panic disorder and agoraphobia, while cognitive concerns are related to generalized anxiety disorder and obsessive-compulsive disorder, and social concerns are related to social anxiety disorder (Allan et al., 2014; Naragon-Gainey, 2010). Baek et al. (2019) found that a panic disorder group scored higher than most other anxiety disordered groups on the physical concerns dimension, whereas the generalized anxiety disorder group scored higher on the cognitive concerns dimension.

In addition to anxiety sensitivity, rumination is also a common susceptibility factor that affects mental health, including depression and anxiety (McLaughlin & Nolen-Hoeksema, 2011). Nolen-Hoeksema (1991) first proposed the response style theory of depression, which regards rumination as an important psychological trait and predisposing factor of depression. Rumination refers to the phenomenon that when individuals encounter negative life events such as test failure and loss, their minds will repetitively process these events (Grafton et al., 2016). Meanwhile, they would repeatedly focus on symptoms of pain, and think about causes and effects of the event. Individuals caught in rumination will not try to solve their problems actively by changing the environment (Nolen-Hoeksema et al., 2008).

The evidence indicate that rumination is a susceptibility factor of depression across different ages and various groups. However, although most previous studies have focused on the relationship between rumination and depression, some researchers also found the link between rumination and anxiety (Fresco et al., 2002; Harwell et al., 2011; Smith & Alloy, 2009). Rumination is used by individuals to process information and perceive the situation around them, which belongs to the category of psychological processes (Koster et al., 2011). It may be the reason why rumination has often been studied as a mediator of various kinds of mental disorders or abnormal behaviors (Berset et al., 2011; Borawski, 2019; Cox et al., 2001; Raes, 2010; Satici et al., 2020).

Researchers proposed that rumination is a multi-dimensional structure rather than a single dimension. Treynor et al. (2003) divided rumination into two components: brooding and reflection. The brooding component refers to comparing one's current state with unmet standards (eg, "think of the latest situation to expect it to become better"), while reflection usually involves purposeful inward seeking to solve problems (eg, "analyze your personality to try to understand why you are depressed"). There is evidence that brooding and reflection have different effects on depression (Nolen-Hoeksema et al., 2008; Schoofs et al., 2010; Yang et al., 2010). However, studies on anxiety rarely consider the difference between reflection and brooding, and different studies draw inconsistent conclusions (Olatunji et al., 2013).

Anxiety sensitivity is a kind of relatively stable trait, while rumination is a kind of cognitive style. Based on previous studies, we concluded that anxiety sensitivity people with higher anxiety sensitivity are more prone to pay attention to negative information, and adopt a more negative way of thinking, and this kind of mode of thinking, in turn, increased its attention to negative information (Ho et al., 2018; Klein et al., 2018). Based on previous studies, we can conclude that people with higher anxiety sensitivity are more prone to pay attention to negative information, and adopt a more negative way of thinking, which may trigger rumination.

The current study hypothesizes that rumination plays a mediating role between anxiety sensitivity and anxiety. Although some studies have revealed the effects of anxiety sensitivity and rumination on anxiety, few studies have explored the mediating effect of specific dimensions of anxiety sensitivity and different types of rumination in impacting anxiety. Given that rumination and cognitive concerns are both intimately related to cognitive processes, we mainly focus on the cognitive dimension of anxiety sensitivity. In addition, this study also aims to explore how the cognitive concern of anxiety sensitivity affects anxiety through different types of rumination.

Methods

Participants and Procedure

We conducted a Chinese language online survey using Survey Star between February 17 and 25, 2020. Survey Star offers features to avoid bots from redundant participation. For demographic variables, participants were required to report gender, age, education, marital status, and residence status. 641 participants completed the Anxiety Sensitivity Index-3rd Edition (ASI-3), the Ruminative Responses Scale (RRS), the Depression Anxiety Stress Scale-21 (DASS-21) in order, and 615 individuals were entered into final processing. Among the remaining, 473 were females (76.9%), 142 were males (23.1%), average year was 24.73 years ($SD = 7.11$). Our questionnaire was shared via WeChat, an extensively used social media App in China.

Measures

Anxiety Sensitivity Index-3rd Edition (ASI-3)

The original version of the scale consists of 18 self-report items, divided into three subscales: physical concerns, social concerns, and cognitive concerns (Taylor et al., 2007). The Chinese version was used in the current study, which has excellent construct validity (Wang et al., 2014). Items are rated on a 5-point Likert scale from 0 (“very little”) to 4 (“very much”), with six items for each dimension. A higher score indicates higher anxiety sensitivity. Cronbach’s alphas in the current study were as follows: physical concerns (0.89); social concerns (0.89); cognitive concerns (0.87).

Ruminative Responses Scale (RRS)

Rumination was measured by the Chinese version (Yang et al., 2009) of the Ruminative Response Scale (RRS, Nolen-Hoeksema & Morrow, 1991), which consists of 22 items. Participants rated each item from 1 (“never”) to 4 (“always”), higher scores indicate higher tendency to ruminate (Wang et al., 2018). Cronbach’s α for brooding and reflection were both 0.84 in this study.

Depression Anxiety Stress Scale-21 (DASS-21)

The DASS-21 is a 21-item self-report instrument, including three subscales (7 items each) for anxiety, depression, and stress symptoms. Participants were asked to report their symptom ratings over the past week using a Likert-type scale from 0 (“Did not apply to me at all”) to 3 (“Applied to me very much”). Higher scores indicate higher degrees of anxiety, depression or stress symptoms. We used the Chinese version of the scale (Gong et al., 2010), which was validated previously

(Wang et al., 2016). Only the anxiety items were analyzed in the processing of data. Cronbach’s alphas were 0.80 for anxiety in the current study.

Analysis

We used SPSS (v. 24.0 for Windows; IBM Corporation, 2016) for data processing and analyses. Mediation tests were conducted using the additional PROCESS v. 3.4 macro (Hayes, 2017) with 95% bias corrected confidence interval (CI) based on 5000 bootstrap samples. The mediating effect exists if the confidence interval does not include zero.

Results

Descriptive Statistics and Correlations

Descriptive statistics and correlation coefficients are shown in Table 1. Correlation analysis shows significant correlation between all variables. Among the three dimensions of anxiety sensitivity, cognitive concerns have a stronger correlation with anxiety and the two types of rumination.

Mediating Effects of Brooding and Reflection in the Association between Anxiety Concerns and Anxiety Severity

We used the SPSS PROCESS macro (model 6) to examine multiple mediation models (Hayes, 2015). Our model showed significant mediating effects of brooding and reflection in the association between anxiety sensitivity’s cognitive concerns and anxiety severity. The results indicate that anxiety sensitivity’s cognitive concerns generally positively predicted anxiety severity, and the remaining paths were significant (displayed in Table 2).

As can be observed in Fig. 1, anxiety sensitivity’s cognitive concerns had a direct effect on anxiety severity. Furthermore,

Table 1 Main descriptive statistics and correlationVariable

	1	2	3	4	5	6
1 ASCC	1.00					
2 ASPC	0.81**	1.00				
3 ASSC	0.77**	0.71**	1.00			
4 Reflection	0.58**	0.54**	0.51**	1.00		
5 Brooding	0.53**	0.45**	0.46**	0.81**	1.00	
6 Anxiety	0.61**	0.60**	0.54**	0.83**	0.78**	1.00

Note: $n = 619$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; ASCC = Anxiety Sensitivity Cognitive Concerns; ASPC = Anxiety Sensitivity Physical Concerns; ASSC = Anxiety Sensitivity Social Concerns

Table 2 Regression analysis of the relationship among model variables

Outcome variable	Predictor	R	R ²	F	β	t
Reflection	Cognitive concerns	0.58	0.33	306.94	0.57	17.52***
Brooding	Cognitive concerns	0.81	0.66	598.83	0.09	3.06**
	Reflection				0.76	26.37***
Anxiety	Cognitive concerns	0.87	0.75	590.69	0.17	6.58***
	Reflection				0.50	13.70***
	Brooding				0.29	8.16***

Note: β in the model is the standardized coefficient; * $p < 0.05$, *** $p < 0.001$

reflection and brooding were significant mediators between anxiety sensitivity's cognitive concerns and anxiety severity, including three paths. The analysis of indirect effects shows (see Table 3) that because the bootstrap CI was above zero, the mediating role of reflection and brooding between cognitive concerns and anxiety was significant.

Discussion

In the current study, we used several commonly used scales to investigate mental health during the pandemic, to reveal the process by which anxiety sensitivity impacts anxiety, and the role of brooding and reflection. The results indicate that anxiety sensitivity's cognitive concerns not only directly affected anxiety severity, but also affected anxiety through brooding and reflection.

Prior work has demonstrated the relationship between anxiety sensitivity and anxiety severity. For example, researchers conducted a two-year longitudinal study and found high stability of anxiety sensitivity, and change in anxiety sensitivity was positively correlated with change in severity of anxiety symptoms (Hovenkamp-Hermelink et al., 2019). Meanwhile, previous studies on cognitive concerns have found a relationship between cognitive sensitivity and depression. For example, a study found that cognitive concerns were related to both cognitive and affective/somatic symptoms of depression, while other dimensions were not related to depression

symptom dimensions (Saulnier et al., 2018). Our results extend prior findings, indicating that anxiety sensitivity's cognitive concerns also affect anxiety through rumination.

Studies have also found that individuals with high rumination have a preference for negative stimuli. Koster et al. (2011) proposed the impaired disengagement hypothesis, which supposes that prolonged processing of self-related negative information is caused by the uncorrupting of attention to negative information, a process that is closely related to rumination. But current research has confirmed that ruminative thinking is related to the break-up of disengagement in attentional bias, rather than to the engagement (Grafton et al., 2016; Hur et al., 2019; Vălenaș et al., 2017). Also, Owens and Gibb (2017) found that increased brooding was associated with greater continuous attention paid to sad faces compared to happy faces. This kind of specific attentional bias is probably the common psychological mechanism of mental health such as anxiety sensitivity and ruminative thinking affecting anxiety, which is worth further discussion. At the conceptual level, anxiety sensitivity and rumination are similar and both describe repetitive negative thoughts. Nevertheless, anxiety sensitivity reveals the fear of future painful symptoms, while rumination involves negative rethinking regarding past symptoms of distress. Despite conceptual similarities, few studies have considered the interplay between anxiety sensitivity and rumination and their associations with anxiety (Brown et al., 2016). Rumination and anxiety sensitivity are both responses to negative emotions or symptoms generally, while

Table 3 Analysis of the mediation effects of anxiety sensitivity cognitive concerns and anxiety

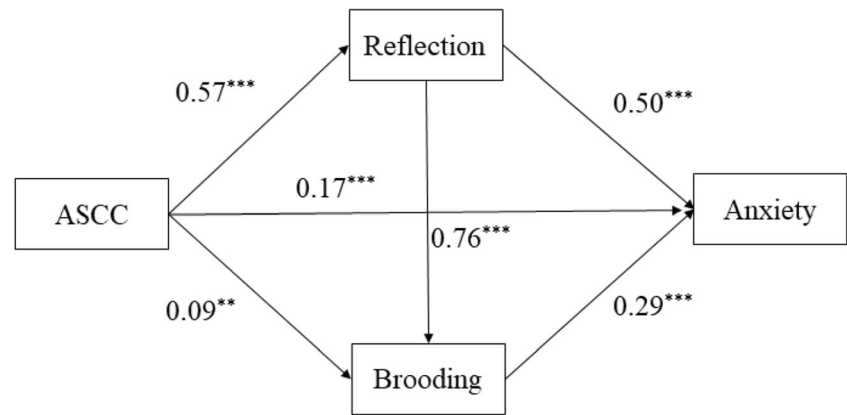
	Indirect effect	Boot SE	Boot 95% CI lower	Boot 95% CI upper
Total indirect effect	0.44	0.26	0.40	0.50
Indirect effect 1	0.29	0.03	0.23	0.35
Indirect effect 2	0.03	0.01	0.01	0.04
Indirect effect 3	0.13	0.02	0.10	0.16

Note: Indirect effect 1: cognitive concerns → reflection → anxiety;

indirect effect 2: cognitive concerns → brooding → anxiety;

indirect effect 3: cognitive concerns → reflection → brooding → anxiety

Fig. 1 Mediation analysis of brooding and reflection



rumination and anxiety sensitivity are both regarded as inappropriate emotional regulation strategies to handle suffering and pain (Aldao et al., 2010; Weems, 2011). And individuals of high cognitive concerns are more likely to notice anxiety-provoking stimuli (Bardeen & Daniel, 2018), thereby giving rise to more rumination of the event and themselves, and deepening anxiety.

In current study, compared with brooding, reflection had a greater mediation effect between cognitive concerns and anxiety severity. In some studies on depression and suicide, reflection and brooding have shown different effects. In most studies, brooding had a greater impact on emotional distress, while the role of reflection is controversial (Cole et al., 2015; Gooding et al., 2012; Marroquín et al., 2010). Reflection seems to be a more adaptive way to solve problems (Olatunji et al., 2013; Surrence et al., 2009). But in the current study, both brooding and reflection contributed to anxiety, and moreover, cognitive concerns are more about deepening anxiety through influence of reflection, and the path coefficients of cognitive concerns and brooding were smaller. This may be because individuals with high cognitive concerns tend to analyze events to solve the problems, but in fact this kind of reflection does not translate into action, but further deepens anxiety. However, this effect is likely to change over time. Treynor et al. (2003) suggested that reflection might be triggered by negative affect or give rise to negative affect in the short-term.

Admittedly, the study has some limitations. Firstly, due to the pandemic, our questionnaires were distributed online, but the main participants are students, so the sample is limited and there is restricted generalizability. Secondly, we did not conduct longitudinal methodology and were unable to obtain dynamic data. Thus, further studies can extend the study in various populations and track participants to explore changes over time. Thirdly, given the Need for Cognition (NFC), which describes individual's tendency to participate in and enjoy thinking, was related

to cognitive reflection when faced with cognitive tasks (Aquino et al., 2018; Cacioppo & Petty, 1982), it would be meaningful to explore the role of Need for Cognition in the process of anxiety development.

Despite the above limitations, our work still expands the findings of existing research. Previous studies have only found the specific relation between anxiety sensitivity cognitive concern and depression, generalized anxiety disorder, suicide and PTSD, but the mediating effects of rumination were seldom discussed (Allan et al., 2014; Brown et al., 2014; Oglesby et al., 2015; Olatunji & Wolitzky-Taylor, 2009; Olthuis et al., 2014; Saulnier et al., 2018). In sum, the current study may be the first research indicating that cognitive concern could influence anxiety via the mediating of brooding and reflection in the Chinese population.

Author Contributions HY designed the study protocol. FJ conducted data collection. XZ conducted data management, cleaning, and analysis. XZ and HY wrote the first draft of the paper. JE substantially revised the manuscript.

Funding This research receives a grant from the National Social Science Major Project of China (20ZDA079).

Data Availability Data and survey materials will be made available upon request.

Declarations

Ethical Approval All procedures performed in studies involving human participants were in accordance with ethical standards of institutional research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent Informed consent was obtained from all individual participants included in the study.

Conflict of Interest The authors report on conflicts of interest with this paper's study.

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