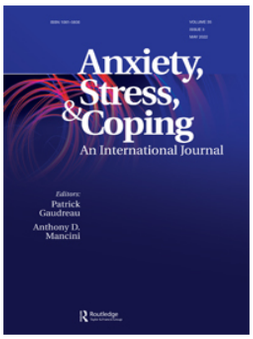

Routledge
Taylor & Francis Group

Anxiety, Stress, & Coping
An International Journal

ISSN: (Print) (Online) Journal homepage: www.tandfonline.com/journals/gasc20

Sequential multiple mediation of cognitive fusion and experiential avoidance in the relationship between rumination and social anxiety among Chinese adolescents

Qi Cheng, Congrong Shi, Chao Yan, Zhihong Ren, Sunny Ho-Wan Chan, Sijia Xiong, Tao Zhang & Hong Zheng

To cite this article: Qi Cheng, Congrong Shi, Chao Yan, Zhihong Ren, Sunny Ho-Wan Chan, Sijia Xiong, Tao Zhang & Hong Zheng (2022) Sequential multiple mediation of cognitive fusion and experiential avoidance in the relationship between rumination and social anxiety among Chinese adolescents, Anxiety, Stress, & Coping, 35:3, 354-364, DOI: 10.1080/10615806.2021.1955864

To link to this article: https://doi.org/10.1080/10615806.2021.1955864

Published online: 21 Jul 2021.

ANXIETY, STRESS, & COPING
2022, VOL. 35, NO. 3, 354–364
https://doi.org/10.1080/10615806.2021.1955864

Routledge
Taylor & Francis Group

Sequential multiple mediation of cognitive fusion and experiential avoidance in the relationship between rumination and social anxiety among Chinese adolescents

Qi Cheng [a*], Congrong Shi [b*], Chao Yan[a], Zhihong Ren[b], Sunny Ho-Wan Chan[c], Sijia Xiong[b], Tao Zhang[b] and Hong Zheng[d]

[a]Institute of Brain and Education Innovation; Key Laboratory of Brain Functional Genomics (MOE & STCSM), School of Psychology and Cognitive Science, East China Normal University, Shanghai, People's Republic of China; [b]Key Laboratory of Adolescent Cyberpsychology and Behavior (Ministry of Education), Key Laboratory of Human Development and Mental Health of Hubei Province, School of Psychology, Central China Normal University, Wuhan, People's Republic of China; [c]Department of Rehabilitation Sciences, The Hong Kong Polytechnic University, Hong Kong, People's Republic of China; [d]Shanghai Changning Mental Health Center, Shanghai, People's Republic of China

ABSTRACT

Background and Objectives: The potential mechanism by which rumination influences social anxiety through cognitive fusion and experiential avoidance proposed by the Acceptance and Commitment Therapy model has not been well-documented. This study, therefore, aimed to examine the sequential multiple mediation of the two processes.
Design: A cross-sectional survey was conducted.
Method: A total of 233 Chinese adolescents (42.06% girls) completed a set of printed self-report questionnaires measuring rumination, cognitive fusion, experiential avoidance, and social anxiety. The SPSS macro PROCESS (model 6) was used to test a sequential mediating model. A 95% confidence interval (CI) was calculated with 5000 bootstrapping re-samples.
Results: Bootstrap analyses indicated that there were indirect effects of rumination on social anxiety mediated by cognitive fusion together with experiential avoidance ($B = 0.098$, BootSE = 0.032, CI = 0.045 to 0.170), or solely by experiential avoidance ($B = 0.048$, BootSE = 0.020, CI = 0.014 to 0.093). The mediation of cognitive fusion alone was not significant ($B = 0.065$, BootSE = 0.038, CI = –0.006 to 0.144).
Conclusions: The results indicated the sequential mediating role of cognitive fusion and experiential avoidance, and the relative prominence of the latter in the association between rumination and social anxiety.

ARTICLE HISTORY
Received 2 November 2020
Revised 28 June 2021
Accepted 2 July 2021

KEYWORDS
Social anxiety; experiential avoidance; cognitive fusion; rumination; mediation

Introduction

Social anxiety, characterized as an intense and persistent fear of social situations (Leigh & Clark, 2018), is common in adolescents worldwide, with the prevalence ranging from 3.5% to 26.1% (Cheng et al., 2020; Feehan et al., 1994; Knappe et al., 2011; Li et al., 2016; Merikangas et al., 2010; Wagner et al., 2017). The onset of social anxiety usually occurs in early adolescence (Grant et al., 2005), and adolescents affected by social anxiety are likely to have high levels of impairments,

CONTACT Chao Yan cyan@psy.ecnu.edu.cn; Zhihong Ren ren@ccnu.edu.cn
*Both authors contributed equally to the study.
Supplemental data for this article can be accessed https://doi.org/10.1080/10615806.2021.1955864.

such as curtailed academic attainment, poor social relations, and difficult day-to-day life (Chiu et al., 2021; Leigh & Clark, 2018). Moreover, these functional impairments associated with social anxiety disorder (SAD) may persist into adulthood, manifesting low productivity in jobs and awful close relationships (Essau et al., 2014). The profound negative consequences signify the importance of exploring the factors related to social anxiety, which could provide an evidential basis for relieving adolescents' social anxiety. However, as opposed to overall anxiety symptomatology, little is known about the specific factors underlying social anxiety (Pickard et al., 2020).

Rumination, a potential transdiagnostic process(Cuthbert & Insel, 2013; Ehring & Watkins, 2008; McLaughlin & Nolen-Hoeksema, 2011), involves repetitive and passive thinking on personal distressing symptoms and a self-reflection on the possible causes and consequences of those symptoms (Nolen-Hoeksema et al., 2008). According to the cognitive model of SAD (Clark & Wells, 1995; Hofmann, 2007), the key cognitive processes such as negatively biased performance evaluation and overestimating the consequences of negative appraisals play a critical role in the maintenance of SAD. A ruminative response style may increase the likelihood of social anxiety by repeatedly reflecting on negative consequences of a performance or social situation (Modini et al., 2018). Several studies have also shown a predictive role of rumination in social anxiety among adults (Brozovich et al., 2015; Mellings & Alden, 2000; Wong & Moulds, 2012) and adolescents (Orue et al., 2014; Zhang & Zhou, 2018) when faced with social events.

Elucidating the nature of the relationship between rumination and social anxiety, and particularly identifying the mechanisms that associate dissimilar vulnerabilities with social anxiety, is crucial for developing theory-driven transdiagnostic interventions. The Acceptance and Commitment Therapy (ACT; Hayes et al., 1999) identities two core processes (i.e., cognitive fusion and experiential avoidance) that may help to understand the relation between aforementioned vulnerabilities and social anxiety. Cognitive fusion refers to one's tendency to get so caught up in the content of what they're thinking that it predominates over other useful sources of behavioral regulation (Hayes et al., 2011). Experiential avoidance is conceptualized as the unwillingness to contact one's private experiences that trigger the negative emotions and thoughts, and the efforts to alter the frequency or form of these unwanted experiences, even when doing so could have detrimental consequences (Hayes et al., 1996). Entangling with the content of private thoughts, rather than focusing on the ongoing psychological process, leads to avoidance of aversive experiences and efforts to control them (Greco et al., 2008), and thus cognitive fusion is often regarded as preceding and strengthening experiential avoidance (Hayes et al., 1996; Hayes et al., 1999).

According to the ACT model, cognitive fusion and experiential avoidance, gradually suppressing positive experiences, life meaning, and other core values of self, and exacerbating individuals' negative experiences (Kashdan et al., 2006), are likely to be toxic mechanisms that mediate the relationship between risk factors (e.g., rumination) and psychopathology (e.g., social anxiety). First, no research has been conducted on the association of rumination with cognitive fusion among adolescents, but a positive correlation between the two variables has been demonstrated in adult samples (Costa et al., 2018; Gillanders et al., 2014). Given that cognitive fusion has been described as an important underlying process in the development of adult anxiety symptoms (Bardeen & Fergus, 2016; Cookson et al., 2020; Herzberg et al., 2012), we hypothesized that cognitive fusion, by maintaining the excessive attachment to literal contents, might contribute to the unremitting negative effect of rumination on adolescent social anxiety. Second, experiential avoidance is positively correlated with social anxiety in adolescents (Kashdan et al., 2014; Papachristou et al., 2018; Shimoda et al., 2018). Rumination also has been conceptualized as an avoidance strategy (Martell et al., 2001) and is harmful when having avoidant functions (Giorgio et al., 2010). Considering that avoidance predicted the maintenance of anxiety disorder beyond the effect of rumination in adult samples (Spinhoven et al., 2017) and mediated the association between rumination and common mental health problems such as depressive symptoms (Brockmeyer et al., 2015) and posttraumatic stress disorder (Bishop et al., 2018), we hypothesized that experiential avoidance might account for a proportion of the relationship between rumination and social anxiety in adolescents. Finally, as experiential

avoidance is suggested in ACT literatures as a consequence of the entanglement with language-based processes (e.g., Hayes et al., 1996; Hayes et al., 1999) and the serial pathway from cognitive fusion to experiential avoidance has been supported (Cookson et al., 2020), we postulated a sequential mediating effect of the two processes in the association between rumination and social anxiety.

Additionally, some socio-demographic variables may influence adolescents' social anxiety. A recent review by Asher et al. (2017) indicated a consistently higher prevalence of social anxiety disorder in females compared to males, and this difference might be greater among adolescents. However, the gender difference was not stable among Chinese adolescents; some studies showed a higher level of social anxiety in girls than in boys (e.g., Li, 2012; Liu et al., 2019), and others found no significant gender differences among high school students (e.g., Bian et al., 2014; Gong, 2012; Yin et al., 2011). For the inhabitation, some Chinese scholars revealed that rural high school students, compared to urban students, showed a higher level of social anxiety (e.g., Li, 2012; Luo et al., 2008), which was not replicated in the study by Kang (2019). Moreover, a lower level of social anxiety was found in high school students who are the only child than those who are not (Luo et al., 2008), while Li (2012) found no difference between the two groups on social anxiety. In general, these inconsistent results suggest that the socio-demographic variables should be considered when examining the relation between rumination and social anxiety among Chinese adolescents.

So far, the potential mechanism by which rumination influences social anxiety through the two core processes proposed by the ACT model has not been well-documented. To increase the effectiveness of intervention programs for social anxiety among adolescents, information on this mechanism is valuable. As such, the present study aimed to clarify the associations between the four key variables and examine whether cognitive fusion and experiential avoidance accounted for variance in the relationship between rumination and social anxiety in a sample of Chinese adolescents.

Methods

Participants and procedure

A cross-sectional survey was conducted in March 2020 with a convenience sample of adolescents from a public middle school in central China. Prior to the investigation, we obtained the informed consents from the participants and their parents or guardians. The specific time of the survey was arranged by the school. Standardized instruction was provided to illustrate the purpose of research and the importance of participation. All the participants were informed that anonymity and confidentiality were guaranteed throughout the study, and completed a set of printed self-report questionnaires under the instruction of their head teachers and one of our research assistants. Thirty-three participants with missing data on any of the measured items were excluded, and the Little's

Table 1. Demographic characteristics of participants.

Variables	*n*	%
Age		
14	8	3.13
15	177	75.97
16	48	20.60
Gender		
Male	135	57.94
Female	98	42.06
Inhabitation		
Urban	171	73.39
Rural	62	26.61
Only child		
Yes	107	45.92
No	126	54.08

Missing Completely at Random test (Little, 1988) showed that the data were missing at random ($\chi^2(1549) = 1561.16$, $p = .409$). The final sample consisted of 233 participants, 135 boys (57.94%) and 98 girls (42.06%). The demographic characteristics are presented in Table 1. The protocol of the study was approved by the Ethics Committee of the School of Psychology, Central China Normal University.

Measures

Rumination

This variable was measured using the Ruminative Responses Scale-Reduced 10-itemVersion (RRS-10; Treynor et al., 2003). The scale includes two components, reflection (5 items) and brooding (5 items). All items are rated on a Likert 4-point scale from 1(almost never) to 4 (almost always). The Chinese version of this scale (Han & Yang, 2009) has demonstrated good internal consistency ($\alpha = .90$) and test-retest reliability ($r = .82$). The 10 items were summed to create a measure of rumination, with higher total scores indicating greater ruminative responses. In the current study, the internal consistency was satisfactory ($\alpha = 0.806$).

Social anxiety

This variable was measured with the Liebowitz Social Anxiety Scale (LSAS; Liebowitz, 1987). This scale includes social situations (11 items) and operation situations (13 items) and measures fear/anxiety and avoidance over the past three months, respectively. Fear/anxiety is rated using a 3-point Likert scale that ranges from 0 (none) to 3 (severe), and avoidance is assessed on a 3-point Likert scale that ranges from 0 (never) to 3 (always). The Chinese version of this measure (He & Zhang, 2004) is well validated and reliable, with high Cronbach's alpha (above .90) and adequate test-retest reliability ($r = .779$). The total score is calculated by summing all 24 items, and a higher score indicates a greater level of social anxiety. Cronbach's alpha for the scale was 0.954 in this study.

Cognition fusion

This variable was measured with the Fusion subscale of the Cognitive Fusion Questionnaire (CFQ; Gillanders et al., 2014). This subscale is composed of nine items that are rated on a 7-point Likert scale ranging from 1 (never true) to 7 (always true). A total subscale score is obtained by summing all the subscale items, and higher scores indicate greater cognitive fusion. The scale has been validated in China (Zhang et al., 2014), and showed good internal consistency ($\alpha = .92$) and acceptable test-retest reliability ($r = .67$). In the current study, the internal consistency was 0.895.

Experiential avoidance

This variable was measured with the Acceptance and Action Questionnaire-Second Edition (AAQ-II; Fledderus et al., 2012), which is a 7-item self-report questionnaire. Participants were asked to rate each item on a 7-point Likert scale the degree to which each statement was true for them. The total score is computed by summing all seven items, with higher scores indicating greater experiential avoidance. This measure has been validated in China (Cao et al., 2013), demonstrating good internal consistency ($\alpha = .88$) and test-retest reliability ($r = .80$). In the present study, the Cronbach's α for this scale was 0.854.

Data analysis

All the data analyses were performed by SPSS 23.0. Descriptive statistics was used to present the sample's characteristics on all the measures. Independent-samples *t* tests and one-way analysis of variance were conducted to test the group differences on the study variables. Pearson's correlation analyses were employed to examine the relationships among rumination, cognitive fusion, experiential avoidance and social anxiety. The sequential multiple mediation analysis was conducted to

test a mediating model; demographic variables which had significant differences in the study variables (i.e., gender, only child) were determined to be the covariates, rumination was the independent variable, social anxiety was the dependent variable, and cognitive fusion and experiential avoidance were used as pathways from rumination to social anxiety. The SPSS macro PROCESS (model 6) was used for estimating the total, direct and indirect effects (Hayes & Preacher, 2013). A 95% confidence interval (CI) was calculated with 5000 bootstrapping re-samples. If the 95% CI of the mediation path did not contain zero, the indirect effect was considered statistically significant.

Collinearity analysis was conducted to examine whether cognitive fusion and experiential avoidance met the assumptions for the mediation in the model. A tolerance of less than 0.20 and a variance of inflation factor (VIF) of 5.00 or above indicate a multicollinearity problem (O'Brien, 2007), which means that the sequential multiple mediation model is affected.

Results

Preliminary analysis

The means, standard deviations and correlations between variables are listed in Table 2. The results showed that all the variables were significantly correlated. Regarding the group differences on the research variables (see Appendix 1), females reported higher levels of experiential avoidance ($t(231) = 2.39$, $p = .018$); the only child group reported lower levels of experiential avoidance ($t(231) = -2.25$, $p = .025$) and social anxiety ($t(231) = -2.82$, $p = .005$); there were no other group differences on any other research variables. In addition, the collinearity analysis of rumination, cognitive fusion and experiential avoidance showed that the tolerance values were higher than 0.20 and that the VIF values were lower than 5.00 when social anxiety was determined to be the dependent variable (Appendix 2). This means that no collinearity issues exist in the variables of rumination, cognitive fusion and experiential avoidance, indicating that the results of mediation analysis were unbiased.

Cognitive fusion and experiential avoidance as sequential mediators

The results of the sequential multiple analysis as summarized in Appendix 3 revealed that rumination explained a 13.94% variance on social anxiety in the total effect model ($F = 12.37$, $p < 0.001$), and rumination, cognitive fusion, and experiential avoidance had a 29.18% variance in social anxiety ($F = 18.71$, $p < 0.001$).

Figure 1 displays the relationships among rumination, cognitive fusion, experiential avoidance and social anxiety. As can be seen, rumination had a total effect on social anxiety ($c = 0.324$, $p < 0.001$) when the variables of cognitive fusion and experiential avoidance were uncontrolled; however, the direct effect diminished to a nonsignificant one ($c' = 0.110$, $p = 0.088$) when the mediators (i.e., cognitive fusion and experiential avoidance) were entered into the model. This indicates that the effects of rumination on social anxiety were totally mediated by cognitive fusion and experiential avoidance.

Further analyses revealed the indirect sequential effects of cognitive fusion through experiential avoidance, and direct effects of experiential avoidance but not of cognitive fusion. The indirect effects of rumination on social anxiety through cognitive fusion and then experiential avoidance

Table 2. Means, standard deviations, and correlations among the main variables.

	Mean	*SD*	Rumination	Cognitive fusion	Experiential avoidance
Rumination	24.30	5.40	–		
Cognitive fusion	40.95	11.45	0.45**	–	
Experiential avoidance	23.06	8.95	0.45**	0.73**	–
Social anxiety	44.04	24.68	0.33**	0.45**	0.51**

Note. **$p < 0.01$.

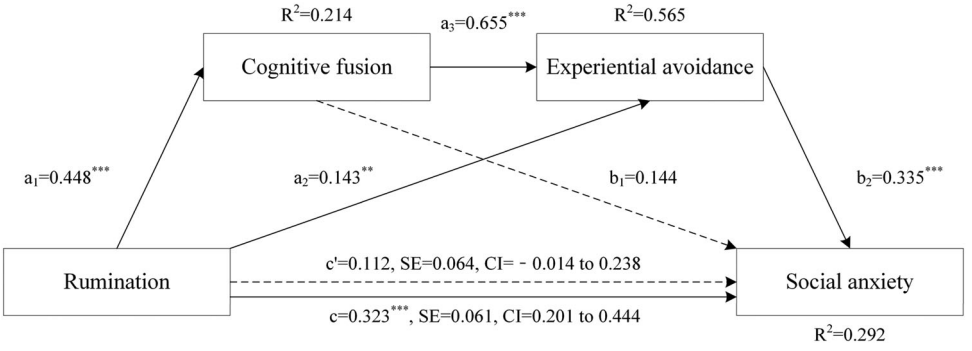

Figure 1. The model of sequential mediating role of cognitive fusion and experiential avoidance in the relationship between rumination and social anxiety.

Note. All the path coefficients are standardized coefficients. The solid line indicates a significant coefficient, while the dashed line nonsignificant. $^{**}p < 0.01$, $^{***}p < 0.001$.

were significant ($B = 0.098$, BootSE = 0.032, 95% confidence interval [CI] = 0.045 to 0.170). The indirect effect of rumination on social anxiety through experiential avoidance was also significant ($B = 0.048$, BootSE = 0.020, 95% CI = 0.014 to 0.093). Nonetheless, the indirect effect of rumination on social anxiety through cognitive fusion was not significant ($B = 0.065$, BootSE = 0.038, 95% CI = -0.006 to 0.144).

In addition, given the cross-sectional nature of the data, we tested the serial way from cognitive fusion to experiential avoidance in the competing model (see Appendix 4 and 5). The results showed that the indirect effects of rumination on social anxiety through the serial way from EA to CF ($B = 0.042$, BootSE = 0.024, CI = −0.005 to 0.089) and the indirect effect through CF ($B = 0.023$, BootSE = 0.016, CI = −0.002 to 0.059) were both not significant, while that through experiential avoidance was significant ($B = 0.146$, BootSE = 0.045, CI = 0.068 to 0.240).

Overall, these results illustrate the importance of the mediating roles of cognitive fusion and experiential avoidance, particularly the latter, as strong predictors of social anxiety.

Discussion

The current study assessed the relationships among rumination, cognitive fusion, experiential avoidance and social anxiety. We also used sequential multiple mediation models to determine how rumination influences social anxiety through the effects of cognitive fusion and experiential avoidance.

The result that rumination was significantly correlated with social anxiety is consistent with previous studies (Brozovich et al., 2015; Hofmann, 2007; Mellings & Alden, 2000; Modini & Abbott, 2016; Zhang & Zhou, 2018). However, we found in the sequential multiple mediation analysis that rumination did not have a significantly direct effect but an indirect one on adolescents' social anxiety, which contributes to our in-depth understanding of the association of rumination with social anxiety and the clarification of the predicting effect of rumination on social anxiety (Segerstrom et al., 2000; Valenas & Szentagotai-Tatar, 2015). Specifically, rumination had significant indirect effects on social anxiety either through cognitive fusion and experiential avoidance together in a series or through experience avoidance solely.

On the one hand, the rumination-cognitive fusion-experience avoidance-social anxiety path seems to suggest that rumination do not per se impact social anxiety, but rather the excessive attachment to the literal content of thoughts and the avoidance of unpleasant experiences lead to social anxiety. That is, the adolescents who consider the repetitive thinking of the negative aspects of self or distressing situations (i.e., rumination) as a way of better understanding their internal experiences and solving their problems could become fused with their difficult thoughts

and lose contact with the present moment, which induces a tendency to use avoidant strategies to control aversive private experiences and further intensifies suffering and anxious symptoms. Notably, the competing model showing the nonsignificant path from experiential avoidance to cognitive fusion consolidates the reversed sequential mediating path, namely from cognitive fusion to experiential avoidance. The findings are consistent with the serial relationship between cognitive fusion and experiential avoidance implicated in ACT literatures (Greco et al., 2008; Hayes et al., 1996), and with the proposition that inflexibly entangled with verbal processes, coupled with excessive control and avoidance of unwanted experiences, is thought to be a common pathway to psychopathology (Cookson et al., 2020) and exacerbate emotional distress (Bond et al., 2006). In clinical practice, this finding suggests a possible sequence of intervention targets for adolescent social anxiety.

On the other hand, the rumination-experience avoidance-social anxiety path supports the toxic influences of experiential avoidance as a core mechanism in the development and maintenance of psychological distress (Cookson et al., 2020; Kashdan et al., 2006), and is in accordance with previous studies showing a unique predicting role of experiential avoidance in social anxiety (Epkins, 2016; Kashdan et al., 2013; Spinhoven et al., 2014). It appears that a ruminative style provides adolescents with an evidential base to justify inactivity and social withdrawal (Nolen-Hoeksema et al., 2008), and prompts them to control, avoid, or escape the upsetting inner experiences (Dinis et al., 2015) instead of initiating the active problem solving (Nolen-Hoeksema & Morrow, 1991), which seems to intensify social anxiety. In fact, as a strategy of emotion regulation, avoidance has been suggested to ironically increase negative experiences (Campbell-Sills et al., 2006) and cause emotional dysregulation (Hayes et al., 1996). For clinical practice, this finding indicates that focusing solely on cognitive defusion techniques is not sufficient to alleviate social anxiety in adolescents.

Another noteworthy result was that experiential avoidance appeared to be more crucial for understanding adolescents' social anxiety than cognitive fusion. Contrary to our prediction, cognitive fusion did not have a direct effect on social anxiety but only an indirect one through experiential avoidance. In other words, when rumination and experiential avoidance were added to the mediation model, cognitive fusion alone was not a significant predictor of social anxiety. As Hayes et al. (2012) mentioned, cognitive fusion, in-and-of- itself, may not be maladaptive unless one has no other alternatives to fusion that can be applied flexibly. Then, the dysfunctional outcomes (e.g., social anxiety) caused by cognitive fusion could be attributable to a rigid use of avoidance as a primary or sole source of regulation which greatly reduce the possibility for individuals to detach from their thoughts. Therefore, more attention should be paid to adolescents who cope with distress in an avoidant way regardless of whether they are excessively attached to the literal contents of their thoughts.

Limitations and implications

Several limitations should be mentioned. First, the cross-sectional design cannot determine the causal the associations between the variables studied and the time sequence of their occurrences, and the sample size is relatively small, so the findings of this study should be interpreted with caution. Longitudinal study and a large sample are needed to further explore the interactions of these variables. Second, all the data were collected through self-report measurements, which means that they may be affected by the participants' subjective responses. Finally, the convenience sampling used in the current study is not well representative of the Chinese adolescent population, and thus the results are not necessarily generalizable to other young people of the same age.

Despite these limitations, our research constitutes a crucial step in examining the mechanism of the relationship between rumination and social anxiety, and yields tentative implications for the intervention of social anxiety in adolescents. The results tentatively suggest that interventions targeting in cognitive fusion and experiential avoidance are helpful for alleviating social anxiety. Further, the sequential relationship between cognitive fusion and experiential avoidance and the

relative prominence of the latter, albeit in need of replication, is somewhat informative for clinical practice. For example, interventions focusing solely on cognitive defusion techniques, not accompanied by acceptance-based approaches, may have a limited capability to reduce the heightened levels of social anxiety for adolescents who experience stressful social interaction and/or who are prone to perseverative, repetitive, and negative thinking. Conversely, reducing the attempts to control internal aversive experiences and strengthening the ability to attend to these experiences in a more flexible, fluid, and voluntary manner may be a beneficial early intervention to reduce the risk of developing social anxiety for adolescents who are prone to respond to distress in a ruminative style and be fused with what the thoughts imply. Notably, these interventions discussed above should be implemented with caution due to the study limitations and need a broader knowledge base which will be bolstered in future studies.

Conclusion

The current study has identified significant associations among rumination, cognitive fusion, experiential avoidance and social anxiety in Chinese adolescents. Theoretically, this study has contributed to a new model of social anxiety development from rumination through cognitive fusion and experiential avoidance. Practically, the results provide some implications for the interventions tailored to adolescents with high levels of social anxiety.

Funding

This work was supported by the Fundamental Research Funds for the Central Universities (Grant No. 2020YBZZ091); the Basic Research Project of Shanghai Science and Technology Commission (Grant No.19JC1410101); the Research Funds for Shanghai Health Commission for Academic Leader Training (Grant No. GWV-10.2-XD30); the Research Funds for Changning District Health Committee of Medical Specialty (Grant No.20192002); the Project of Humanities and Social Sciences [grant number 20YJC190025].

Data availability statement

The data used to support the findings of this study are available from the corresponding author upon request.

Ethics statement

The protocol of the study was approved by the Ethics Committee of the School of Psychology, Central China Normal University.

ORCID

Qi Cheng http://orcid.org/0000-0002-4099-7998
Congrong Shi http://orcid.org/0000-0002-4632-4874

References

Asher, M., Asnaani, A., & Aderka, I. M. (2017). Gender differences in social anxiety disorder: A review. *Clinical Psychology Review*, *56*, 1–12. https://doi.org/10.1016/j.cpr.2017.05.004

Bardeen, J. R., & Fergus, T. A. (2016). The interactive effect of cognitive fusion and experiential avoidance on anxiety, depression, stress and posttraumatic stress symptoms. *Journal of Contextual Behavioral Science*, *5*(1), 1–6. https://doi.org/10.1016/j.jcbs.2016.02.002

Bian, C., Li, X., & Chen, Y. (2014). Social anxiety and interpersonal attribution among high school students. *Chinese Journal of School Health*, *35*(09), 1325–1327.

Bishop, L. S., Ameral, V. E., & Reed, K. M. P. (2018). The impact of experiential avoidance and event centrality in trauma-related rumination and posttraumatic stress. *Behavior Modification*, *42*(6), 815–837. https://doi.org/10.1177/0145445517747287

Bond, F. W., Hayes, S. C., & Barnes-Holmes, D. (2006). Psychological flexibility, ACT, and organizational behavior. *Journal of Organizational Behavior Management*, *26*(1-2), 25–54. https://doi.org/10.1300/J075v26n01_02

Brockmeyer, T., Holtforth, M. G., Krieger, T., Altenstein, D., Doerig, N., Zimmermann, J., Backenstrass, M., Friederich, H., & Bents, H. (2015). Preliminary evidence for a nexus between rumination, behavioural avoidance, motive satisfaction and depression. *Clinical Psychology & Psychotherapy*, *22*(3), 232–239. https://doi.org/10.1002/cpp.1885

Brozovich, F. A., Goldin, P., Lee, I., Jazaieri, H., Heimberg, R. G., & Gross, J. J. (2015). The effect of rumination and reappraisal on social anxiety symptoms during cognitive-behavioral therapy for social anxiety disorder. *Journal of Clinical Psychology*, *71*(3), 208–218. https://doi.org/10.1002/jclp.22132

Campbell-Sills, L., Barlow, D. H., Brown, T. A., & Hofmann, S. G. (2006). Effects of suppression and acceptance on emotional responses of individuals with anxiety and mood disorders. *Behaviour Research and Therapy*, *44*(9), 1251–1263. https://doi.org/10.1016/j.brat.2005.10.001

Cao, J., Ji, Y., & Zhu, Z. (2013). Reliability and validity of the Chinese version of the Acceptance and Action Questionnaire-Second Edition (AAQ-II) in college students. *Chinese Mental Health Journal*, *27*(11), 873–877.

Cheng, Y., Li, N., & Tang, W. (2020). Prevalence of multiple anxiety disorder and associated factors among adolescents three years after Ya'an Earthqhake. *Chinese Journal of School Health*, *41*(6), 855–858.

Chiu, K., Clark, D. M., & Leigh, E. (2021). Prospective associations between peer functioning and social anxiety in adolescents: A systematic review and meta-analysis. *Journal of Affective Disorders*, *279*, 650–661. https://doi.org/10.1016/j.jad.2020.10.055

Clark, D. M., & Wells, A. (1995). A cognitive model of social phobia. In R. G. Heimberg, M. R. Liebowitz, D. A. Hope, & F. R. Schneier (Eds.), *Social phobia: Diagnosis, assessment, and treatment* (pp. 69–93). Guilford Press.

Cookson, C., Luzon, O., Newland, J., & Kingston, J. (2020). Examining the role of cognitive fusion and experiential avoidance in predicting anxiety and depression. *Psychology and Psychotherapy: Theory, Research and Practice*, *93*(3), 456–473. http://doi.org/10.1111/papt.12233

Costa, J., Gouveia, J. P., & Marôco, J. (2018). The role of negative affect, rumination, cognitive fusion and mindfulness on depressive symptoms in depressed outpatients and normative individuals. *International Journal of Psychology and Psychological Therapy*, *18*(2), 207–220.

Cuthbert, B. N., & Insel, T. R. (2013). Toward the future of psychiatric diagnosis: The seven pillars of RDoC. *BMC Medicine*, *11*(1), 126. https://doi.org/10.1186/1741-7015-11-126

Dinis, A., Carvalho, S., Gouveia, J. P., & Estanqueiro, C. (2015). Shame memories and depression symptoms: The role of cognitive fusion and experiential avoidance. *International Journal of Psychology and Psychological Therapy*, *15*(1), 63–86.

Ehring, T., & Watkins, E. R. (2008). Repetitive negative thinking as a transdiagnostic process. *International Journal of Cognitive Therapy*, *1*(3), 192–205. https://doi.org/10.1521/ijct.2008.1.3.192

Epkins, C. C. (2016). Experiential avoidance and anxiety sensitivity: Independent and specific associations with children's depression, anxiety, and social anxiety symptoms. *Journal of Psychopathology and Behavioral Assessment*, *38*(1), 124–135. https://doi.org/10.1007/s10862-015-9502-1

Essau, C. A., Lewinsohn, P. M., Olaya, B., & Seeley, J. R. (2014). Anxiety disorders in adolescents and psychosocial outcomes at age 30. *Journal of Affective Disorders*, *163*, 125–132. https://doi.org/10.1016/j.jad.2013.12.033

Feehan, M., McGee, R., Raja, S. N., & Williams, S. M. (1994). DSM-III-R disorders in New Zealand 18-year-olds. *Australian and New Zealand Journal of Psychiatry*, *28*(1), 87–99. https://doi.org/10.3109/00048679409075849

Fledderus, M., Oude Voshaar, M. A., Ten Klooster, P. M., & Bohlmeijer, E. T. (2012). Further evaluation of the psychometric properties of the Acceptance and Action Questionnaire-II. *Psychological Assessment*, *24*(4), 925–936. https://doi.org/10.1037/a0028200

Gillanders, D. T., Bolderston, H., Bond, F. W., Dempster, M., Flaxman, P. E., Campbell, L., Kerr, S., Tansey, L., Noel, P., Ferenbach, C., Masley, S., Roach, L., Lloyd, J., May, L., Clarke, S., & Remington, B. (2014). The development and initial validation of the Cognitive Fusion Questionnaire. *Behavior Therapy*, *45*(1), 83–101. https://doi.org/10.1016/j.beth.2013.09.001

Giorgio, J. M., Sanflippo, J., Kleiman, E., Reilly, D., Bender, R. E., Wagner, C. A., Liu, R. T., & Alloy, L. B. (2010). An experiential avoidance conceptualization of depressive rumination: Three tests of the model. *Behaviour Research and Therapy*, *48*(10), 1021–1031. https://doi.org/10.1016/j.brat.2010.07.004

Gong, Q. (2012). The relationship between social anxiety and self-concordance among high school students. *Scientific Information*, *34*, 365–368.

Grant, B. F., Hasin, D. S., Blanco, C., Stinson, F. S., Chou, P., Goldstein, R. B., Dawson, D. A., Smith, S., Saha, T. D., & Huang, B. (2005). The epidemiology of social anxiety disorder in the United States: Results from the national epidemiologic survey on alcohol and related conditions. *Journal of Clinical Psychiatry*, *66*(11), 1351–1361. https://doi.org/10.4088/JCP.v66n1102

Greco, L. A., Baer, R. A., & Lambert, W. (2008). Psychological inflexibility in childhood and adolescence: Development and evaluation of the avoidance and fusion questionnaire for youth. *Psychological Assessment*, *20*(2), 93–102. https://doi.org/10.1037/1040-3590.20.2.93

Han, X., & Yang, H. (2009). Chinese version of Nolen-Hoeksema Ruminative Responses Scale (RRS) used in 912 college students: Reliability and validity. *Chinese Journal of Clinical Psychology*, *17*(5), 550–551, 549.

Hayes, A. F., & Preacher, K. J. (2013). Conditional process modeling: Using structural equation modeling to examine contingent causal processes. In G. R. Hancock, & R. O. Mueller (Eds.), *Structural equation modeling: A second course* (2nd ed., pp. 219–266). Information Age Publishing.

Hayes, S. C., Strosahl, K. D., & Wilson, K. G. (1999). *Acceptance and commitment therapy: An experiential approach to behavior change*. Guilford Press.

Hayes, S. C., Strosahl, K. D., & Wilson, K. G. (2012). *Acceptance and commitment therapy: The process and practice of mindful change* (2nd ed.). Guilford Press.

Hayes, S. C., Villatte, M., Levin, M., & Hildebrandt, M. (2011). Open, aware, and active: Contextual approaches as an emerging trend in the behavioral and cognitive therapies. *Annual Review of Clinical Psychology*, *7*(1), 141–168. https://doi.org/10.1146/annurev-clinpsy-032210-104449

Hayes, S. C., Wilson, K. G., Gifford, E. V., Follette, V. M., & Strosahl, K. (1996). Experiential avoidance and behavioral disorders: A functional dimensional approach to diagnosis and treatment. *Journal of Consulting and Clinical Psychology*, *64*(6), 1152–1168. https://doi.org/10.1037/0022-006X.64.6.1152

He, Y., & Zhang, M. (2004). Psychometric investigation of Liebowitz Social Anxiety Scale. *Journal of Diagnostics: Concepts and Practice*, *3*, 89–93.

Herzberg, K. N., Sheppard, S. C., Forsyth, J. P., Crede, M., Earleywine, M., & Eifert, G. H. (2012). The Believability of Anxious Feelings and Thoughts Questionnaire (BAFT): A psychometric evaluation of cognitive fusion in a nonclinical and highly anxious community sample. *Psychological Assessment*, *24*(4), 877–891. https://doi.org/10.1037/a0027782

Hofmann, S. G. (2007). Cognitive factors that maintain social anxiety disorder: A comprehensive model and its treatment implications. *Cognitive Behaviour Therapy*, *36*(4), 193–209. https://doi.org/10.1080/16506070701421313

Kang, H. (2019). *A research on the relationships between parent-child attachment and social anxiety in senior middle school students: Mediating role of interpersonal sensitivity* [Master's thesis], Henan University, CNKI. https://kns.cnki.net/KCMS/detail/detail.aspx?dbname=CMFD202001&filename=1019186139.nh

Kashdan, T. B., Barrios, V., Forsyth, J. P., & Steger, M. F. (2006). Experiential avoidance as a generalized psychological vulnerability: Comparisons with coping and emotion regulation strategies. *Behaviour Research and Therapy*, *44*(9), 1301–1320. https://doi.org/10.1016/j.brat.2005.10.003

Kashdan, T. B., Farmer, A. S., Adams, L. M., Ferssizidis, P., McKnight, P. E., & Nezlek, J. B. (2013). Distinguishing healthy adults from people with social anxiety disorder: Evidence for the value of experiential avoidance and positive emotions in everyday social interactions. *Journal of Abnormal Psychology*, *122*(3), 645–655. https://doi.org/10.1037/a0032733

Kashdan, T. B., Goodman, F. R., Machell, K. A., Kleiman, E. M., Monfort, S. S., Ciarrochi, J., & Nezlek, J. B. (2014). A contextual approach to experiential avoidance and social anxiety: Evidence from an experimental interaction and daily interactions of people with social anxiety disorder. *Emotion*, *14*(4), 769–781. https://doi.org/10.1037/a0035935

Knappe, S., Beesdo-Baum, K., Fehm, L., Stein, M. B., Lieb, R., & Wittchen, H. (2011). Social fear and social phobia types among community youth: Differential clinical features and vulnerability factors. *Journal of Psychiatric Research*, *45*(1), 111–120. https://doi.org/10.1016/j.jpsychires.2010.05.002

Leigh, E., & Clark, D. M. (2018). Understanding social anxiety disorder in adolescents and improving treatment outcomes: Applying the cognitive model of Clark and Wells (1995). *Clinical Child and Family Psychology Review*, *21*(3), 388–414. https://doi.org/10.1007/s10567-018-0258-5

Li, L. (2012). *The research for the high school students' features of social anxiety and the relationship among social anxiety and the related variables* [Master's thesis]. Hunan Normal University, CNKI. https://kns.cnki.net/KCMS/detail/detail.aspx?dbname=CMFD201301&filename=1012438181.nh

Li, T., Cao, J., Lu, W., Li, Y., Yang, J., & Li, Y. (2016). Research progress on psychological intervention of social anxiety disorder in adolescents. *Chinese Journal of School Health*, *37*(10), 1590–1593.

Liebowitz, M. R. (1987). Social Phobia. *Modern Problems of Pharmacopsychiatry*, *22*, 141–173. https://doi.org/10.1159/000414022

Little, R. J. (1988). A test of missing completely at random for multivariate data with missing values. *Journal of the American Statistical Association*, *83*(404), 1198–1202. https://doi.org/10.1080/01621459.1988.10478722

Liu, G., Zhang, D., Mo, W., Li, J., & Zhu, Z. (2019). On effect of adolescents' psychological suzhi on social anxiety and its gender differences. *Journal of Southwest China Normal University (Nature Science Edition)*, *44*(02|2), 91–96.

Luo, Y., Wang, X., Zhu, X., & Yao, S. (2008). The level of anxiety and its influencing factor among high school students. *Chinese Mental Health Journal*, *22*(08), 628–629.

Lyubomirsky, S., Kasri, F., Chang, O., & Chung, I. (2006). Ruminative response styles and delay of seeking diagnosis for breast cancer symptoms. *Journal of Social and Clinical Psychology*, *25*(3), 276–304. https://doi.org/10.1521/jscp.2006.25.3.276

Martell, C. R., Addis, M. E., & Jacobson, N. S. (2001). *Depression in context: Strategies for guided action*. WW Norton.

McLaughlin, K. A., & Nolen-Hoeksema, S. (2011). Rumination as a transdiagnostic factor in depression and anxiety. *Behaviour Research and Therapy*, *49*(3), 186–193. https://doi.org/10.1016/j.brat.2010.12.006

Mellings, T. M., & Alden, L. E. (2000). Cognitive processes in social anxiety: The effects of self-focus, rumination and anticipatory processing. *Behaviour Research and Therapy*, *38*(3), 243–257. https://doi.org/10.1016/S0005-7967(99)00040-6

Merikangas, K. R., He, J. P., Burstein, M., Swanson, S. A., Avenevoli, S., Cui, L., … Swendsen, J. (2010). Lifetime prevalence of mental disorders in US adolescents: Results from the national comorbidity survey replication-adolescent supplement (NCS-A). *Journal of the American Academy of Child & Adolescent Psychiatry*, *49*(10), 980–989. https://doi.org/10.1016/j.jaac.2010.05.017.

Modini, M., & Abbott, M. J. (2016). A comprehensive review of the cognitive determinants of anxiety and rumination in social anxiety disorder. *Behaviour Change*, *33*(3), 150–171. https://doi.org/10.1017/bec.2016.10

Modini, M., Rapee, R. M., & Abbott, M. J. (2018). Processes and pathways mediating the experience of social anxiety and negative rumination. *Behaviour Research and Therapy*, *103*, 24–32. https://doi.org/10.1016/j.brat.2018.01.009

Nolen-Hoeksema, S., & Morrow, J. (1991). A prospective study of depression and posttraumatic stress symptoms after a natural disaster: The 1989 Loma Prieta Earthquake. *Journal of Personality and Social Psychology*, *61*(1), 115–121. https://doi.org/10.1037/0022-3514.61.1.115

Nolen-Hoeksema, S., Wisco, B. E., & Lyubomirsky, S. (2008). Rethinking rumination. *Perspectives on Psychological Science*, *3*(5), 400–424. https://doi.org/10.1111/j.1745-6924.2008.00088.x

O'Brien, R. M. (2007). A caution regarding rules of thumb for variance inflation factors. *Quality & Quantity*, *41*(5), 673–690. https://doi.org/10.1007/s11135-006-9018-6

Orue, I., Calvete, E., & Padilla, P. (2014). Brooding rumination as a mediator in the relation between early maladaptive schemas and symptoms of depression and social anxiety in adolescents. *Journal of Adolescence*, *37*(8), 1281–1291. https://doi.org/10.1016/j.adolescence.2014.09.004

Papachristou, H., Theodorou, M., Neophytou, K., & Panayiotou, G. (2018). Community sample evidence on the relations among behavioural inhibition system, anxiety sensitivity, experiential avoidance, and social anxiety in adolescents. *Journal of Contextual Behavioral Science*, *8*, 36–43. https://doi.org/10.1016/j.jcbs.2018.03.001

Pickard, H., Hirsch, C., Simonoff, E., & Happe, F. (2020). Exploring the cognitive, emotional and sensory correlates of social anxiety in autistic and neurotypical adolescents. *Journal of Child Psychology and Psychiatry, 61*(12),1317-1327. http://doi.org/10.1111/jcpp.13214

Segerstrom, S. C., Tsao, J., Alden, L. E., & Craske, M. G. (2000). Worry and rumination: Repetitive thought as a concomitant and predictor of negative mood. *Cognitive Therapy and Research*, *24*(6), 671–688. https://doi.org/10.1023/A:1005587311498

Shimoda, Y., Ishizu, K., & Ohtsuki, T. (2018). The reciprocal relations between experiential avoidance and social anxiety among early adolescents: A prospective cohort study. *Journal of Contextual Behavioral Science*, *10*, 115–119. https://doi.org/10.1016/j.jcbs.2018.10.001

Sparrevohn, R. M., & Rapee, R. M. (2009). Self-disclosure, emotional expression and intimacy within romantic relationships of people with social phobia. *Behaviour Research and Therapy*, *47*(12), 1074–1078. https://doi.org/10.1016/j.brat.2009.07.016

Spinhoven, P., Drost, J., De Rooij, M., Van Hemert, A. M., & Penninx, B. W. (2014). A longitudinal study of experiential avoidance in emotional disorders. *Behavior Therapy*, *45*(6), 840–850. https://doi.org/10.1016/j.beth.2014.07.001

Spinhoven, P., van Hemert, A. M., & Penninx, B. W. J. H. (2017). Experiential avoidance and bordering psychological constructs as predictors of the onset, relapse and maintenance of anxiety disorders: One or many? *Cognitive Therapy and Research*, *41*(6), 867–880. https://doi.org/10.1007/s10608-017-9856-7

Treynor, W., Gonzalez, R., & Nolen-Hoeksema, S. (2003). Rumination reconsidered: A psychometric analysis. *Cognitive Therapy and Research*, *27*(3), 247–259. https://doi.org/10.1023/A:1023910315561

Valenas, S. P., & Szentagotai-Tatar, A. (2015). The relationships between stress, negative affect, rumination and social anxiety. *Journal of Evidence-Based Psychotherapies*, *15*(2), 179–189.

Wagner, G., Zeiler, M., Waldherr, K., Philipp, J., Truttmann, S., Dur, W., Treasure, J. L., & Karwautz, A. F. K. (2017). Mental health problems in Austrian adolescents: A nationwide, two-stage epidemiological study applying DSM-5 criteria. *European Child & Adolescent Psychiatry*, *26*(12), 1483–1499. https://doi.org/10.1007/s00787-017-0999-6

Wong, Q. J. J., & Moulds, M. L. (2012). Does Rumination Predict the Strength of Maladaptive Self-Beliefs Characteristic of Social Anxiety Over Time? *Cognitive Therapy and Research*, *36*(1), 94–102. https://doi.org/10.1007/s10608-010-9316-0

Yin, Y., Li, Y., & Xie, J. (2011). Investigation and analysis on social anxiety of rural high school students in Hunan province. *Educational Measurement and Evaluation*, *25*(1), 39–42.

Zhang, W., Ji, Y., Li, X., Guo, H., & Zhu, Z. (2014). Reliability and validity of the Chinese version of the Cognitive Fusion Questionnaire. *Chinese Mental Health Journal*, *28*(1), 40–44.

Zhang, C., & Zhou, Z. (2018). Passive social network site use, social anxiety, rumination and depression in adolescents. *Chinese Journal of Clinical Psychology*, *26*(3), 490–493, 497.