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STANDARD PAPER

The Impact of Cognitive Restructuring on Post-Event Rumination and Its Situational Effect on Socially Anxious Adolescents

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Abstract

Post-event rumination (PER) has been seen as a key element in the persistence of social anxiety (disorder). Studies on PER-targeted intervention, e.g., cognitive restructuring (CR), has, however, received little attention in adults, not yet in youth. In addition, previous research showed that, compared to interaction, participants reported higher levels of PER after speech task. The main aim of the present study was to investigate the effect of CR targeting PER among socially anxious (Chinese) adolescents and also to compare the intervention effect between speech and interaction situations. The present study recruited a sample of 73 high socially anxious adolescents aged 12–16 years and then randomly assigned them into speech ($n = 37$) or interaction ($n = 36$) group, without control group. PER and social anxiety (SA) were measured before and after CR. Analysis of Covariance (ANCOVA) results showed that adolescents' PER and SA symptoms were significantly improved with intervention with moderate to high effect size. Furthermore, the decrease in PER could significantly predict the improvement of SA. However, the intervention effect showed no difference between groups. Although no control group was included, one-session CR still showed its potential to improve participants' PER and SA. Limitations and future directions were discussed.

Keywords: adolescents; cognitive restructuring; post-event rumination; situational effect; social anxiety

Introduction

Social anxiety disorder (SAD) is characterised by being fearful of negative evaluations or judgements from others in social situations (Diagnostic and Statistical Manual of Mental Disorders (DSM)-5; American Psychiatric Association, 2013; Hirsch, Meeten, Krahé, & Reeder, 2016; Westenberg, Gullone, Bokhorst, Heyne, & King, 2007). It is one of the most epidemic psychological disorders in children and adolescents (Kessler et al., 1994) with a prevalence rate of about 10% (e.g., Beesdo et al., 2007; Wittchen, Stein, & Kessler, 1999). The existence of SAD in the period of adolescence would raise the risk of comorbid other mental disorders (e.g., Costello, Mustillo, Erkanli, Keeler, & Angold, 2003). Moreover, SAD during adolescence is relevant to impairments in academic and social functioning, such as, lower peer acceptance (e.g., Blöte & Westenberg, 2007; Greco & Morris, 2005), negative interaction with peers (e.g., Blöte, Miers, Heyne, & Westenberg, 2015), and victimisation by peers (e.g., Ranta, Kaltiala-Heino, Fröjd, & Marttunen, 2013).

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Clark and Wells (1995) proposed that the post-event rumination (PER) following an anxiety-provoking social situation is a key factor in the maintenance of SAD, including in youth sample (Hodson, McManus, Clark, & Doll, 2008). PER is a repetitive cognitive process involving intrusive images, negative thoughts and self-perception related to social situations, and similar past social failures (Abbott & Rapee, 2004; Clark & Wells, 1995; Hofmann, 2007). Previous research has consistently indicated that socially anxious individuals registered high levels of PER after experiencing social occasions (e.g., Kiko et al., 2012; Makkar & Grisham, 2011); however, relatively few empirical studies have examined the role of PER in the maintenance of social anxiety (disorder) in youth samples (e.g., Blöte, Miers, Van den Bos, & Westenberg, 2019; Hodson et al., 2008).

One cross-sectional study by Hodson et al. (2008) demonstrated that socially anxious adolescents aged 11–14 years old showed greater PER than participants with low levels of social fear. The result of further regression analysis showed that after controlling for depression, PER could significantly predict social anxiety (SA) (Hodson et al., 2008). Although no longitudinal design was adopted in Hodson et al. (2008)'s study, the authors still claimed that the cross-sectional research design was able to infer the applicability of Clark and Well's (1995) model to young people, which the conclusion that PER could be significantly predictive of adolescents' SA was convincible as the model primarily concerns the maintenance, not the aetiology, of social anxiety (disorder) (Hodson et al., 2008). In another study, Blöte et al. (2019) used an experimental social event — a 5-min Leiden Public Speaking Task (Westenberg et al., 2009) — with a community sample of 229 adolescents, aged 11–18 years, whose PER was measured with Thoughts Questionnaire (Edwards, Rapee, & Franklin, 2003) 1 week after the social task. Results demonstrated that after partially out of depression, adolescents' SA measured at baseline significantly predicted PER after the speech task (Blöte et al., 2019). Thus, for socially anxious adolescents, a vicious and an interactive circle exists; in other words, the original SA raises their PER level after experiencing social occasions; then the induced PER further increases their fears of social events.

Cognitive behavioral therapy (CBT) has been empirically proven efficacious in alleviating SA in the samples of youth (e.g., Albano, 1995; Hayward et al., 2000) and also beneficial in reducing cognitive bias, such as PER (e.g., Kocovski & Rector, 2008; Shikatani, Antony, Kuo, & Cassin, 2014) but only in adult populations. McEvoy, Mahoney, Perini, and Kingsep (2009) recruited 61 participants diagnosed with SAD to conduct group CBT. Results showed that after the 7-week group intervention participants' PER and SA levels were significantly improved with a moderate effect size (McEvoy et al., 2009). Further analyses suggested a significant correlation between the reduction of both PER and SA (McEvoy et al., 2009). Shikatani et al. (2014) recruited 56 participants with high levels of SA. In this study, after delivering a 3-min impromptu speech, participants were randomly distributed to one of two intervention groups: cognitive restructuring (CR) or mindfulness; a control group was also formed. Participants were provided with psychoeducation and were taught by the experimenter how to identify and challenge their negative and unrealistic thoughts about the speech performance. Findings showed that both the CR and the mindfulness groups scored lower on PER than the control group immediately after the intervention (Shikatani et al., 2014).

Furthermore, in consideration of the potentially negative consequences of PER, Hofmann and Otto (2008) proposed PER-targeted techniques including aspects of CBT, for example, CR, in their treatment model. As far as we know, only two studies have examined the amelioration of PER with CR. One is from Shikatani et al. (2014), and the other is from Modini and Abbott (2017). In the latter study, researchers recruited 47 adults diagnosed with SAD and randomly assigned them to an intervention or control group. Participants were asked to finish a speech presentation immediately followed by a brief 30-min intervention, including the rationale on CR and guidance on challenging negative thoughts about the speech task (Modini & Abbott, 2017). Results nevertheless demonstrated that the intervention effect did not differentiate between the intervention and the control group with regard to negative rumination following the speech task (Modini & Abbott, 2017). A possible explanation was that the cognitive intervention was not specific to PER but was instead applicable to broader cognitive bias, for example, threat appraisal and self-

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performance evaluation (Modini & Abbott, 2017), resembling the CR steps used by Shikatani et al. (2014). The unsupportive evidence left unclear whether the PER-targeted intervention was effective in improving the negative rumination of socially anxious individuals, including adolescents. Additionally, in the present study, one important manipulation which is unlike with Modini and Abbott (2017)'s design was that, we would first trigger participants' original anxiety with hypothetical social situation text, and then intervene their PER and SA by providing social situation-specified realistic thoughts. Our most concern was to target PER, not a range of cognitive processes as mentioned in Modini and Abbott (2017), by CR.

CR is a technique designed to alleviate negative emotions by adjusting individuals' biased cognitions (Ellis, Prather, Grenen, & Ferrer, 2019; Goldin, Morrison, Jazaieri, Heimberg, & Gross, 2017). More specifically, CR can help individuals replace their distorted thoughts with more adaptive ones by using realistic thinking (McLellan, Alfano, & Hudson, 2015). Namely, adaptative thoughts might be for or against original thoughts (McLellan et al., 2015), e.g., a socially anxious adolescent scared to give a speech, as she/he feared to be observed as being nervous and hand-shaking; however, the adaptive fact might be that her/his hands were a little shaking but might not be found out by others. Another problem in conducting PER-targeted CR for socially anxious individuals, however, is how to develop the intervention procedure experimentally. Morgan and Banerjee (2008) experimentally manipulated PER by providing a hypothetical social situation text and types of post-event thoughts, for example, ruminative as opposed to reflective; however, their study emphasised the influence of PER on autobiographical memories, not SA symptoms. Moreover, the operation of manipulating reflective post-event processing occurred by providing positive rather than realistic thoughts, for example, '*I believe I can change and improve my feelings about my new job*' (Morgan & Banerjee, 2008). Despite a lack of CR in Morgan and Banerjee's (2008) research, the manipulation procedure aiming at PER was a helpful reference. Hence, the main objective of the present study was to intervene PER by developing PER-orientated realistic thoughts suitable for (Chinese) socially anxious adolescents. Furthermore, whether the alleviation of PER could also reduce the distress resulting from SA was our concern. Another important reason to develop our own realistic thoughts was that some concerns about the social situation might be true, for instance, for an adolescent with SA who would blush during a speech task, she/he is possibly teased by others, as our eastern culture does not so encourage people to openly express themselves; but, the result would not be catastraphised as she/he concerns. Hence, unlike positive thoughts from Morgan and Banerjee (2008), developing culturally appropriate realistic thoughts in the current was necessary.

Moreover, previous findings demonstrated a situational difference phenomenon in PER among participants after undergoing various social events, for example, a speech task as opposed to interaction with others. For instance, Fehm, Schneider, and Hoyer (2007) showed that participants reported higher levels of PER following social interaction as opposed to social performance (e.g., speech task). Conversely, Makkar and Grisham (2011) pointed out that socially anxious individuals are inclined to engage in PER during the speech task. A possible explanation was that, compared to interaction, the speech task was more likely to elicit negative performance appraisals, attracting attention from others and making the social situation ambiguous (Brozovich & Heimberg, 2008; Makkar & Grisham, 2011). By contrast, we preferred the idea proposed by Brozovich and Heimberg (2008): The deficiency of instant feedback from audiences in the process of a speech would indeed cause more negative appraisal, increasing the difficulty to verify the assumption about self-performance.

In general, PER may be changed after social situations, but for socially anxious individuals experiencing social occasions, such as a speech task as opposed to interaction with others, does the PER-targeted intervention effect show difference? When Price and Anderson (2011) conducted group CBT among participants diagnosed with SAD, their results showed a significant reduction in negative PER and SA symptoms. Nevertheless, further multilevel analyses results signified that participants with higher levels of PER at the baseline would relatively benefit less from the intervention. Taken together, we hypothesised that participants experiencing the speech task would benefit less from the PER-targeted intervention.

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To summarise, by recruiting socially anxious (Chinese) adolescents, the present study focused on two research questions. First, does PER-targeted CR lead to the decrease in adolescents' PER and SA level? Second, does the intervention effect show a situational effect?

Materials and Methods

Participants

Two stages were included for recruiting participants in the present study. During the first stage, 17 socially anxious Chinese adolescents who exceeded 50[1] on the Social Anxiety Scale for Adolescents (SAS-A) (La Greca & Lopez, 1998) were recruited to evaluate the realism and emotional arousal of self-developed hypothetical social situation text. Their age range was from 13 to 17 years ($M \pm SD_{age} = 15.24 \pm 1.44$). The average SAS-A score was 58.89 ($SD = 10.05$). During the second phase, another original sample of 907 Chinese adolescents from three urban public middle schools in the Beijing district completed an initial screening procedure using SAS-A. As there was no cut-off value for the Chinese version of SAS-A (Zhou et al., 2008), among 907 participants, adolescents with SAS-A score in the top 10% (Miers, Blöte, Bögels, & Westenberg, 2008; Yu, Westenberg, Li, Wang, & Miers, 2019) were invited to participate the intervention; finally, 73 high socially anxious Chinese adolescents (30 boys and 43 girls) (and their parents) in total voluntarily accepted our invitation and were then randomly allocated to the speech ($n = 37$) or interaction ($n = 36$) group, without control group. They ranged from 12 to 16 years old with the average of 13.93 ($SD_{age} = 1.51$) and a score of 70.80 on the SAS-A ($SD_{SAS\text{-}A} = 6.88$).

The majority of adolescents' parents ($n = 64$; 87.7%) were married, 5.5% were divorced ($n = 4$), 1.4% ($n = 1$) were separated, 4.1% ($n = 3$) were widowed, and 1.4% ($n = 1$) were remarried. Among which, the most of the participants (95.9%) reported their place of residence as city, 2.7% as county/town, and the rest (1.40%) was from the countryside. Most participants (74.0%) were the only child of the family. In addition, adolescents in the speech or interaction group showed no significant difference in terms of demographic information, including gender, age, place of residence, or parental marriage status. In the two stages, exclusion criteria were as follows: (1) intellectual disability or history of substance abuse, (2) diagnosis with a psychotic disorder, (3) reported suicidal ideation or tendency, or (4) currently receiving psychological or medical therapy. After receiving the intervention, adolescents also were given a small gift for their participation.

Experimental Materials[2]

Hypothetical social situation text

The preparation process was conducted in the following procedures. First, we reviewed several intervention handbooks targeting SA (e.g., Hope, Heimberg, Juster, & Turk, 2000; Rapee et al., 2006) and related literature and drew upon our clinical experiences. Hereby, anxiety-provoking texts for the speech (i.e., give a self-introduction talk in front of classmates at the beginning of a new semester) and interaction (i.e., chat with classmates in the 10-min break in the corridor) situations typically for high socially anxious adolescents were drafted. Second, three research experts in the adolescent SA field and one professor certified by the Academy of Cognitive Therapy were invited to discuss the social encounters.[3] Third, a psychological practitioner working with adolescents in middle school for more than 3 years was invited to adjust the drafted text. Fourth, to confirm the final version, 17 socially anxious Chinese adolescents were invited to score the text for its realism and emotional

[1]A cut-off value of 50 was adopted. The SAS-A has not had a cut-off value for Chinese adolescents yet (Yu et al., 2019; Zhou, Xu, Inglés, Hidalgo, & La Greca, 2008); hence, the cut-off value for U.S. adolescents was used in the current study.

[2]The experimental materials will be available for researchers when in contact with the first or corresponding author.

[3]A social encounter is defined as a social occasion that provokes social anxiety (Morgan & Banerjee, 2008).

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arousal.[4] Finally, the hypothetical social text contained four social encounters and 405 Chinese characters for speech and interaction situations, respectively. For example, '… *You stand on the platform and introduce yourself. Your classmates are looking at you. You notice that your hands are sort of shaking. You have no idea where to put them and are also concerned that your shaking hands will be noticed by others …* ' (excerpt from speech situation text). An excerpt from interaction situation is given as follow, '… *You wanted to join them, but you hesitated, wondering if they would like you to join. In the end, you walked over and participated in the discussion with everyone, but found that your voice was shaking when you spoke, and you were not sure whether people really wanted to listen to you …*'.

Social situation-specified realistic thoughts

First, the original version of the social situation-specified realistic thoughts was mostly derived from several therapeutic handbooks for SADs (e.g., Hope et al., 2000; Rapee et al., 2006) but adapted to be specific to the social encounters in the hypothetical social situation. The rationale for developing realistic thoughts relied on the important approaches of cognitive therapy, for instance, de-catastrophisation, looking at the positive side, breaking the emotional reasoning (McLellan et al., 2015). Then, 14 realistic thoughts targeting SA symptoms were drafted for speech and interaction situation, separately.[5] Second, to modify the wording, we mainly adopted expert evaluation method as those thoughts are more likely to be clinical-experience-independent, i.e., we consulted two Ph.D. candidates in clinical and consulting psychology with more than 5 years' experience with CBT and one clinical psychology professor certified as CBT therapist and fellow by the Academy of Cognitive Therapy. Finally, 12 realistic thoughts were confirmed for the speech and interaction situations (cf. Morgan & Banerjee, 2008), separately. Example is given from the speech situation: '*I was undeniably nervous; however, I stood on the platform anyway.*', and from interaction situation: '*Although chatting with classmates may seem a little nervous, it will not affect my completion of the entire chat process.*', separately.

Measurements

Social anxiety scale for adolescents (SAS-A)

La Greca and Lopez (1998) contained 18 items and three subscales: Fear of Negative Evaluation (SAS-A-FNE), Social Avoidance Specific to New Situations or Unfamiliar Peers (SAS-A-New), and Social Avoidance and Distress in General (SAS-A-G). According to the degree to which the item '*is true for you*', SAS-A was rated on a 5-point Likert scale from 1 (*not at all*) to 5 (*all the time*). The Chinese version of the SAS-A was revised by Zhou et al. (2008), showing a satisfactory reliability and validity. Cronbach's coefficient for the SAS-A in the current study was 0.59, and the alpha coefficients for three subscales were 0.76, 0.66, and 0.60, separately ($N = 907$).[6]

[4]Evaluation results demonstrated that the average for realism was 8.06 out of 10 ($SD = 1.44$) and for emotional arousal was 7.06 out of 10 ($SD = 1.52$), suggesting that the hypothetical social situation would effectively trigger socially anxious adolescents' anxiety.

[5]For the speech, among the drafted 14 realistic thought sentences, 6 of them were reworked by Hope et al. (2000), two were revised by Morgan and Banerjee (2008), 2 adapted from Hope, Heimberg, and Turk (2010), 1 adapted from Miers et al. (2008), 1 from McLellan et al. (2015), and the rest were self-develped depending on own clinical experience. With respect to interaction situation, six of which were adapted from Hope et al. (2000), two revised from Hope et al. (2010), two recomposed from Rapee et al. (2006), and the rest were developed by the first author relying on own experience.

[6]Although the internal consistency coefficient of the SAS-A in the present study was not ideal, the alpha coefficient of subscale SAS-A-FNE was acceptable. A possible explanation was that the participants in the current study were without a diagnosis of SAD, other than subclinical adolescents screened by SAS-A. The negative cognitions about others' evaluation characterize their main clinical feature; however, the fear or anxiety did not cause clinical distress or impairment in social, learning, or other important functioning. Given this, the Cronbach's coefficient for the SAS-A was still acceptable.

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Short mood and feelings questionnaire (SMFQ)

Angold, Costello, Messer and Pickles (1995) were used to measure depressive emotion in children and adolescents aged 8–16 years. The SMFQ included 13 items and was rated on a 3-point Likert from 0 (*not true*) to 2 (*true*). The Chinese version of the SMFQ was culturally revised by Cheng, Cao, and Su (2009) and showed reliable psychometric properties. The internal consistency coefficient in the current study was 0.84 ($N = 907$).

Post-event processing inventory-trait (PEPI-T)

Blackie and Kocovski (2017) were to measure PER following all types of social situations and showed an excellent psychometric property. PEPI-T contained 12 items asking participants to rate on a 5-point Likert scale (1 = '*strongly disagree*', *5* = '*strongly agree*'). The Chinse version of the PEPI-T was revised for adolescents and showed an acceptable reliability and validity (Yu, Pan, Xu, Zhu, & Wang, 2020). PEPI-T was administered during the screening stage in the present study, and its internal consistency coefficient was 0.85 ($N = 907$).

Post-Event Processing Inventory-Trait-Revised (PEPI-T-R) was adapted by authors from the PEPI-T to measure rumination pre- and post-intervention. The main revisions focused on the instructions and the verb tense in items. The PEPI-T-R was administered twice in the current study. During the first measurement, participants were asked to rate the degree of agreement (agree or disagree) with statements after reading the hypothetical social situation text. The verb tense was changed from the present to future, for example, '*I will think about how poorly the situation will go*'. During the second measurement, after the reading realistic thoughts, that is, receiving cognitive appraisal intervention, the socially anxious adolescents were asked to rate again how they will think when encountering similar social situations in the future. The Cronbach's coefficient for the PEPI-T-R pre- and post-intervention in the current study was 0.87 and 0.91, respectively ($n = 73$).

Emotional thermometer

The emotional thermometer was adapted from Higa and Daleiden (2008) to measure SA pre- and post-intervention. As the protagonist in the hypothetical text, participants were asked to rate from 0 (*not at all*) to 10 (*extremely*) how worried they would be about looking foolish to others in a particular situation. SA was surveyed twice, immediately after reading the hypothetical social situation text and immediately after reading the realistic thoughts.

Experimental Procedure

This research was approved by the ethics committee of the corresponding author's university. The research was completed in two sessions. At the baseline measurement, adolescents were invited to fill out a packet of questionnaires, including the SAS-A, the SMFQ, the PEPI-T, and the demographic information questionnaire. Then, those participants whose SAS-A score ranked in the top 10% (Miers et al., 2008; Yu et al., 2019) were invited to participate in the intervention experiment 1 week later. Once informed written consents were acquired from participants and at least one parent, the adolescents were randomly assigned to the speech or interaction group.

At the appointed time participants attended the second session. Sitting before a laptop, each participant was instructed to read the hypothetical social situation (speech or interaction) text displayed on the screen with no time limit. They were requested to try their best to visualise them locating in the hypothetical social situations. This manipulation was expected to induce participants' SA (Morgan & Banerjee, 2008). Once participants had finished reading the text, they reported their PER and SA levels (T1) by filling in the PEPI-T-R and the emotional thermometer. Then, they were instructed to read the situation-specified realistic thoughts displayed on the laptop screen; thus, they received CR intervention. Each realistic thought statement was presented for 10 s. When all 12 realistic thought sentences had been presented in sequence, adolescents were asked to

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make a choice which two statements were the most believable. The choice of the statement was not included in the analyses but to ensure that the adolescents were indeed engaged in reading the sentences (Morgan & Banerjee, 2008).

Following the above-mentioned procedure, via completing the PEPI-T-R and using the emotional thermometer, participants were asked to report again their PER and SA level (T2). Finally, participants were asked to choose the most fearful social situation among the given choices. This task was designed to check whether the group — speech and interaction — to which the participants were randomly assigned matched the social situation they feared in reality. All participants took part in the current study individually and were thanked for their participation with a small gift.

Data Analyses

Participants who dropped out of the study ($n = 1$) at any stage were excluded from the data analyses. Hence, the final sample comprised 73 socially anxious adolescent participants. First, the Pearson chi-squared test was used to examine whether the group to which the participants were randomly assigned matched the social situation they actually were in fear of. The Pearson correlation analyses were adopted for investigating the correlation coefficients between variables at the baseline and pre- and post-intervention. Tests of heterogeneity of variance were conducted before ANOVAs for analysing the group differences between variables. ANCOVAs, with depression as a covariate to control the comorbidity effect, were used for analysing the intervention effect and the effect between groups. Hierarchical regression analysis was adopted to investigate whether the intervention targeting PER could also effectively alleviate SA symptoms. All the analyses were conducted with SPSS 22.0. In addition, Cohen's d was adopted to demonstrate the intervention effect and was interpreted as follows: 0.20, 0.05, and 0.80 for small, medium, and large effect, respectively (Cohen, 1988).

Results

Descriptive Statistics and Bivariate Relations

The Pearson chi-squared test showed no significant difference (x^2 (1) = 0.01, $p = 0.922$), suggesting a random grouping. Further Analysis of Variance (ANOVA) results demonstrated no significant difference between speech and interaction participants on the SAS-A, SMFQ, and PEPI-T ($F(1,71) = 0.003–1.67$, $ps > 0.200$), suggesting the homogeneity of the participants. As shown in Table 1, Pearson correlation analyses results demonstrated that PEPI-T significantly correlated with PER_T1 and PER_T2. Score on the SMFQ was significantly ($rs = 0.24–0.35$, $ps < 0.039$) associated with SA_T1 and PER pre- and post-intervention. The SMFQ also significantly associated with SA ($r = 32$, $p = 0.007$) and the PER level measured at the baseline ($r = 31$, $p = 0.008$). Associations between SA and PER scores measured at pre- and post-intervention displayed at significantly moderate to high level ($rs = 0.44–0.80$, $ps < 0.001$).

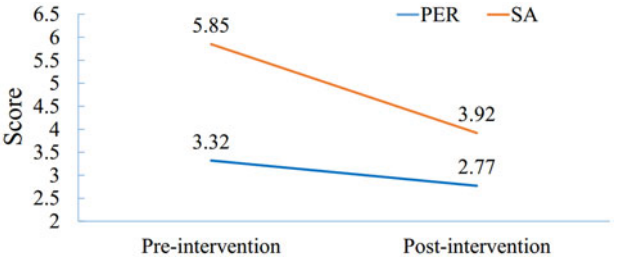

Figure 1. Score change of PER and SA pre- and post-intervention. Note: PER — the average item score; SA — the sum score.

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Table 1. Bivariate Relations Among Variables

		M (*SD*)	1	2	3	4	5	6	7
1	SAS-A	70.80 (6.88)							
2	PEPI-T	42.06 (8.24)	0.02						
3	SMFQ	12.95 (5.35)	0.32**	0.31**					
4	PER_T1	39.81 (8.60)	0.03	0.24*	0.35**				
5	PER_T2	33.19 (9.44)	−0.05	0.24*	0.30*	0.80***			
6	SA_T1	5.85 (2.30)	0.09	0.09	0.15	0.60***	0.44***		
7	SA_T2	3.92 (2.28)	0.03	0.09	0.24*	0.53***	0.64***	0.66***	

Note: *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$. SAS-A = Social Anxiety Scale for Adolescents measured at the baseline; PEPI-T = Post-Event Processing Inventory-Trait measured at the baseline; SMFQ = Short Mood and Feelings Questionnaire measured at the baseline; PER_T1 = the PER score measured immediately after reading the hypothetical social situation text; PER_T2 = the PER score measured immediately after receiving the CR intervention; SA_T1 = the social anxiety score measured at Time 1; SA_T2 = the social anxiety score measured at Time 2, that is, immediately after receiving CR intervention.

Table 2. ANCOVA Results of PER and SA Pre- and Post-Intervention

	M (*SD*)				
Dependent variables	Pre-intervention	Post-intervention	$F(1,70)$	η_p^2	*d*
PER	39.81 (8.60)	33.19 (9.44)	21.77***	0.13	0.71
SA	5.85 (2.30)	3.92 (2.28)	26.83***	0.16	0.84

Note: ***$p < 0.001$. PER = post-event rumination; SA = social anxiety.

The Intervention Effect of CR

As shown in Table 2 and Figure 1, after controlling for depression, participants' PER and SA levels significantly decreased after the intervention ($ps < 0.001$) with moderate to high effect size (d = 0.71–0.84). Hierarchical regression analysis further demonstrated that, after inputting depression in the first step as covariate (($\beta = 0.11$, $\Delta R^2 = 0.01$, $p = 0.356$), the decrease in PER could significantly predict the improvement of SA symptoms immediately after receiving CR intervention ($\beta = 0.55$, $\Delta R^2 = 0.30$, $p < 0.001$).

The Situational Effect of CR Intervention

As shown in Table 3, unexpected in the hypothesis, the change in PER and SA, that is, the intervention effect, showed no difference among participants from speech and interaction groups. From the perspective of PER and SA levels pre- and post-intervention, no significant difference between groups was shown even after controlling for depression ($F(1,70) = 1.20$–1.38, $ps > 0.132$). Additional ANCOVA results showed no significant difference between PEPI-T and PER_T1 ($F(1) = 2.91$, $p = 0.090$, $\eta_p^2 = 0.02$) after controlling for depression; however, a significant difference was found between the PEPI-T and PER_T2 ($F(1) = 39.98$, $p < 0.001$, $\eta_p^2 = 0.22$) after controlling for depressive emotion. Thus, this finding also demonstrated the effectiveness of the one-session intervention for targeting PER.

Discussion and conclusions

To our best knowledge, the present study was the first attempt to target PER with the rationale of CBT among socially anxious adolescents and yielded encouraging findings. On the basis of the cognitive model of SAD proposed by Clark and Wells (1995), we developed PER-targeted realistic thoughts to examine their intervention effect. Results showed that, albeit no control group was included, one-

Table 3. Analysis of Variance Results Among State PER and Social Anxiety

	M (*SD*)				
	Speech ($n = 37$)	Interaction ($n = 36$)	$F(1,70)$	η_p^2	*d*
PER change[a]	−6.43 (6.21)	−6.81 (5.20)	0.08	0.001	0.07
SA change	−1.92 (1.72)	−1.94 (2.07)	0.004	<0.001	0.01
PER_T1[b]	38.38 (9.24)	41.28 (7.73)	2.32	0.03	0.34
PER_T2[b]	31.95 (9.28)	34.47 (9.56)	1.38	0.02	0.27
SA_T1[b]	6.14 (2.37)	5.56 (2.21)	1.20	0.02	0.25
SA_T2[b]	4.22 (2.41)	3.61 (2.14)	1.38	0.02	0.27

Note: [a]Change = the score of post-intervention minus pre-intervention; [b]SMFQ score was controlled as a covariate when analysing the state of PER and social anxiety. PER_T1 = the PER score measured immediately after reading the hypothetical social situation text; PER_T2 = the PER score measured immediately after receiving the CR intervention; SA_T1 = the social anxiety score measured at Time 1; SA_T2 = the social anxiety score measured at Time 2 (i.e., immediately after receiving CR intervention).

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session CR still showed its potential to improve rumination and SA symptoms among adolescents with high levels of SA, with moderate to high effect size. This is parallel with previous results with CBT among adults (e.g., McEvoy et al., 2009; Modini & Abbott, 2017). Furthermore, regression analysis result showed that the reduction of PER could be significantly predictive of SA, which also parallels the previous findings in an adult population (e.g., Price & Anderson, 2011). Although a randomised control group was not adopted in the current study, the significant difference between the rumination score measured at the baseline and post-intervention still suggested the intervention effect of PER-targeted method. Unexpectedly, the intervention did not show situational effect.

The improvement in individuals' PER often benefits from the change of negative self-perception and catastrophic estimation to social costs (Hofmann & Otto, 2008). The current study provided realistic thoughts specific to social encounters to reduce negative self-perceptions in socially anxious adolescents (e.g., '*My classmates might notice my embarrassment, but most of them also dislike giving speeches, so this is not a big deal.*') and to decatastrophise the social costs (e.g., '*Although I was a little awkward during the conversation, they'll soon forget about it.*'). Notably, participants were primed with realistic thoughts (e.g., '*I was undeniably nervous; however, I stood on the platform anyway.*') to notice positive cues. This assisted them in expanding their scope of attention (Price & Anderson, 2011) and in more objectively judging their social outcomes. Once less obsessed with focusing on negative details, they became less anxious. From the perspective of intervention, the hypothesis proposed in the cognitive model — that PER is key to the persistence of SAD (Clark & Wells, 1995) — was tested again in the present study.

Previous research conducted with adults showed that CBT can moderately to highly improve PER and SA symptoms (e.g., 7-week intervention) (McEvoy et al., 2009). Notably, in the current study, the PER-targeted invention also yielded a moderate to high effect size among highly anxious adolescents, illustrating that one-session CR demonstrated its potential value in improving the social-related distorted cognition. Adolescence is characterised by changes in social — effective and — cognitive abilities (Haller, Kadosh, Scerif, & Lau, 2015); therefore, adolescents' emotion and ratiocination about outside social world and others' mental states would easily fluctuate in response to social cues (Haller et al., 2015). Because of its nonfixed nature, targeted intervention can loosen their biased cognitions and make the alleviation of symptoms of anxiety and distress possible; moreover, compared to children, adolescents have the advantage of better understanding and ability to learn (Crone & Dahl, 2012). These age characteristics favour the application of one-session PER-targeted CR for adolescents.

Unexpectedly, the intervention effect did not show group differences in the current study. Combining results from sections The Intervention Effect of Cognitive Restructuring and The Situational Effect of Cognitive Restructuring Intervention, the level of PER was *indeed* significantly lower right after receiving CR than that both at the baseline and after reading hypothetical social situation; however, after reading the PER-targeted realistic thoughts, socially anxious adolescents from two groups did not differentiate on PER and SA scores. In addition, the amount of reduction from pre- to post-intervention also did not differ between the two groups. A possible explanation would be that the hypothetical text provoking SA, especially for interaction, was still imaginary, despite the high score on realism and emotional arousal. This might limit the participants' engagement in real conversational situations and not receiving feedback from partners with no chance to affirm self-image in others' eyes; therefore, participants visualising themselves in the hypothetical interaction situation still reported similar levels of rumination and anxiety by contrast to those in the speech task group. Nevertheless, in the consideration of convenience, the hypothetical social situation texts still effectively provoked SA.

Albeit the present study yielded notable findings on intervening PER and SA among Chinese socially anxious adolescents, several important limitations require consideration. First, highly socially anxious adolescents, instead of a group with a diagnosis of SAD, were recruited to conduct a preventive intervention in the current study; so the findings cannot be generalised to clinical patients. Second, because of the changing characteristics of adolescents and the special requirements of the school, no randomised control group was adopted; however, compared to the rumination score measured at

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baseline, the rumination level immediately after the intervention still showed a significant decrease. Future research should incorporate control group to re-examine the effect of this one-session CR intervention for socially anxious adolescents. Third, developing PER-targeted CR sentences specific to social situations (e.g., social encounters) requires researchers armed with CBT clinical practice, which to some extent would constrain the wide application of this method. Fourth, to examine the stability of the intervention effect over time, a follow-up measurement should have been required. Fifth, because the hypothetical texts were visualised, more vivid methods, such as Apps with interactive functions would be useful in future research. Finally, as the sample size in the current study was not-large, results should be cautiously explained and future research should re-examine the situation effect in a larger population of socially anxious adolescents.

Despite the limitations noted above, the current study still was the first effort to examine the intervention effect of targeting PER using aspects of CBT among socially anxious (Chinese) adolescents and yield clinical implications. Several cognitive models of SAD (Clark & Wells, 1995; Hofmann, 2007; Rapee & Heimberg, 1997) have shown that after engaging in social events, highly anxious individuals often repetitively ruminate on their mistakes and negative performance. With the sense of shame, and their levels of self-confidence were then gradually reduced. To relieve the distress, individuals might avoid social situations and become more isolated from others. Clinically, PER may further increase individuals' suicide rate (Clark & Wells, 1995); consequently, the intervention aiming at PER, especially in adolescents' population, would effectively relieve rumination and anxious symptoms. More importantly, the standardised intervention procedure may have made the operation process easier to follow and the duration shorter. In addition, the one-session PER-targeted method presented on a computer screen is easy to conduct, suggesting the inclusion of this method in psychology classes for (Chinese) adolescents as a preventive measure is possible and perhaps essential in future research and practice. To sum up, the present study endeavoured its first effort to conduct the PER-oriented intervention with CR, and proved it in socially anxious Chinese adolescents' sample. Future research should be concerned with the cultural examination of the intervention effect's diversity and uniformity.

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References

Abbott MJ and Rapee RM (2004). Post-event rumination and negative self-appraisal in social phobia before and after treatment. *Journal of Abnormal Psychology*, **113**, 136–144. doi:10.1037/0021-843X.113.1.136

Albano AM (1995). Treatment of social anxiety in adolescents. *Cognitive and Behavioral Practice*, **2**, 271–298. doi:10.1016/S1077-7229(95)80014-X.

American Psychiatric Association (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Washington, DC: American Psychiatric Publishing.

Angold A, Costello EJ, Messer SC and Winder F (1995). Development of a short questionnaire for use in epidemiological studies of depression in children and adolescents. *International Journal of Methods in Psychiatric Research*, **5**, 237–249. doi:1049-8931.95/040237-13.

Beesdo K, Bittner A, Pine DS, Stein MB, Hofler M, Lieb R and Wittchen H-U (2007). Incidence of social anxiety disorder and the consistent risk for secondary depression in the first three decades of life. *Archives of General Psychiatry*, **64**, 903–912. doi:10.1001/archpsyc.64.8.903.

Blackie RA and Kocovski NL (2017). Development and validation of the trait and state versions of the post-event processing inventory. *Anxiety, Stress and Coping*, **30(2)**, 202–218. doi:10.1080/10615806.2016.1230668

Blöte AW and Westenberg PM (2007). Socially anxious adolescents' perception of treatment by classmates. *Behaviour Research and Therapy*, **45**, 189–198. doi:10.1016/j.brat.2006.02.002.

Blöte AW, Miers AC, Heyne DA and Westenberg PM (2015). Social anxiety and the school environment of adolescents. In K Ranta, AM La Greca, L-J Garcia-Lopez and M Marttunen (Eds.), *Social anxiety and phobia in adolescents*. doi:10.1007/978-3-319-16703-9

Blöte AW, Miers AC, Van den Bos E and Westenberg PM (2019). The role of performance quality in adolescents' self-evaluation and Rumination after a speech: Is it contingent on social anxiety level? *Behavioural and Cognitive Psychotherapy*, 47(2),148–163. doi:10.1017/S1352465818000310.

Brozovich F and Heimberg RG (2008). An analysis of post-event processing in social anxiety disorder. *Clinical Psychology Review*, **28**, 891–903. doi:10.1016/j.cpr.2008.01.002.

Cheng P, Cao F and Su L (2009). Reliability and validity of the short mood and feelings questionnaire in Chinese adolescent. *Chinese Mental Health Journal*, **23**, 60–63. doi:10.3969/j.issn.1000-6729.2009.01.016.

Clark DM and Wells A (1995). A cognitive model of social phobia. In RG Heimberg, MR Liebowitz, DA Hope and FR Schneier (Eds.), *Social phobia: Diagnosis, assessment, and treatment* (pp. 63–90). New York, NY: The Guildford Press.

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

Costello EJ, Mustillo S, Erkanli A, Keeler G and Angold A (2003). Prevalence and development of psychiatric disorders in childhood and adolescence. *Archives of General Psychiatry*, **60**, 837–844. doi:10.1001/archpsyc.60.8.837.

Crone EA and Dahl RE (2012). Understanding adolescence as a period of social–affective engagement and goal flexibility. *Nature Reviews Neurosciences*, **13**, 636–650. doi:10.1038/nrn3313.

Edwards SL, Rapee RM and Franklin J (2003). Postevent rumination and recall bias for a social performance event in high and low socially anxious individuals. *Cognitive Therapy and Research*, **27**, 603–617. doi:10.1023/A:1026395526858.

Ellis EM, Prather AA, Grenen EG and Ferrer RA (2019). Direct and indirect associations of cognitive reappraisal and suppression with disease biomarkers. *Psychology & Health*, **34**, 336–354. doi:10.1080/08870446.2018.1529313.

Fehm L, Schneider G and Hoyer J (2007). Is post-event processing specific for social anxiety? *Journal of Behavior Therapy and Experimental Psychiatry*, **38**, 11–22. doi:10.1016/j.jbtep.2006.02.004.

Goldin PR, Morrison AS, Jazaieri H, Heimberg RG and Gross JJ (2017). Trajectories of social anxiety, cognitive reappraisal, and mindfulness during an RCT of CBGT versus MBSR for social anxiety disorder. *Behaviour Research and Therapy*, **97**, 1–13. doi:10.1016/j.brat.2017.06.001.

Greco LA and Morris TL (2005). Factors influencing the link between social anxiety and peer acceptance : Contributions of social skills and close friendships during middle childhood. *Behavior Therapy*, **36**, 197–205. doi:005-7894/05/0197-0205$1.00/0.

Haller SPW, Kadosh KC, Scerif G and Lau JYF (2015). Social anxiety disorder in adolescence: How developmental cognitive neuroscience findings may shape understanding and interventions for psychopathology. *Developmental Cognitive Neuroscience*, **13**, 11–20. doi:10.1016/j.dcn.2015.02.002.

Hayward C, Varady S, Albano AM, Thienemann M, Henderson L and Schatzberg AF (2000). Cognitive-behavioral group therapy for social phobia in female adolescents : Results of a pilot study. *Journal of the American Academy of Child & Adolescent Psychiatry*, **39**, 721–726. doi:10.1097/00004583-200006000-00010.

Higa CK and Daleiden EL (2008). Social anxiety and cognitive biases in non-referred children: The interaction of self-focused attention and threat interpretation biases. *Journal of Anxiety Disorders*, **22**, 441–452. doi:10.1016/j.janxdis.2007.05.005.

Hirsch CR, Meeten F, Krahé C and Reeder C (2016). Resolving ambiguity in emotional disorders: The nature and role of interpretation biases. *Annual Review of Clinical Psychology*, **12**, 281–305. doi:10.1146/annurev-clinpsy-021815-093436.

Hodson KJ, McManus FV, Clark DM and Doll H (2008). Can Clark and Wells' (1995) cognitive model of social phobia be applied to young people? *Behavioural and Cognitive Psychotherapy*, **36**, 449–461. doi:10.1017/S1352465808004487

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

Hofmann SG and Otto MW (2008). *Cognitive behavioral therapy for social anxiety disorder: evidenced-based and disorder-specific treatment techniques*. New York: Routledge Taylor & Francis Group.

Hope DA, Heimberg RG, Juster HR and Turk CL (2000). *Managing social anxiety: A cognitive-behavioral therapy approach (client workbook)* (D. Barlow, ed.). New York, NY: Graywind Publications Incorporated.

Hope DA, Heimberg RG and Turk CL (2010). *Managing social anxiety: A cognitive-behavioral therapy approach (therapist guide)* (2nd ed.) (D. Barlow, ed.). New York, NY: Oxford University Press.

Kessler RC, Mcgonagle KA, Zhao S, Nelson CB, Hughes M, Eshleman S, … Kendler KS (1994). Lifetime and 12-month prevalence of DSM-III-R psychiatric disorders in the United States. *Archives of General Psychiatry*, **51**, 8–19. doi:10.1001/archpsyc.1994.03950010008002.

Kiko S, Stevens S, Mall AK, Steil R, Bohus M and Hermann C (2012). Predicting post-event processing in social anxiety disorder following two prototypical social situations: State variables and dispositional determinants. *Behaviour Research and Therapy*, **50**, 617–626. doi:10.1016/j.brat.2012.06.001.

Kocovski NL and Rector NA (2008). Post-event processing in social anxiety disorder: Idiosyncratic priming in the course of CBT. *Cognitive Therapy and Research*, **32**, 23–36. doi:10.1007/s10608-007-9152-z.

La Greca AM and Lopez N (1998). Social anxiety among adolescents: Linkages with peer relations and friendships. *Journal of Abnormal Child Psychology*, **26**, 83–94. doi:0091-0627/98/0400-0083$15.00/0.

Makkar SR and Grisham JR (2011). The predictors and contents of post-event processing in social anxiety. *Cognitive Therapy Research*, **35**, 118–133. doi:10.1007/s10608-011-9357-z.

https://doi.org/10.1017/bec.2023.5 Published online by Cambridge University Press

McEvoy PM, Mahoney A, Perini SJ and Kingsep P (2009). Changes in post-event processing and metacognitions during cognitive behavioral group therapy for social phobia. *Journal of Anxiety Disorders*, **23**, 617–623. doi:10.1016/j.janxdis.2009.01.011.

McLellan LF, Alfano CA and Hudson JL (2015). Cognition-focused interventions for social anxiety disorder among adolescents. In K Ranta, AM La Greca, L-J Garcia-Lopez and M Marttunen (Eds.), *Social anxiety and phobia in adolescents: development, manifestation and intervention strategies* (pp. 225–250). Switzerland: Springer International Publishing. doi:10.1007/978-3-319-16703-9.

Miers AC, Blöte AW, Bögels SM and Westenberg PM (2008). Interpretation bias and social anxiety in adolescents. *Journal of Anxiety Disorders*, **22**, 1462–1471. doi:10.1016/j.janxdis.2008.02.010.

Modini M and Abbott MJ (2017). Negative rumination in social anxiety: A randomised trial investigating the effects of a brief intervention on cognitive processes before, during and after a social situation. *Journal of Behavior Therapy and Experimental Psychiatry*, **55**, 73–80. doi:10.1016/j.jbtep.2016.12.002.

Morgan J and Banerjee R (2008). Post-event processing and autobiographical memory in social anxiety: The influence of negative feedback and rumination. *Journal of Anxiety Disorders*, **22**, 1190–1204. doi:10.1016/j.janxdis.2008.01.001.

Price M and Anderson PL (2011). The impact of cognitive behavioral therapy on post event processing among those with social anxiety disorder. *Behaviour Research and Therapy*, **49**, 132–137. doi:10.1016/j.brat.2010.11.006.

Ranta K, Kaltiala-Heino R, Fröjd S and Marttunen M (2013). Peer victimization and social phobia : A follow-up study among adolescents. *Social Psychiatry and Psychiatric Epidemiology*, **48**, 533–544. doi:10.1007/s00127-012-0583-9.

Rapee RM and Heimberg RG (1997). A cognitive-behavioral model of anxiety in soical phobia. *Behaviour Research and Therapy*, **35**, 741–756.

Rapee RM, Lyneham HJ, Schniering CA, Wuthrich V, Abbott MA, Hudson JL and Wignall A (2006). *Cool kids: Child & adolescent anxiety program (client workbook)*. Sydney, Australia: Centre for Emotional Health, Macquarie University.

Shikatani B, Antony MM, Kuo JR and Cassin SE (2014). The impact of cognitive restructuring and mindfulness strategies on postevent processing and affect in social anxiety disorder. *Journal of Anxiety Disorders*, **28**, 570–579. doi:10.1016/j.janxdis.2014.05.012.

Westenberg PM, Gullone E, Bokhorst CL, Heyne DA and King NJ (2007). Social evaluation fear in childhood and adolescence: Normative developmental course and continuity of individual differences. *British Journal of Developmental Psychology*, **25**, 471–483. doi:10.1348/026151006X173099.

Westenberg PM, Bokhorst CL, Miers AC, Sumter SR, Kallen VL, van Pelt J and Blöte AW (2009). A prepared speech in front of a pre-recorded audience: Subjective, physiological, and neuroendocrine responses to the Leiden Public Speaking Task. *Biological Psychology*, **82**, 116–124. doi:10.1016/j.biopsycho.2009.06.005.

Wittchen HU, Stein MB and Kessler RC (1999). Social fears and social phobia in a community sample of adolescents and young adults : prevalence, risk factors and co-morbidity. *Psychological Medicine*, **29**, 309–323. doi:10.1017/S0033291798008174.

Yu M, Westenberg PM, Li W, Wang J and Miers AC (2019). Cultural evidence for interpretation bias as a feature of social anxiety in Chinese adolescents. *Anxiety, Stress, & Coping*, **32**, 376–386. doi:10.1080/10615806.2019.1598556.

Yu M, Pan J, Xu Q, Zhu Y and Wang J (2020). The psychometric properties of post-event processing inventory-trait (PEPI-T) among Chinese adolescents. *Chinese Journal of Behavioral Medicine and Brain Science*, **29**, 943–947. doi:10.3760/cma.j.cn371468-20200215-01030.

Zhou X, Xu Q, Inglés CJ, Hidalgo MD and La Greca AM (2008). Reliability and validity of the Chinese version of the Social Anxiety Scale for Adolescents. *Child Psychiatry and Human Development*, **39**, 185–200. doi:10.1007/s10578-007-0079-0.

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