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Anger rumination partly accounts for the association between trait self-control and aggression

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ABSTRACT

Higher trait self-control is related to less aggression, but the psychological processes underlying this association are largely unknown. This research tested the hypothesis that reduced anger rumination in high self-control individuals may partly account for this association. In seven cross-sectional, longitudinal and daily diary studies (total $N = 2689$) people high in trait self-control reported less aggression of different types and this relation was partially mediated by less rumination about anger-evoking events. An internal meta-analysis estimated this indirect effect to be of medium size. These findings suggest that a lower propensity to engage in anger rumination may be a crucial working process partly explaining *how* high trait self-control translates into less aggression. Overcoming anger rumination is a promising avenue to reduce aggression.

1. Introduction

Aggressive behavior is detrimental to both the involved individuals and society at large. Converging evidence has shown that high trait self-control is robustly associated with lower levels of aggressive behaviors (Denson, DeWall, & Finkel, 2012; DeWall, Finkel, & Denson, 2011). However, the psychological processes explaining this link are largely unknown. In this study, we examine anger rumination as one plausible yet untested mechanism underlying the association between trait self-control and aggression: people high in trait self-control may – at least in part – behave less aggressively because they focus less on angry thoughts and feelings about anger-provoking events, which is known to increase aggression.

1.1. Trait self-control and aggression

Self-control refers to one's ability to alter thoughts, emotions, and behaviors in order to follow social norms, moral values, personal standards, and to support the pursuit of long-term goals (Baumeister, Vohs, & Tice, 2007; Tangney et al., 2004). High levels of trait self-control are associated with lower levels of direct and displaced, physical and verbal aggressive behaviors in different cultures and among populations of different ages (Finkenauer, Engels, & Baumeister, 2005; Hamama & Ronen-Shenhav, 2012; Özdemir, Vazsonyi, & Çok, 2013; Situ, Li, & Dou, 2016; Tangney et al., 2004). For example, in one study conducted among U.S. adults, high trait self-control individuals engaged in less violence against their romantic partners as compared to those low in trait self-control (Finkel, DeWall, Slotter, Oaten, & Foshee, 2009). In a longitudinal study of Dutch adolescents, trait self-control predicted both later aggression and delinquency (De Kemp et al., 2009). In a sample of Chinese college students, trait self-control was related to lower levels of both physical and verbal aggression (Li, Nie, Boardley, Situ, & Dou, 2014). Collectively, these findings suggest a robust negative association between trait self-control and aggressive behavior across different cultural backgrounds, ages, and study designs.

Despite the evidence for the association between trait self-control and aggression, the mediating mechanisms for this relationship are largely unknown. Prominent theories such as the I^3 model of aggression (Finkel, 2014; Slotter & Finkel, 2011), the General Aggression Model (GAM; Anderson & Bushman, 2002), or the general theory of crime (Gottfredson & Hirschi, 1990) make

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few clear-cut predictions for the processes by which trait self-control presumably exerts its influence on aggressive behavior. For example, the I^3 model proposes three conceptually orthogonal factors (i.e., instigation, impellance, and inhibition) that are related to the emergence of aggression. The model views (trait) self-control as (part of) the inhibitory force that is necessary to prevent an acute urge to aggress from being translated into overt behavior. Situational factors such as self-control depletion (Baumeister & Vohs, 2016; c.f. Friese, Loschelder, Gieseler, Frankenbach, & Inzlicht, 2019) or alcohol intoxication may reduce the ability to exert the necessary inhibition. Low levels of inhibition, the presence of instigators (e.g., provocation, social exclusion) and high levels of impellance (e.g., trait aggressiveness) comprise a "perfect storm" that makes aggressive behavior most likely. Unfortunately, the I^3 model does not specify the mechanisms underlying the association between (trait) self-control and aggression beyond the notion of inhibiting the behavioral implications of aggressive urges.

The GAM postulates that both person and situation input variables influence a present internal state after an anger-evoking event. Appraisal and decision processes determine whether the individual will act thoughtfully or impulsively (i.e. potentially driven by aggressive impulses). The model does not directly talk about (trait) self-control and therefore does not specify how self-control may exert its influence on aggressive behavior. However, the model is generally broad enough as a theoretical framework to incorporate self-control, for example, as an inhibitory force predisposing the individual to thoughtful instead of impulsive actions (DeWall et al., 2011).

The general theory of crime (Gottfredson & Hirschi, 1990) articulates that self-control is the single most important predictor of crime, deviance, and analogous behavior (including aggression), beyond the effect of other personality factors and regardless of cultures, ethnicities, gender, or age. However, this theory also does not spell out the working processes through which self-control protects against a wide range of undesired behaviors.

In sum, there is both an empirical and theoretical scarcity of evidence about *how* self-control may exert a dampening effect on aggressive behavior. We will now outline why individual differences in anger rumination may play an important role.

1.2. Anger rumination and aggression

In everyday life, individuals may experience a variety of events that make them feel angry (e.g., being provoked or treated unfairly). Anger can be experienced several times a week to several times a day, and this feeling typically lasts for about half an hour (Averill, 1983; Kassinove, Sukhodolsky, Tsytsarev & Soloveyva, 1997). After encountering an anger-inducing event, some people may successfully "let it go" whereas others cannot stop thinking about the anger-provoking episode. The latter phenomenon is known as anger rumination, conceptualized as one's tendency to engage in reoccurring thoughts about anger episodes (Sukhodolsky, Golub, & Cromwell, 2001). People who engage in anger rumination re-experience what led to the anger, focusing on angry thoughts, memories of the anger-evoking episode and the mental rehearsal of possible acts of revenge (Denson, Pedersen, & Miller, 2006; Sukhodolsky et al., 2001). As a result, anger rumination increases angry feelings, aggressive cognitions, cardiovascular responses such as blood pressure, and aggressive behaviors (Denson, 2009).

Anger rumination is reliably associated with various types of aggressive behavior including physical aggression, verbal aggression, and hostility (Anestis, Anestis, Selby, & Joiner, 2009; Denson, Pedersen, Friese, Hahm, & Roberts, 2011; Peters et al., 2015). In addition, people who frequently ruminate about anger-evoking events not only aggress against those who made them angry. They are also more likely to engage in displaced aggression --- aggressive acts towards innocent others that have nothing to do with the provoked anger (Denson et al., 2006, phase 2 Study).

State anger rumination is also related to higher levels of aggression. In a series of studies, participants were provoked and given the opportunity to ruminate (or not) about the event (Denson et al., 2011). Rumination was associated with more aggressive behavior and mediated the effect of provocation on aggression.

Taken together, convergent evidence from correlational and experimental studies has demonstrated that both high trait and state levels of anger rumination are associated with more aggression in various forms.

1.3. Trait Self-Control and anger rumination

Denson (2009) proposed that anger rumination is aversive due to thoughts and feelings intrusively capturing attention and that individuals are therefore typically motivated to stop ruminating. Trait self-control – the ability to change thoughts, emotions, and behaviors (De Ridder, Lensvelt-Mulders, Finkenauer, Stok, & Baumeister, 2012; Tangney et al., 2004) – should be conducive to the regulation of these cognitive processes. Prior research has shown that compared to those low in trait self-control, individuals high in trait self-control are better able to suppress undesirable thoughts (Gailliot, Schmeichel, & Baumeister, 2006), unwanted memories (Anderson & Levy, 2009) and ignore external distractions (Diamond, 2013). In the course of regulating ruminative thoughts, individuals high in trait self-control should therefore be more likely to cut off the memories of anger experiences, to redirect their attention away from the anger-evoking episode, and to regulate their thoughts about seeking revenge. In other words, they should engage less in anger rumination. Indeed, in a recent study conducted among athletes, trait self-control was directly related to lower levels of anger rumination (Sofia & Cruz, 2015). In sum, these theoretical assumptions and the (limited) empirical evidence lead to the expectation that high trait self-control is associated with less anger rumination.

1.4. Overview of the present research

Based on theoretical work and empirical evidence, we assume that individuals with high levels of trait self-control are better at regulating their ruminative thoughts compared to those low in trait self-control, which in turn should lower their propensity to engage in aggressive behavior. We carried out seven studies and an internal meta-analysis to examine this hypothesis. Different aggressive behaviors were assessed to examine the generalizability of our assumption.

Study 1 explored the mediation effect of anger rumination between trait self-control and a general measure of aggressive behavior in a sample of college students using a cross-sectional design. Study 2 sought to conceptually replicate the results investigating physical and verbal aggression in university students. Study 3 tested the hypothesis focusing on workplace aggressive behavior among employees. Study 4 investigated the hypothesis based on parent-reports of adolescents' aggression. Study 5 used a two-wave design with proactive and reactive aggression as outcomes among adolescents. Study 6 employed a three-wave design to test the mediating effect of anger rumination in a sample of college students with a general measure of aggressive behavior as the outcome. Study 7 was a daily diary study to examine the hypotheses in more nuanced ways in real world settings. Finally, we conducted an internal meta-analysis to synthesize the direct and indirect effects across the seven studies using a parameter-based metaSEM approach (Cheung, 2015). In all studies, we statistically

Table 1
Correlations between trait self-control, anger rumination, and aggression among Chinese college students (Study 1).

	M	SD	1	2	3
1. Trait self-control	2.78	0.32	–		
2. Anger rumination	1.77	0.48	−0.44***	–	
3. Aggression	0.31	0.32	−0.49***	0.57***	–

*** $p < .001$. $N = 346$.

controlled for participant sex given known sex differences in aggressive behavior (Archer, 2004). Specifically, we controlled for the effect of sex on the mediator (i.e., anger rumination) and the dependent variable (i.e., aggression) following Kenny's (2018) suggestion. Among the seven studies, some were specifically designed to test the hypotheses of this research project (Studies 1, 3, 5 & 7) whereas others were part of larger projects (Studies 2, 4, & 6). In all cases, the main variables (i.e., trait self-control, anger rumination, and aggression) were measured with one scale only in each study.

2. Study 1

Study 1 was a cross-sectional study conducted among Chinese college students to provide initial evidence for our hypotheses.

2.1. Method

2.1.1. Participants and procedure

A convenience sample of 346 Chinese college students (180 men, 166 women; $M_{age} = 19.87$ years, $SD = 0.89$) completed a battery of self-report measures on a survey website to enter a drawing to win 100 RMB (approximately U.S. $15). No participants were excluded from the analyses.

2.1.2. Measures

2.1.2.1. Trait self-control. The Chinese version of Grasmick, Tittle, Bursik, and Arneklev (1993) Low Self-Control Scale (Chiu, 2006) was used to assess participants' trait self-control. This scale consists of 24 items rated on a four-point scale (from "1 = strongly disagree" to "4 = strongly agree"). We recoded the items so that a high mean score indicates high self-control. Sample items are "I am more concerned about what happens to me in the short run than in the long run" and "Excitement and adventure are more important to me than security". Cronbach's α of this scale was 0.84.

2.1.2.2. Anger rumination. The Chinese version of Sukhodolsky et al. (2001) Anger Rumination Scale (Zhang, Tang, Liu, & Lv, 2015) was used to assess participants' frequency of ruminative thoughts about angry events. This measure contains 19 items that are rated on four-point scale (from "1 = never" to "4 = always"). A total mean score can be obtained by averaging all the items, with higher scores indicating more frequent anger rumination. Sample items are "When something makes me angry, I turn this matter over and over again in my mind" and "I keep thinking about events that angered me for a long time". Cronbach's α was 0.87.

2.1.2.3. Aggressive behavior. The Chinese version of the *Aggressive behavior* subscale of Achenbach and Rescorla (2003) Adult Self-Report was used to assess participants' aggressive behavior. This subscale was rated on a three-point scale (from "0 = never" to "2 = often"). The total mean score was obtained by averaging all items with higher scores indicating more aggressive behavior. This scale has been back-translated and used in a Chinese population in a multi-national study (Ivanova et al., 2015), showing excellent psychometric properties. Sample items are "I get in many fights" and "I argue a lot". Cronbach's α was 0.93.

2.2. Results

Means, standard deviations, and bivariate correlations were calculated in SPSS 18.0 and are presented in Table 1. High trait self-control was negatively related to anger rumination ($r = -0.44$, $p < .001$) and aggressive behavior ($r = -0.49$, $p < .001$); whereas anger rumination was positively related to aggressive behavior ($r = 0.57$, $p < .001$).

The total effect of trait self-control on aggression and the indirect effect through anger rumination were examined using Hayes's (2013) PROCESS macro (v2.13, model 4). A biased-corrected Bootstrap technique ($N = 10{,}000$ samples) was utilized and a 95% confidence interval was employed to determine the significance of the mediation.

The total effect model – the effect of trait self-control on aggression without anger rumination included in the model – accounted for 24.2% of the variance in aggression scores. The relationship between trait self-control and aggression was significant ($B = -0.474$, S.E. = 0.047, $t = -10.20$, $p < .001$). The indirect effect model – including the combined effect of trait self-control on anger rumination and anger rumination on aggression – explained 39.3% of the variance in aggression scores (Fig. 1). In this model, the association between trait self-control and aggression was reduced compared to the total effect model, but was still significant ($B = -0.289$, S.E. = 0.046, $t = -6.26$, $p < .001$). More importantly, the trait self-control-aggression link was partially mediated by anger rumination (unstandardized indirect effect: estimate = −0.184, 95% CI = [−0.267, −0.114]; standardized indirect effect: estimate = −0.188, 95% CI = [−0.266, −0.112]). The ratio of indirect to total effect was 0.389, suggesting that 38.9% of the total effect was explained by the indirect effect through anger rumination. The results remained similar when not controlling for sex[1].

2.3. Discussion

Study 1 revealed that individuals with low levels of trait self-control were more likely to engage in aggressive behavior, corroborating earlier work (e.g., Finkenauer, Engels, & Baumeister, 2005; Özdemir et al., 2013; Tangney et al., 2004). More crucially, this link was partly accounted for by less engagement in anger rumination. These results provide initial cross-sectional evidence for the idea that one important reason why individuals low in trait self-control engage in aggressive acts may be that they ruminate less about the anger-evoking events that can lead to aggression.

3. Study 2

The aim of Study 2 was to conceptually replicate the findings of Study 1 using two specific types of aggression – physical and verbal aggression, instead of a general measure of aggression.

[1] Across Studies 1 to 7, results of total and indirect effect models without controlling for sex are presented in supplementary online materials.

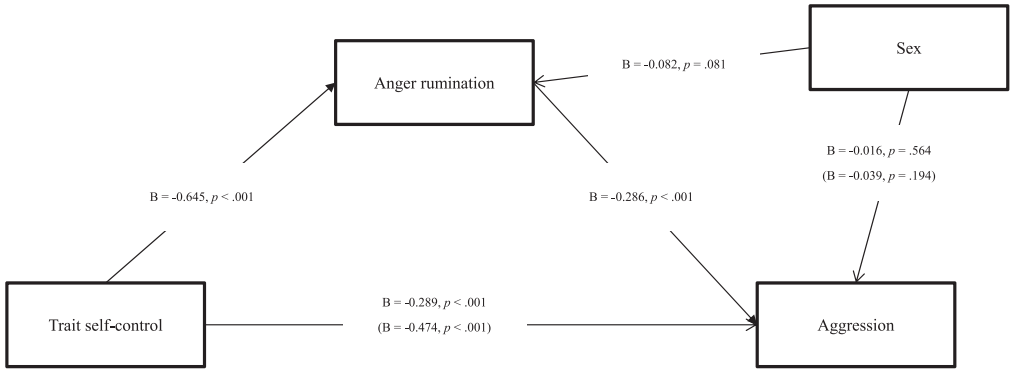

Fig. 1. Mediation model of anger rumination between trait self-control and aggression among college students (Study 1, $N = 346$). Note: values in parentheses refer to the effect when the mediator was not included in the model.

3.1. Method

3.1.1. Participants and procedure

Stratified sampling was used to recruit the current sample from a one-off large-scale survey hosted by the Teaching Office of Guangzhou University aiming to investigate the learning, living, and psychological situations of students. The survey was implemented by the coordinators of each faculty, and all students of the university were asked to complete some common measures (not included in this study) and some add-up measures (for example, the measures reported this study). A total of about 25,000 students participated in the survey, representing about 80% of the population of the whole university. About 6% of the total sample (1,500 students) was randomly selected from the total sample to answer the common measures assigned by the teaching office and the add-up measures used in this study. These 1500 students were then randomly divided into two subsamples with a ratio of 3:2 for two studies. Nine hundred students comprised the sample of the current study whereas the remaining 600 students comprised the sample of another independent study. Participants who did not complete the survey (>25% missing item responses of each questionnaire) were excluded from the final analyses, resulting in the final sample size of 811 (434 males, 377 females; 206 freshmen, 217 sophomores, 197 junior and 191 senior). Participants' age was not assessed.

3.1.2. Measures

3.1.2.1. Trait self-control. The Chinese version of Tangney et al.'s (2004) Brief Self-Control Scale (Li, Vazsonyi, & Dou, 2018; Situ et al., 2016; Unger, Bi, Xiao, & Ybarra, 2016) was used to assess participants' trait self-control. This scale contains 13 items rated on a five-point scale (from "1 = not like me at all" to "5 = very much like me"). A higher mean score indicates better self-control. Sample items are "I am good at resisting temptation" and "I have a hard time breaking bad habits". Cronbach's α was 0.73.

3.1.2.2. Anger rumination. As in Study 1, the Anger Rumination Scale (Sukhodolsky et al., 2001; Zhang et al., 2015) was used to assess participants' anger rumination in this study. Cronbach's α was 0.89.

3.1.2.3. Aggression. The physical (PA) and verbal (VA) aggression subscales of Buss and Perry (1992) Aggression Questionnaire were employed to assess participants' physical and verbal aggressive behavior. This scale has been translated and validated in Chinese samples (Li et al., 2011; Ying & Dai, 2008) showing adequate psychometric properties. The PA subscale consisted of 9 items (α = 0.67) and the VA subscale contained 5 items (α = 0.66); all items were rated on a 5-point Likert scale (from "1 = extremely uncharacteristic of me" to "5 = extremely characteristic of me"). This scale has been used in Chinese university students in prior research, showing acceptable psychometric properties (Li et al., 2014). Sample items are "I have threatened people I know" (physical aggression) and "I can't help getting into arguments when people disagree with me" (verbal aggression).

3.2. Results

Means, standard deviations, and bivariate correlations were calculated in SPSS 18.0 and are presented in Table 2. High trait self-control was negatively related to anger rumination ($r = -0.31$, $p < .001$), physical aggression ($r = -0.17$, $p < .001$) and verbal aggression ($r = -0.21$, $p < .001$); whereas anger rumination was positively related to both physical aggression ($r = 0.44$, $p < .001$) and verbal aggression ($r = 0.42$, $p < .001$).

The same procedure as used in Study 1 was used to separately test the total effect of trait self-control on physical and verbal aggression and the indirect effect through anger rumination. Regarding physical aggression, the total effect model accounted for 8.6% of the variance in physical aggression. The relationship between trait self-control and physical aggression was significant ($B = -0.231$, S.E. = 0.037, $t = -6.23$, $p < .001$). The indirect effect model (Fig. 2a) explained 23.0% of the variance in aggression scores. In this model, the association between trait self-control and physical aggression remained significant ($B = -0.088$, S.E. = 0.036, $t = -2.44$, $p = .015$). More importantly, this link was

Table 2
Correlations between trait self-control, anger rumination, and aggression among Chinese college students (Study 2).

	M	SD	1	2	3	4
1. Trait self-control	3.25	0.52	–			
2. Anger rumination	1.78	0.43	−0.31***	–		
3. Physical aggression	2.02	0.57	−0.17***	0.44***	–	
4. Verbal aggression	2.38	0.70	−0.21***	0.42***	0.41***	–

*** $p < .001$. $N = 811$.

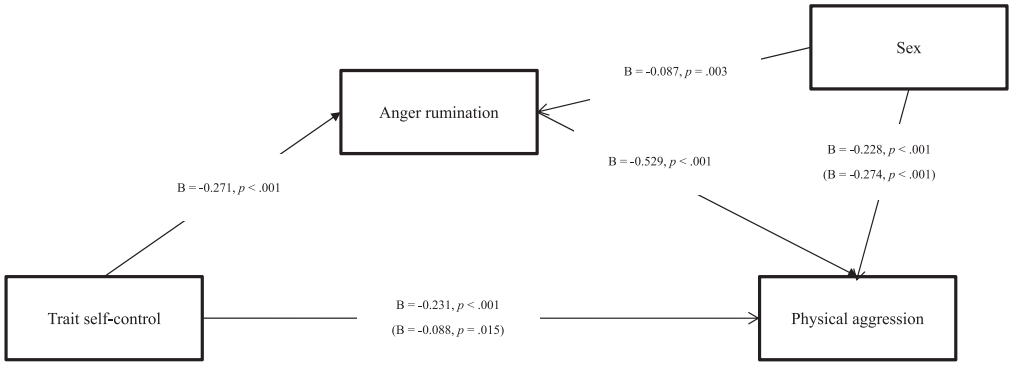

Fig. 2a. Mediation model of anger rumination between trait self-control and physical aggression among college students (Study 2, $N = 811$). Note: values in parentheses refer to the effect without the mediator.

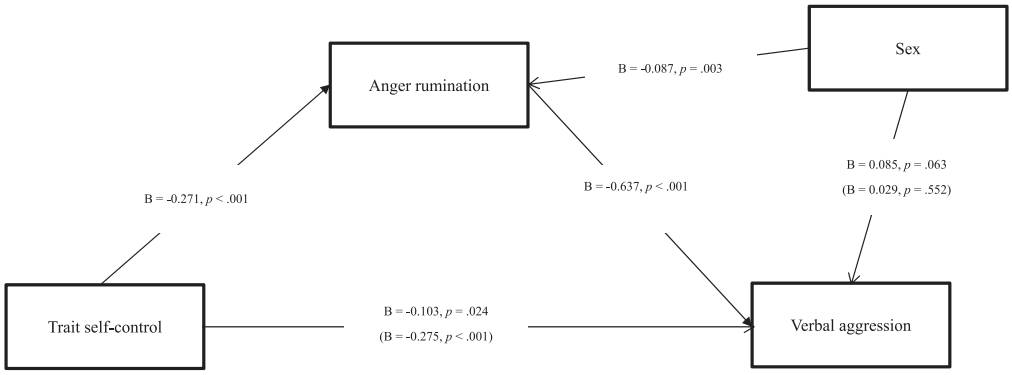

Fig. 2b. Mediation model of anger rumination between trait self-control and verbal aggression among college students (Study 2, $N = 811$). Note: values in parentheses refer to the effect without the mediator.

partially mediated by anger rumination (unstandardized indirect effect: estimate = −0.143, 95% CI = [−0.186, −0.107]; standardized indirect effect: estimate = −0.132, 95% CI = [−0.169, −0.100]). The ratio of indirect to total effect was 0.619, indicating that about 62% of the total effect of trait self-control on physical aggression were accounted for by the path through anger rumination. The pattern of results remained similar when not controlling for sex.

Regarding verbal aggression, the total effect model accounted for 4.4% of the variance in verbal aggression. The relationship between trait self-control and verbal aggression was significant ($B = -0.275$, S.E. = 0.047, $t = -5.90$, $p < .001$). The indirect effect model (Fig. 2b) explained 18.3% of the variance in aggression scores. In this model, the association between trait self-control and verbal aggression was reduced, but was still significant ($B = -0.103$, S.E. = 0.046, $t = -2.26$, $p = .024$). Again, this link was partially mediated by anger rumination (unstandardized indirect effect: estimate = −0.172, 95% CI = [−0.223, −0.129]; standardized indirect effect: estimate = −0.127, 95% CI = [−0.163, −0.096]). The ratio of indirect to total effect was 0.626. The pattern of results remained similar when not controlling for sex.

3.3. Discussion

Study 2 conceptually replicated that higher levels of trait self-control were related to higher levels of aggression, specifically physical and verbal aggression. One advantage of this study was the comparatively large sample size. However, the overall effects were weaker in Study 2 than those in Study 1. One possible reason may be due to the differences in population and measurements. This notwithstanding, Studies 1 and 2 provided converging evidence for the mediating effect of anger rumination. Moreover, in Studies 1 and 2 we employed different measures to assess trait self-control, one developed in criminology (the LSCS, Grasmick et al., 1993) and the other developed in psychology (the BSCS, Tangney et al., 2004). Nevertheless, the item contents of both scales show some overlap, attesting to their conceptual similarity (Li & Vazsonyi, 2019). This is corroborated by the successful replication of the hypothesized model in both studies. One limitation of both Study 1 and Study 2 is that in both studies samples were drawn from university student populations. This limits the generalizability of the results. To generalize the findings, Studies 3 to 5 and Study 7 relied on samples from further populations using various indicators of aggression as outcomes.

4. Study 3[2]

Study 3 aimed to conceptually replicate the findings found in Studies 1 and 2 using a different sample (i.e., full-time employees) and a different indicator of aggression (i.e., workplace aggression) as outcome.

4.1. Method

4.1.1. Participants and procedure

A convenience sample of 395 Chinese employees was recruited in 2016 in two ways. A small portion of participants ($N = 60$, 15.2%) were recruited online via advertisements. They filled out the questionnaires online to enter a drawing to win 100 RMB

[2] Study 3 was pre-registered at [omitted website for masked review purpose].

(approximately U.S. $15). The remaining part of participants was recruited offline via a mandatory occupational training course held in the university. These participants were full-time teachers of primary and middle schools from cities near Guangzhou, one of the most developed cities located in Southern China. They undertook the study in exchange for partial fulfillment of the course.

After eliminating invalid data due to incompletion of questionnaires (>25% missing item responses), data from 378 participants (70 males, 304 females, 4 missing; M_{age} = 32.72 years, SD = 6.66) were used for further analyses. The mean tenure was 10.79 years (SD = 7.41), and most participants earned less than 100,000 RMB (approximately U.S. $14,500) per year (0–49,999 RMB: 43.1%; 50,000–99,999 RMB: 35.7%; 100,000–149,999 RMB: 16.1%, >150,000 RMB: 3.2%; missing: 1.9%; average wage of employed persons in Guangzhou urban units was 83,424 RMB in the year of 2016).

4.1.2. Measures

4.1.2.1. Trait self-control. Again, the Chinese version of Tangney et al.'s (2004) Brief Self-Control Scale (Situ et al., 2016) was employed to assess participants' trait self-control. Cronbach's α was 0.76

4.1.2.2. Anger rumination. Again, the Chinese version of Sukhodolsky et al. (2001) Anger Rumination Scale (Zhang et al., 2015) was employed to assess the frequency of participants' rumination about angry events. Cronbach's α was 0.91.

4.1.2.3. Workplace aggression. The second author, who received his Ph.D. in I/O psychology with several years of experience working with Chinese enterprises, selected twenty items from existing scales (i.e., the Workplace Aggression Scale and the Work Deviance Scale; Neuman & Baron, 1998; Robinson and O'Leary-Kelly, 1998; Zhang & Chen, 2011) used in previous studies to assess participants' aggression at the workplace.[3] The selection criteria included: (1) fit of the item content with the Chinese workplace culture and (2) face validity of the items. Each item describes a behavior that reflects aggressive acts either towards colleagues (e.g., argue with colleagues) or towards the organization (e.g., spread rumors that jeopardize the organization's reputation). Participants were asked to indicate how often they reacted in the way described in the item when faced with unfair treatment and provocations by colleagues over the past six months on a five-point scale (1 = zero, 2 = one to three times, 3 = four to six times, 4 = seven to nine times, and 5 = ten or more than ten times). Two mean scores were calculated, namely, the one averaging the 12 items of aggression toward colleagues (Cronbach's α = 0.87) and the one of the 8 items of aggression toward the organization (Cronbach's α = 0.79). Results of an initial analysis showed that these two scores were highly correlated (r = 0.80), suggesting that combining the two scores into a single score would make the model more parsimonious. Thus, the mean score based on the twenty items served as the final indicator of aggressive behavior in the workplace. Cronbach's α was 0.91.

4.2. Results

Means, standard deviations, and correlations were calculated in SPSS 18.0 and are presented in Table 3. The results showed that self-control was negatively related to anger rumination (r = −0.28, p < .001) and workplace aggression (r = −0.28, p < .001); whereas anger rumination was positively related to workplace aggression (r = 0.30, p < .001).

[3] The full set of items is reported in the online supplemental material.

The same procedure used in Studies 1 and 2 was utilized to test the hypothesis. The total effect model explained 9.0% variance of workplace aggression. Trait self-control was negatively related to workplace aggression (B = −0.111, S.E. = 0.020, t = −5.57, p < .001). The indirect effect model (Fig. 3) accounted for 14.3% of the variance of workplace aggression. In this model, the association between trait self-control and workplace aggression decreased but was still significant, B = −0.084, S.E. = 0.020, t = −4.14, p < .001. The relation between trait self-control and workplace aggression was partially mediated by anger rumination (unstandardized indirect effect: estimate = −0.027, 95% CI = [−0.056, −0.011]; standardized indirect effect: estimate = −0.069, 95% CI = [−0.113, −0.032]). The ratio of indirect to total effect was 0.247. The results remained similar when not controlling for sex and when recruitment method was controlled for.

4.3. Discussion

Trait self-control was negatively associated with aggressive behavior in an organizational context and this association was partly accounted for by individual differences in anger rumination. Study 3 thus provides a conceptual replication of Studies 1–2 with a different sample and a different indicator of aggressive behavior and delivers further evidence for the mediating role of anger rumination for the relation between trait self-control and aggressive behavior.

5. Study 4

Although the first three studies confirmed our hypothesis, they exclusively relied on self-reports. In Study 4, we sought to expand the evidence to other-reports. More specifically, we sought to conceptually replicate the previous studies using a parent-report measure of aggression in a sample of high school students.

5.1. Method

5.1.1. Participants and procedure

A cohort of Grade 10 students (the first year of high school) and their parents were invited to participate in this study. These students were recruited from one high school in Guangzhou (China) in September 2018 when the new academic year began. A total of 519 students (240 boys, 260 girls, 19 missing) undertook the study with their parents' consent. Out of these 519 students, 331 parents (242 mothers and 89 fathers) took part in the study and provided completed data for further analyses. Therefore, this study included 331 child-parent dyads (144 boys, 178 girls, 9 missing). Compared to those for whom we did not obtain parent-reported aggression, participants for whom we obtained parent-reported aggression did not differ significantly in trait self-control ($M_{\text{with parent-report}}$ = 3.10, SD = 0.50, $M_{\text{without parent-report}}$ = 3.02, SD = 0.52, t(4 7 6) = 1.72, p = .086, d = 0.16) or anger rumination ($M_{\text{with parent-report}}$ = 1.94, SD = 0.48, $M_{\text{without parent-report}}$ = 1.96, SD = 0.54, t(4 8 7) = −0.42, p = .673, d = 0.04).

This study was part of a larger research project about how parent and individual factors affect high school students' adjustment and future career choice. The school's principals approved of this study and students could only participate after their parents gave consent. We obtained parent-reports of their own parenting, personality, and on their children's social-emotional functioning (e.g., psychological difficulties, aggressive behavior, prosocial behavior, etc.) at the beginning of the study in September 2018 (the 1st wave, T1). At T1, students provided self-reports of trait self-control, anger rumination, social-emotional functioning, and their envisioned future career choice. The larger research project

Table 3
Correlation between trait self-control, anger rumination, and workplace aggression among Chinese employees (Study 3).

	M	SD	1	2	3
1. Trait self-control	3.44	0.55	–		
2. Anger rumination	1.86	0.43	−0.28***	–	
3. Workplace aggression	1.11	0.22	−0.28***	0.30***	–

**$p < .001$. $N = 378$.

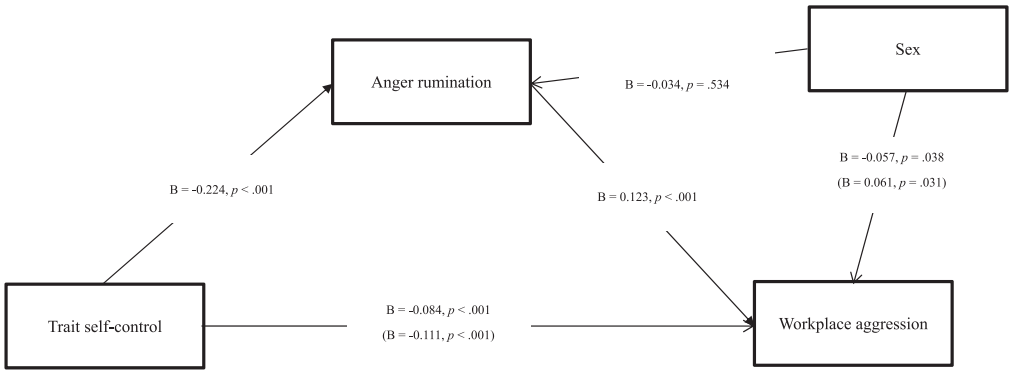

Fig. 3. Mediation model of anger rumination between trait self-control and workplace aggression among employees (Study 3, $N = 378$). Note: values in parentheses refer to the effect without the mediator.

aims to collect data on an annual basis, but for our particular study, we also collected participants' self-reported anger rumination at T2 (1 month after T1) and peer-reported aggression by three randomly selected classmates at T3 (1.5 months after T2). Unfortunately, the inter-rater reliability of the T3 peer-reported aggression was extremely low (ICC < 0.15). We therefore decided to focus on parent-reported aggression as dependent variable and dropped the peer-reported aggression due to its poor reliability[4]. Thus, although the study originally featured three measurement points, we focused on assessments at T1 only.

5.1.2. Measures

5.1.2.1. Trait self-control. Again, the Chinese version of Tangney et al.'s (2004) Brief Self-Control Scale (Situ et al., 2016) was employed to assess participants' trait self-control. Cronbach's α was 0.74.

5.1.2.2. Anger rumination. Again, the Chinese version of Sukhodolsky et al. (2001) Anger Rumination Scale (Zhang et al., 2015) was employed to assess the frequency of participants' rumination about angry events. Cronbach's α was 0.87.

5.1.2.3. Aggression. The Direct and Indirect Aggression Scale (DIAS, Bjorkqvist, Osterman, & Kaukiainen, 1992) was used to assess parents' ratings of their adolescent's aggression when their child is in conflict or angry with his/her friends/classmates. The DIAS features self-report, parent-report, and peer-report subscales. In this study, we used the Chinese version of the parent-report subscale (Yu, Shi, & Wu, 2005). This subscale consists of 24 items assessing three types of aggression, including physical aggression (7 items), verbal aggression (5 items), and indirect aggression (12 items). All items were rated on a 5-point scale (from "0 = never" to "4 = always"). Averaging all the items represents overall aggressive behavior of the child, a high score indicating more aggression. Sample items include "hit him/her" and "ignore him/her". Cronbach's α was 0.89.

5.2. Results

Means, standard deviations, and correlations were calculated in SPSS 18.0 and are presented in Table 4. The results showed that trait self-control was negatively related to anger rumination ($r = -0.27$, $p < .001$) and parent-reported aggression ($r = -0.17$, $p = .003$); whereas anger rumination was positively related to parent-reported aggression ($r = 0.16$, $p = .006$).

The same procedure used in Studies 1 to 3 was utilized to test the hypothesis. The total effect model explained 2.8% variance of parent-report aggression. Trait self-control was negatively related to parent-reported aggression ($B = -0.092$, S.E. = 0.032, $t = -2.93$, $p = .004$). The indirect effect model (Fig. 4) accounted for 4.6% of the variance of parent-reported aggression. In this model, the association between trait self-control and parent-reported aggression decreased but was still significant, $B = -0.072$, S.E. = 0.032, $t = -2.23$, $p = .027$. The relation between trait self-control and parent-reported aggression was partially mediated by anger rumination (unstandardized indirect effect: estimate = −0.020, 95% CI = [−0.043, −0.005]; standardized indirect effect: estimate = −0.036, 95% CI = [−0.075, −0.009]). The ratio of indirect to total effect of trait self-control on parent-reported aggression was 0.218. The results remained similar when not controlling for sex.

5.3. Discussion

Taken together, Study 4 conceptually replicated the findings of Studies 1–3 relying (a) on a sample of yet a different population (high school students), and – more importantly – on parent-reported instead of self-reported aggression. Results were generally consistent with Studies 1–3, but the effects were less pronounced compared to the previous studies. This may at least partly be a result of the necessarily limited insight of parents into their children's aggression compared to self-reported aggression (which may access all occurrences of an individual's behavior).

[4] We suspect that reasons for the low inter-rater reliability of the peer-reported aggression may be twofold. First, the data collection was not anonymous and thus students may have been reluctant to rate their classmates negatively. Second, students only knew their classmates for only 2.5 months before the survey was conducted, thus limiting their knowledge of their classmates' aggressive behavior.

Table 4
Correlation between trait self-control, anger rumination, and parent-report aggression among Chinese adolescents (Study 4).

	M	SD	1	2	3
1. Trait self-control	3.10	0.50	–		
2. Anger rumination	1.94	0.48	−0.27***	–	
3. Parent-reported aggression	1.26	0.27	−0.17**	0.16**	–

** $p < .01$,
*** $p < .001$. $N = 304–317$.

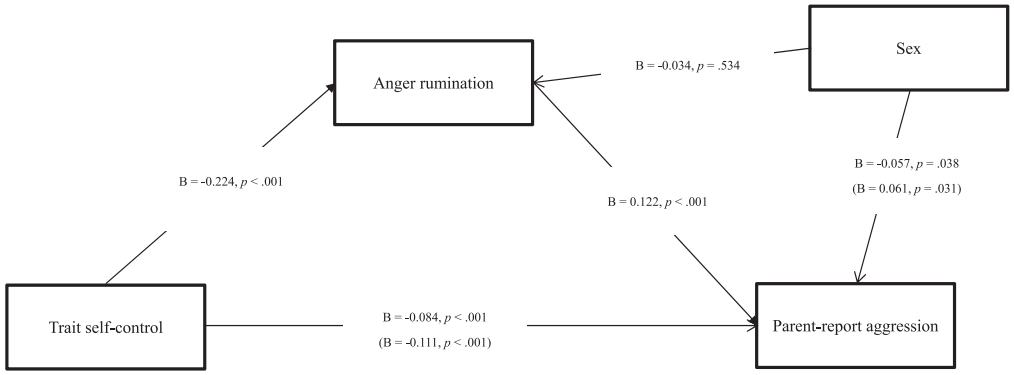

Fig. 4. Mediation model of anger rumination between trait self-control and parent-report aggression among Chinese adolescents (Study 4, $N = 378$). Note: values in parentheses refer to the effect without the mediator.

On the positive side, parent-reports are less likely to be impacted by self-presentation tendencies compared to self-reports.

One important caveat of Studies 1–4 is that they are cross-sectional in nature. This limits the conclusiveness of the mediation models and may lead to biased estimates (Maxwell & Cole, 2007; Maxwell, Cole, & Mitchell, 2011). In order to better disentangle the effect of trait self-control on aggression and the mediating effect of anger rumination, longitudinal designs are needed. To address this issue, Study 5 employed a two-wave study design and Study 6 a three-wave study design.

6. Study 5

Study 5 went beyond the previous studies in three ways: First, a two-wave design was used, which allowed us to control for common shared variance due to data collected at the same time point. Second, to further examine the generalizability of our findings this study drew on a sample from yet a different population than the previous studies. Specifically, we recruited participants who were from a different country (Italy instead of China). Third, Study 5 examined both reactive and proactive aggression, again testing the generalizability of the hypothesis. Reactive aggression is conceptualized as a hostile affect-laden defensive response to provocation, characterized by insufficient self-control to stop aggressive impulses from translating into behavior. Proactive aggression, by contrast, is an instrumental and organized aggressive behavior, characterized by blunted affect and simulation-seeking tendencies (Raine et al., 2006).

6.1. Method

6.1.1. Participants and procedure

A convenience sample of 526 Italian adolescents (172 boys, 352 girls, 2 missing) was recruited from high schools in the Venetian Region of Italy. Three months later (time 2), we collected the data again. Fifty-two students (14 boys and 38 girls, 9.9%) dropped out of the second administration due to participants' absence from class at the second measurement occasion. This left a final sample of 474 adolescents (158 boys, 314 girls, 2 missing; age range: 15–20 years, $M_{age} = 16.51$ years, $SD = 0.72$). Participants who took part in both waves of the study ($M = 3.58$, $SD = 0.53$) did not differ significantly in trait self-control from those who dropped out at the second wave ($M = 3.50$, $SD = 0.52$), $t(5\ 1\ 5) = 1.07$, $p = .284$, $d = 0.09$.

6.1.2. Measures

6.1.2.1. Trait self-control. The Italian version of the Self-Restraint subscale of the Adolescents' Self-Consciousness Questionnaire (Delvecchio et al., 2014) was used to assess participants' trait self-control at Time 1. This subscale consists of 11 items rated on a five-point scale (from "1 = not like me at all" to "5 = like me very much"). A total mean score was calculated by averaging all items (with 10 items reverse scored), a higher score indicating better self-control ability. Sample items are "I can control my emotion" and "I fail in overcoming my bad habits even though I have tried many times" Cronbach's α was 0.65 in this study, which is similar to the one reported in the original validation (Delvecchio et al., 2014).

6.1.2.2. Anger rumination. The Italian version of Sukhodolsky et al. (2001) Anger Rumination Scale was used (Baldetti & Bartolozzi, 2010) to assess anger rumination at time 2. All items were rated on a four-point scale (from "1 = never" to "4 = always"). A higher mean score indicates more frequent engagement in anger rumination. Cronbach's α was 0.85.

6.1.2.3. Reactive and proactive aggression. The Italian version of the Proactive-Reactive Aggression Questionnaire (RPQ, Raine et al., 2006) was used to assess reactive and proactive aggression at time 2 (Fossati et al., 2009). This scale consists of 23 items (11 items for reactive and 12 items for proactive aggression) rated on a three-point scale (from "0 = never" to "2 = often"). A mean score of reactive aggression and proactive aggression, respectively, can be obtained by averaging all corresponding items, with higher scores indicating more reactive/proactive aggression. Sample items are "How often have you yelled at others when they have annoyed you" (reactive aggression) and "How often have you threatened

and bullied someone" (proactive aggression). Cronbach's α of reactive and proactive aggression was 0.79 and 0.69 at time 2, respectively.

6.2. Results

Means, standard deviations, and correlations were calculated in SPSS 18.0 and are presented in Table 5. Time 1 trait self-control was negatively related to time 2 anger rumination ($r = -0.24$) and time 2 reactive ($r = -0.34$) and proactive ($r = -0.23$) aggression. Time 2 anger rumination was positively related to time 2 reactive ($r = 0.45$) and proactive ($r = 0.17$) aggression. All $ps < 0.001$.

The same procedure used in Studies 1 to 4 was utilized to test the hypothesis. Regarding reactive aggression, the total effect model explained 11.5% of the variance of time 2 reactive aggression. Time 1 trait self-control significantly predicted time 2 reactive aggression (B = −0.215, S.E. = 0.029, $t = -7.53$, $p < .001$). The indirect effect model (Fig. 5a) accounted for 26.3% of the variance of time 2 reactive aggression. Time 1 trait self-control was predictive of time 2 reactive aggression (B = −0.153, S.E. = 0.027, $t = -5.66$, $p < .001$). More importantly, time 2 anger rumination was found to partially mediate the association between time 1 trait self-control and time 2 reactive aggression (unstandardized indirect effect: estimate = −0.063, 95% CI = [−0.093, −0.037]; standardized indirect effect: estimate = −0.098, 95% CI = [−0.144, −0.057]). The ratio of the indirect to total effect was 0.291. The results remained similar when not controlling for sex.

Regarding proactive aggression, the total effect model explained 11.9% of the variance of time 2 proactive aggression. Time 1 trait self-control significantly predicted time 2 proactive aggression (B = −0.066, S.E. = 0.014, $t = -4.84$, $p < .001$). The indirect effect model (Fig. 5b) accounted for 13.6% of the variance of time 2 proactive aggression. Time 1 trait self-control was predictive of time 2 proactive aggression (B = −0.056, S.E. = 0.014, $t = -4.01$, $p < .001$). More importantly, time 2 anger rumination partially mediated the association between time 1 trait self-control and time 2 proactive aggression (unstandardized indirect effect: estimate = −0.010, 95% CI = [−0.020, −0.003]; standardized indirect effect: estimate = −0.034, 95% CI = [−0.068, −0.011]). The ratio of indirect to total effect was 0.152. When not controlling for sex, the results were similar when using a 90% CI, but the 95% CI of the indirect

Table 5
Correlations between trait self-control, anger rumination, and reactive and proactive aggression among Italian adolescents (Study 5).

	M	SD	1	2	3	4
1. T1 trait self-control	3.57	0.53	–			
2. T2 anger rumination	2.02	0.53	−0.24***	–		
3. T2 reactive aggression	0.64	0.34	−0.34***	0.45***	–	
4. T2 proactive aggression	0.11	0.17	−0.23***	0.17***	0.48***	–

*** $p < .001$. $N = 457–517$.

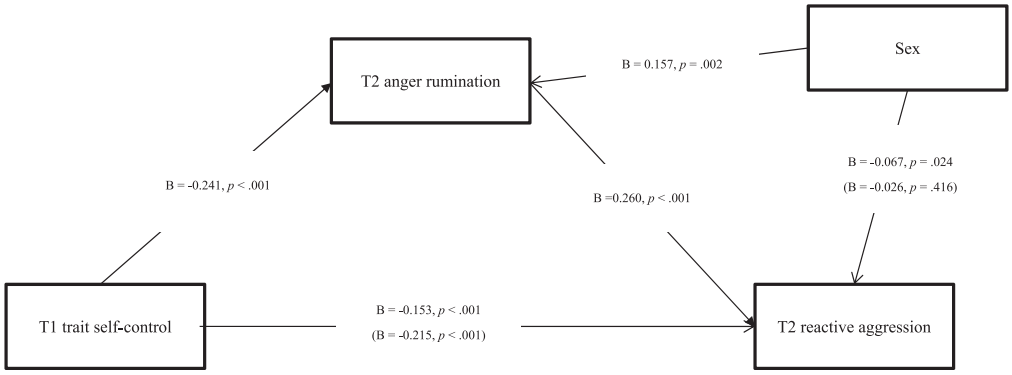

Fig. 5a. Mediation model of anger rumination between trait self-control and reactive aggression among Italian adolescents (Study 5, $N = 449$). Note: values in parentheses refer to the effect without the mediator.

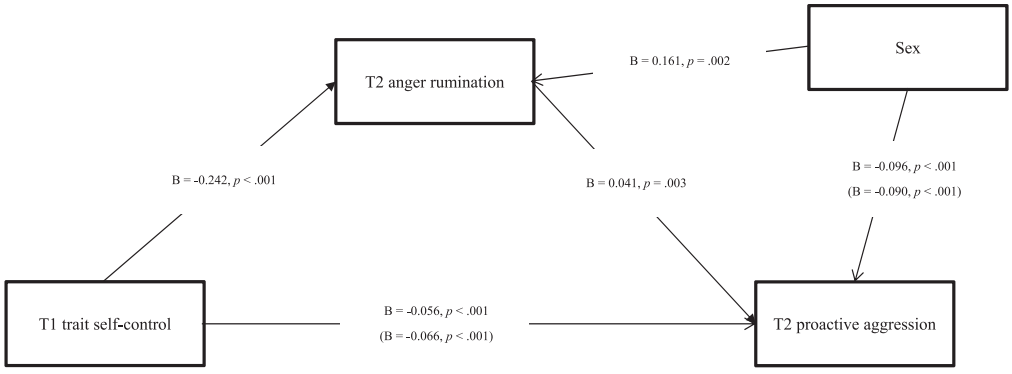

Fig. 5b. Mediation model of anger rumination between trait self-control and proactive aggression among Italian adolescents (Study 5, $N = 449$). Note: values in parentheses refer to the effect without the mediator.

effect on proactive aggression through anger rumination included zero.

6.3. Discussion

Study 5 employed a two-wave design to investigate the mediation effect of anger rumination of the relationship of trait self-control and proactive and reactive aggression, respectively. After controlling for sex, trait self-control was predictive of both reactive and proactive aggression. Moreover, these associations were partially mediated by anger rumination.

Although the relationship between T1 self-control and T2 anger rumination was longitudinal, the associations between anger rumination and both types of aggression were still cross-sectional because they were both assessed at time 2. To further address this issue, Study 6 employed a three-wave longitudinal design.

7. Study 6

Study 6 featured a three-wave longitudinal design that allowed assessing the predictor variable (i.e., trait self-control), the proposed mediator (i.e., anger rumination), and the criterion variable (i.e., aggression) at different time points. At time 1, trait self-control was assessed; at time 2, anger rumination, and at time 3, aggressive behavior.

Study 6 extended the previous studies in yet another way beyond the inclusion of three measurement occasions. In particular, previous studies exclusively tested the mediating role of anger rumination for the association between trait self-control and aggression. Research in recent years suggest that there are several different paths through which people high in trait self-control may achieve their goals (e.g., avoiding temptations, Hofmann, Baumeister, Förster, & Vohs, 2012; adaptive habits, Galla & Duckworth, 2015) or positive coping with difficulties (Li, Delvecchio, Lis, Nie, & Di Riso, 2016). Study 6 was embedded in a larger research project, which allowed us to examine the role of potentially competing mediators that were initially not planned as part of this study. Specifically, we had access to two self-reported emotion regulation strategies (i.e., cognitive reappraisal and expressive suppression, Gross & John, 2003) assessed at time 2. We included these emotion regulation strategies as additional competing mediators to examine whether anger rumination would still (partially) account for the relationship between trait self-control and aggressive behavior. Due to the conceptual closeness of anger rumination and emotion regulation including these emotion regulation strategies as competing mediators in the model constitutes a conservative test of our focal hypothesis relating to anger rumination.

7.1. Method

7.1.1. Participants and procedure

A convenience sample of 201 Chinese college students (103 men, 97 women, 1 missing; M_{age} = 19.98 years, SD = 0.89) participated at time 1. A total of 165 participants (82.1% retention rate) completed all three waves of the assessment. The attrition was due to the participants' absence from class when the measures were administered. Participants who completed all three waves of the study (M = 3.07, SD = 0.49) did not differ significantly in trait self-control from those who dropped out at either wave two and/or three (M = 3.23, SD = 0.49), $t(1\,9\,9) = -1.74$, p = .084, d = 0.25.

Participants took part in the study in exchange for extra course credits. This study was part of a larger longitudinal research project investigating the influence of trait self-control on developmental outcomes among Chinese college students. Participants answered self-report measures at three time points, with a 6-month interval between measurement occasions.

7.1.2. Measures

7.1.2.1. Trait self-control. The Chinese version of Tangney et al.'s (2004) Brief Self-Control Scale (Situ et al., 2016) used in Study 2 was employed to assess participants' trait self-control at T1. Cronbach's α was 0.74.

7.1.2.2. Anger rumination. The Chinese version of Sukhodolsky et al. (2001) Anger Rumination Scale (Zhang et al., 2015) was employed to assess anger rumination at T2. Cronbach's α was 0.92.

7.1.2.3. Emotion regulation. The Chinese version of the Emotion Regulation Questionnaire (ERQ, Gross & John, 2003) was used to assessed participants' cognitive reappraisal and expressive suppression in the process of emotion regulation at T2. The original ERQ consists of 10 items. The adapted Chinese version (Wang, Liu, Li, & Du, 2007) was validated based on the original ERQ but added another 4 items to increase reliability, thus forming a 14-item questionnaire with 8 items assessing cognitive reappraisal and another 6 items assessing expressive suppression. All items were rated on a seven-point scale (from "1 = strongly disagree" to "7 = strongly agree"), with a higher score indicating a stronger tendency to use cognitive reappraisal/expressive suppression to regulate emotion. The Cronbach's α of the cognitive reappraisal subscale was 0.90. The Cronbach's α of the expressive suppression subscale was 0.70. One item had a very low correlation with the total subscale score (r = 0.12). Deleting this item improved Cronbach's α to 0.76. We used this abbreviated subscale in the data analysis.

7.1.2.4. Aggressive behavior. The Chinese version of the *Aggressive behavior* subscale of the Achenbach and Rescorla (2003) Adult Self-Report was used to measure participants' aggression over the past six months at T3. Cronbach's α was 0.85.

7.2. Results

Means, standard deviations, and correlations are presented in Table 6. T1 trait self-control was negatively related to T2 anger rumination (r = −0.28, p < .001), and T3 aggression (r = −0.32, p < .001), but not to T2 cognitive reappraisal (r = 0.09, p = .275) or to T2 expressive suppression (r = −0.03, p = .683). T2 anger rumination was positively linked with T3 aggression (r = 0.41, p < .001). However, T2 cognitive reappraisal (r = −0.11, p = .117) and T2 expressive suppression (r = 0.02, p = .799) were not significantly associated with T3 aggression.

The same analytic approach and software used in Studies 1 to 5 were employed except for the inclusion of the additional, parallel mediators. The total effect model explained 14.8% of the variance of T3 aggression. T1 trait self-control predicted T3 aggression (B = −0.193, S.E. = 0.044, t = −4.42, p < .001). The indirect effect model (Fig. 6) explained 28.4% of the variance of T3 aggression. In this model, the effect of T1 trait self-control on T3 aggression remained significant (B = −0.110, S.E. = 0.044, t = −2.49, p = .014). Importantly, the indirect effect through T2 anger rumination was significant as well (unstandardized indirect effect: estimate = −0.083, 95% CI = [−0.147, −0.035]; standardized indirect effect: estimate = −0.151, 95% CI = [−0.260, −0.062]). The ratio of indirect to total effect was 0.431. The results did not change significantly without controlling for sex. The indirect effects through cognitive reappraisal (unstandardized indirect effect: estimate = −0.003, 95% CI = [−0.023, 0.004]; standardized indirect effect: estimate = −0.005, 95% CI = [−0.041, 0.007]) and expressive suppression (unstandardized indirect effect: estimate = 0.002, 95%

Table 6
Correlations between trait self-control, anger rumination, and aggression among Chinese college students (Study 6).

	M	SD	1	2	3	4	5
1. T1 trait self-control	3.10	0.49	–				
2. T2 anger rumination	1.79	0.49	−0.28***	–			
3. T2 cognitive reappraisal	4.56	0.99	0.09	0.05	–		
4. T2 expressive suppression	3.73	0.98	−0.03	0.20*	0.43***	–	
5. T3 aggression	0.29	0.28	−0.32***	0.41***	−0.11	0.02	–

*** $p < .001$. $N = 165–201$.

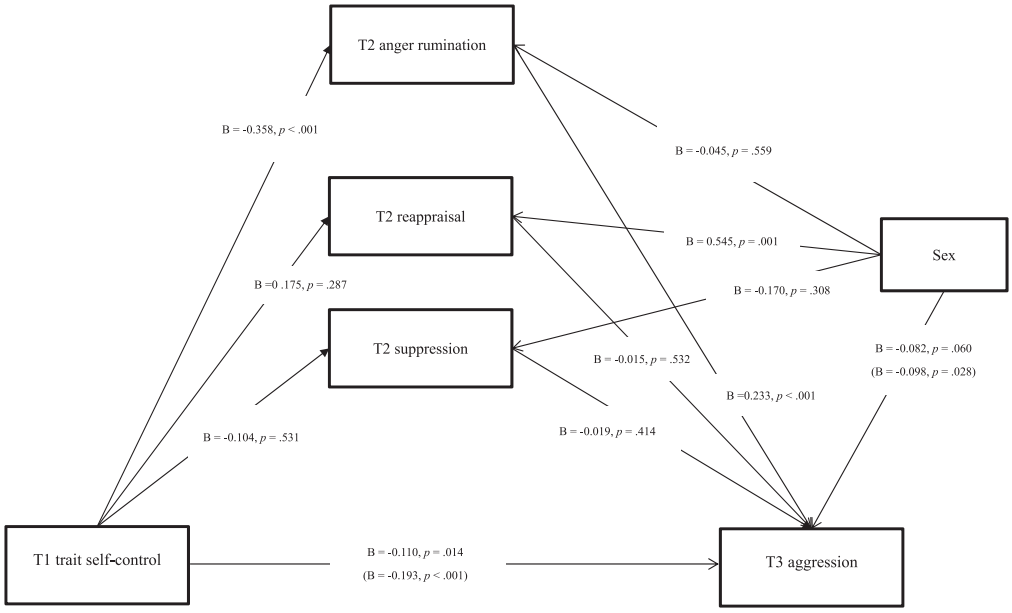

Fig. 6. Mediation model of anger rumination between trait self-control and aggression among Chinese college students (Study 6, $N = 143$). Note: Values in parentheses refer to the effect without the mediator.

CI = [−0.003, 0.020]; standardized indirect effect: estimate = 0.004, 95% CI = [−0.006, 0.036]) were non-significant.

Given the modest sample size of Study 6, we tested whether the sample size was sufficiently large to test the mediation hypothesis with adequate statistical power. To address this issue, we calculated the sample size to achieve an a priori power of 0.8 based on sample size-weighted correlations between self-control, anger rumination, and aggression[5]. We found that based on these correlations (that are similar to the correlations found in the previous studies) at least 104 participants were needed. The current study had 143 participants in the final analyses, which suggests that the current sample size was large enough to test the mediation hypothesis. Note though, that the website used to calculate power for the indirect effect did not allow testing the required N specifically for the three parallel, competing mediators.

7.3. Discussion

This three-wave longitudinal study provides further converging support for our hypotheses. Trait self-control predicted aggressive behavior one year later. This effect was partially explained by individual differences in anger rumination at T2, assessed half a year after trait self-control and half a year before the assessment of aggressive behavior. Neither cognitive reappraisal nor expressive suppression showed a similar mediating effect of the trait self-control-aggression association.

[5] The test was done on https://schoemanna.shinyapps.io/mc_power_med/.

Although results of this study demonstrated that trait self-control predicted aggression one year later partially through anger rumination, it would have been desirable to disentangle intra- and inter-individual variance. Unfortunately, the design of Study 6 did not allow to do so. Future research may consider adopting a cross-lagged panel design or a design that allows to apply multilevel models to address this issue.

8. Study 7

Studies 1 to 6 found consistent and robust results employing self- and other-report measures that pertained to longer time spans. In our final Study 7, we sought to examine our hypothesis in a more fine-grained way using a two-week daily diary study. Daily diary studies greatly reduce the susceptibility of potential memory-biasing effects and provide a closer view on day-to-day real-life experiences. At the same time, they are limited to the experiences a person makes during the time of data collection.

8.1. Participants and procedure

We posted advertisement in two Chinese universities. A total of 218 participants (64 males, 154 females; age range: 18–66 years old; $M_{age} = 21.27$ years, $SD = 5.46$) registered to participate in the study in exchange of extra course credit or a voucher worth of $150 Hong Kong dollars (about 20 U.S. dollars).

The study was conducted in two stages. In the first stage, all participants were invited to complete the Chinese version of the Brief Self-Control Scale (Situ et al., 2016) and their demographic

information online. In the second stage that started one week later and lasted 14 days, participants were e-mailed twice a day (8:30 a.m. and 8:30 p.m.) and invited to answer several questions. This resulted in up to 28 data points for each participant. With every email, participants were asked: (1) "How many times did you encounter angry events since you received the last invitation e-mail?"[6] If participants indicated that they did not experience any angry events within the referred time frame they were asked about their current emotional state and then the survey ended. If they indicated they had experienced one or more angry events, they were asked (2) "Is this angry event over or is it still ongoing?" If they answered "it is still ongoing" they were directed to the same questions about their current emotional state and then the survey ended. If they answered "already over" they were asked three questions about their rumination about the angry event(s) (see "Measures" for detailed items). Subsequently, participants indicated whether or not they had engaged in one or more forms of aggressive behavior (four items, see "Measures" for detailed items). Finally, participants were asked to indicate their current emotional state before the survey ended.

Overall, 34 participants reported that they either did not experience any angry event or that the angry event was still ongoing when they responded to the signal(s). Thus, these 34 participants did not provide any usable daily diary data for the planned analyses. They were thus excluded from the data analysis, resulting in 184 participants (49 males, 135 females) included in the analyses. Participants who were included in the final analyses ($M = 2.96$, $SD = 0.55$) did not differ significantly in trait self-control from those who were not ($M = 2.91$, $SD = 0.66$), $t(2\ 1\ 6) = -0.43$, $p = .670$, $d = 0.06$.

8.2. Measures

8.2.1. Trait self-control

The Chinese version of Tangney et al.'s (2004) Brief Self-Control Scale (Situ et al., 2016) used in Study 2 was employed to assess participants' trait self-control in the first stage of the study. Cronbach's α was 0.84.

8.2.2. Daily anger rumination

We selected three items from the Anger Rumination Scale (Sukhodolsky et al., 2001) used in Studies 1 to 6 to measure participants' rumination about the angry event(s) they had experienced. At each data collection point, we asked "After experiencing the anger-eliciting event, please indicate how often you: (1) kept thinking about the event that angered me; (2) couldn't stop thinking about the event that made me angry; and (3) repeatedly thought about the anger-eliciting experience". All the three items were rated on a 4-point scale (1 = less than a few minutes; 2 = sometimes; 3 = often; 4 = always). A higher mean score suggested higher levels of daily anger rumination. Cronbach's α was 0.89.

8.2.3. Daily aggression

We employed four binary items to measure participants' physical, verbal, relational, and displaced aggression. These four items are "After you ruminated about the angry event, did you ever: (1) show any physically aggressive responses (e.g., hitting, pushing, shoving, slapping, physically fighting, etc.) towards the one(s) who made you angry or towards others?; (2) show any verbal/written aggressive responses (e.g., arguing, verbal abuse, say dirty things, yelling, threatening, insulting, spreading rumor, etc.) towards the one(s) who made you angry or towards others?; (3) show any relationally aggressive responses (e.g., excluding, ignoring, etc.) towards the one(s) who made you angry or towards others?; and (4) show any aggressive responses towards the objects around you such as throwing things hard, destroying things, and so on?" All items were coded 0 = No and 1 = Yes. The four items were summed to represent participants' total aggressive response after anger rumination, higher scores reflecting more aggression.

8.3. Results

Descriptive results showed that the 184 participants responded to 5020 signals. From these 5020 data points, most had to be eliminated because participants either did not report encountering any angry events or the angry event(s) was (were) still ongoing when they responded to the signal. This left 815 data points for the analyses. For each participant, we averaged the daily rumination and aggression scores, respectively. On average, participants reported 4.39 ($SD = 4.53$) times that they had experienced at least one no longer ongoing angry event.

Results of bivariate correlation analyses based on grand means of self-control, reported number of daily angry events, daily rumination and daily aggression showed that the reported number of daily angry events was not significantly related to trait self-control or daily aggressive responses (Table 7). However, trait self-control was negatively related to daily anger rumination ($r = -0.29$, $p < .001$) and whereas daily anger rumination was positively related to daily aggression ($r = 0.17$, $p < .05$).

The associations among trait self-control, daily rumination, and aggression were modeled based on the multi-level structural equation modeling framework (Preacher, Zyphur, & Zhang, 2010). A 2-1-1 model (Independent variable trait self-control is at the between-person level while the mediator and the outcome are at the within-person level) was conducted in Mplus 7.0, with trait self-control as between-level data and daily rumination as well as daily aggression as within-level data (Fig. 7). Following previous work (e.g., Preacher et al., 2010), we report the unstandardized coefficients and the 95% confidence interval to estimate the mediation effect. If the confidence interval does not include zero, then a significant mediation is tenable.

The results showed that the predictive effect of trait self-control on daily rumination was significant (B = −0.203, S.E. = 0.057, $t = -3.57$, $p < .001$), but the effect of trait self-control on daily aggression was not (B = 0.006, S.E. = 0.022, $t = 0.27$, $p = .786$). The association between daily rumination and subsequent aggression was significant (B = 0.105, S.E. = 0.047, $t = 2.24$, $p = .025$). Importantly, the mediation effect of daily rumination was significant, B = −0.021, 95% CI = [−0.041, −0.002]. The results did not change significantly without controlling the effect of sex on daily rumination and daily aggression.

8.4. Discussion

This study suggests that individuals do encounter anger-provoking events in their daily lives, but these events are rare. More important for present purposes, Study 7 suggests that the results obtained from the previous studies that relied on responses that described typical tendencies in rumination and aggressive behavior generalized to a different methodological approach that taps into participants' daily experiences in a more fine-grained way. Study 7 thus provides further support for our assumptions.

Recent developments in self-control research suggest that persons high in trait self-control may plan out their lives in ways that make self-control failures less likely. For example, they tend to encounter fewer temptations in daily life and are thus overall less likely to fall for temptations (Duckworth, Gendler, & Gross, 2016;

[6] At the very first measurement occasion, we asked "How many angry events did you encounter since 8:30p.m. last night?"

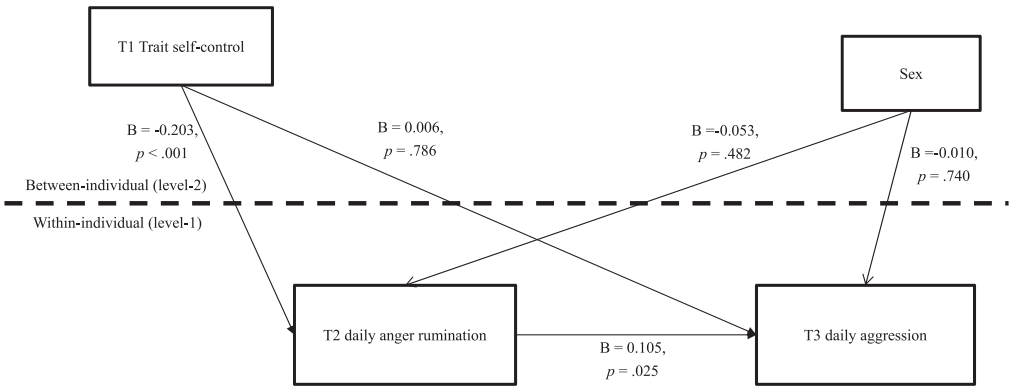

Fig. 7. Mediation model of daily anger rumination between trait self-control and daily aggression (N = 184).

Duckworth, White, Matteucci, Shearer, & Gross, 2016; Hofmann et al., 2012). Based on these findings, it would have been plausible to assume that high trait self-control individuals also structure their lives in ways that let them encounter fewer anger-provoking events. This was not the case, however. This may be due to two reasons. First, this may suggest that even for high trait self-control individuals it is more difficult to structure and plan one's life in a way to avoid anger-provoking events (that may often be triggered by unforeseen circumstances) than it is to avoid temptations in daily life such as in the work by Hofmann et al. (2012). Second, statistical power may not have been high enough to detect the potentially small effect in real-world settings. These possibilities may be interesting issues to study in further research.

The current findings should be interpreted with caution. First, the upper bound of the 95% confidence interval was just outside 0, indicating that the results were not as robust as the ones found in Studies 1–6. Second, the assessment of daily aggression was not optimal. Specifically, we asked participants to report aggressive incidents after they had ruminated about the anger evoking event. This wording implied that rumination necessarily followed after experiencing anger. In reality, this may not have been the case for all participants after all anger evoking events. The results of Study 7 should be interpreted carefully with this limitation in mind. This is because the relationship between experiencing an anger evoking event and rumination that was implied in the item wording may have influenced the results with respect to the relationships of trait self-control and rumination with daily aggression, respectively. Nevertheless, although the findings from Study 7 seem less robust than those from previous studies, they provide further evidence for our assumptions.

9. Internal meta-analysis

Findings from Studies 1 to 7 showed that (a) trait self-control was generally negatively associated with various types of aggression and (b) this relationship was partially mediated by individual differences in anger rumination. Across studies, these direct and indirect effects varied in magnitude. To comprehensively summarize the available evidence, we conducted a parameter-based metaSEM meta-analysis (Cheung, 2015) to gauge the mean effect sizes and the respective confidence intervals of the direct and indirect effects.

9.1. Method

9.1.1. Selection and coding of studies

All seven studies presented above were included in the analyses. Following guidelines (Cheung, 2015; Cheung & Cheung, 2016), sample sizes and correlation matrices were extracted from each study.[7] Moderator analyses were not feasible due to the small number of included studies.

9.1.2. Effect sizes

Pearson correlations matrices were used as the inputs in the calculation. Because sex was controlled for in the original mediation models and the parameter-based metaSEM approach does not allow the inclusion of covariates, correlation matrices were recalculated based on residuals of anger rumination and aggression rather than the raw correlation matrices (i.e., Tables 1–7). Specifically, across all the studies, we used sex to separately predict anger rumination and aggressive outcomes, respectively, and saved the residuals as new variables. Subsequently, we calculated *Pearson* correlations for each study based on the trait self-control score and residuals of anger rumination and aggression, and the full correlation matrix of each study was used as effect size input.

Studies 2 and 5 had two dependent variables each (i.e., physical and verbal aggression in Study 2, proactive and reactive aggression in Study 5), resulting in two effect sizes per study. Entering more than one effect size per study in a meta-analysis leads to dependencies that may bias results (Lipsey & Wilson, 2001; Rosenthal, 1984). Thus, we averaged effect sizes within studies such that each study contributed only one. We used the following formula to average the correlation $r_{mean} = 1/2 * (r1 + r2)$ (Borenstein, Hedges, Higgins, & Rothstein, 2009). For example, in Study 2, the correlation between anger rumination and physical aggression was $r = 0.436$ and the one between anger rumination and verbal aggression was $r = 0.419$. Averaging these two coefficients lead to $r = 0.428$ that was used in the meta-analysis. The full set of the correlation matrices can be obtained in online supplementary materials.

9.1.3. Data analyses

Data analysis was done with "metaSEM" (Cheung, 2017) and "lavaan" (Rosseel, 2011) packages in R Studio environment (version 3.4.1, R Core Team, 2017). The metaSEM consists of two approaches, one is correlation-based and the other is parameter-based. The latter one is more suitable for researchers who want to synthesize the direct and the indirect effects rather than fitting a model (Cheung & Cheung, 2016). Hence, a random-effects parameter-based approach was applied. This method contains two steps. The first is to extract relevant information from the

[7] Since Studies 5 and 6 were longitudinal studies with attrition, we used the numbers of participants who remained in the final wave (i.e., the second wave of Study 5 and the third wave of Study 6) as sample sizes for Studies 5 and 6, respectively, to be conservative. For Study 7, we used the sample of 184 participants who reported experiencing at least one no longer ongoing anger-provoking event.

Table 7
Between-participant correlations between trait self-control, daily anger rumination, and daily aggression (Study 7).

	M	SD	1	2	3	4
Daily angry events	0.51	0.72	–			
Trait self-control	2.96	0.55	0.04	–		
Daily anger rumination	1.45	0.45	0.16*	−0.29***	–	
Daily aggression	0.20	0.18	0.07	−0.01	0.17*	–

* $p < .05$,
*** $p < .001$. $N = 184$.

Table 8
Summary of standardized direct and indirect effects based on parameter-based metaSEM.

	Standardized direct effect					Standardized indirect effect				
	Estimate	95% CI	*z*	*p*	I^2	*Estimate*	95% CI	*z*	*p*	I^2
Based on LBCIs	−0.166	[−0.256, −0.075]	–	–	0.759	−0.091	[−0.137, −0.046]	–	–	0.849
Based on Wald CIs	−0.166	[−0.244, −0.088]	−4.189	<0.001	0.759	−0.091	[−0.123, −0.052]	−4.562	<0.001	0.849

Note: LBCIs = Likelihood-based confidence intervals; Wald CIs = Wald confidence intervals; I^2 = heterogeneity.

given correlation matrices (i.e., indirect effect, direct effect, variance of indirect effect, variance of direct effect, and covariance of the relationship between indirect and direct effects). The second step is to subject these values to a meta-analytic framework to synthesize the direct and the indirect effects. The direct effect reported in the results refers to the association between trait self-control and aggression, while the reported indirect effect refers to the product term of path a (i.e., the relationship between trait self-control and anger rumination) and b (i.e., the relationship between anger rumination and aggression). Likelihood-based confidence intervals (LBCIs) are considered to have better coverage over Wald confidence intervals (Wald CI) and thus recommended, especially when sample sizes are small (Cheung, 2009). However, LBCIs do not provide significance tests as Wald CI does (which is based on the *z* statistic). In order to provide as much information as possible, we report results from both types of CIs.

9.2. Results

Results are summarized in Table 8 and Fig. 8. Pertaining to the results based on LBCIs, the standardized direct effect was −0.166 and its 95% LBCI was [−0.256, −0.075]; whereas the standardized indirect effect was −0.091 and its 95% LBCI was [−0.137, −0.046]. Results based on Wald CIs were highly similar: the standardized direct effect was −0.166, 95% CI = [−0.244, −0.088], $z = -4.189$, $p < .001$, and the standardized indirect effect was −0.091, 95% CI = [−0.123, −0.052], $z = -4.562$, $p < .001$. In both analyses, the value of I^2 was 0.759 and 0.849 for the standardized direct and indirect effects, respectively, suggesting there was strong heterogeneity in both effects.

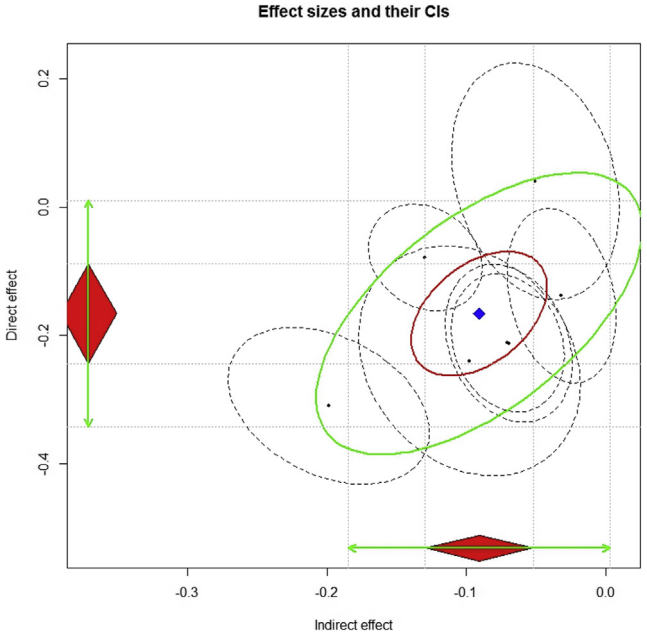

Fig. 8. Parameter-based metaSEM synthesizing the standardized direct and indirect effects across Studies 1 to 7. Note: the black dots and their respective black dashed ovals are the observed effect sizes and their 95% confidence ovals in Studies 1 to 7. The red diamond refers to the 95% confidence interval of the direct (y-axis) and indirect (x-axis) effects. The blue square represents the estimated average population effect size and the red oval is its 95% confidence interval. The green oval represents the 95% confidence oval of the random effects.

9.3. Discussion

We meta-analytically synthesized the effects of Studies 1–7. Convergent results based on LBCIs and Wald CIs showed that the standardized direct and indirect effects were significant. Common conventions suggest that 0.01, 0.09, and 0.25 represent small, medium, and large mediation effect sizes (Kenny, 2018). The meta-analytic estimates suggest that the standardized indirect effect across the seven studies was of medium size. Although there is a high degree of heterogeneity (probably due to the substantial differences in terms of the samples, types of aggression, and study designs), this finding confirms reduced anger rumination as a robust mechanism underlying the "trait self-control-aggression" association that is generalizable to various types of aggression and among diverse populations.

10. General discussion

Investigation of the psychological mechanisms underlying the relationship between trait self-control and aggression is critical for at least two reasons. First, going beyond establishing associations between personality traits and relevant outcomes (*what* is predicted), personality psychology increasingly strives to elucidate the processes that explain *how* personality gives rise to these associations (Hampson, 2012). Abundant research has demonstrated robust associations of trait self-control with a multitude of relevant outcomes including physical and mental health, well-being,

academic success, quality of personal relationships, delinquency, and, of course, aggression (e.g., De Ridder et al., 2012; Moffitt et al., 2011; Tangney et al., 2004; Vazsonyi, Mikuška, & Kelley, 2017). However, an investigation of the underlying mechanisms that allow for a deeper understanding of these associations has only recently picked up (e.g., De Ridder & Gillebaart, 2017; Galla & Duckworth, 2015; Li, Delevecchio, Lis, Nie, & Di Riso, 2016). Second, knowledge of the underlying mechanisms of the trait self-control-aggression link may provide a foundation to develop psychological interventions to reduce aggression. Recent meta-analyses revealed that direct interventions targeting trait self-control may in general not be as effective as previously thought (Beames, Schofield, & Denson, 2017; Friese, Frankenbach, Job, & Loschelder, 2017). This suggests that reducing aggression through increasing trait self-control directly may not be the most promising strategy (at least not with the kinds of interventions that have been used so far). Alternatively, investigation of the working mechanisms underlying the association between trait self-control and aggression may provide alternative avenues for the development of interventions to prevent aggressive behaviors.

In the present research, we investigated the hypothesis that individual differences in anger rumination partly explain the relationship between trait self-control and aggression. To this end, we conducted seven studies in demographically diverse populations using both cross-sectional, longitudinal, and daily diary designs, and assessing trait self-control, anger rumination and various types of aggression with different measures. Converging evidence across studies supports our hypothesis – high levels of trait self-control were related to less anger rumination, which partly accounted for the link between trait self-control and aggressive behavior.

10.1. Theoretical implications

The present findings bear important implications for theories of aggressive behavior. In the introduction, we mentioned that although the GAM does not talk about self-control directly, the model is broad enough as a general framework to incorporate self-control at several stages (DeWall et al., 2011). Specifically, trait self-control may function as a person input variable that influences (among other person and situation input variables) the present internal state of a person in response to an anger-provoking event. According to the GAM, the present internal state is characterized by cognitions, affect, and arousal. In addition, (trait) self-control may play an important role at the appraisal- and decision stage of the GAM that influences whether a person will tend to act thoughtfully or rather impulsively. Evidence suggests that self-control allows individuals to act thoughtfully and keep impulsive influences at bay (Friese & Hofmann, 2009; Hofmann, Friese, & Strack, 2009). Although the GAM does not directly predict that trait self-control exerts (some of) its effect on aggression by influencing anger rumination, these findings are compatible with the model's general ideas. In terms of the model, trait self-control as a person input variable affects anger- and aggression-related cognitions by reducing the likelihood that an individual engages in extensive anger rumination. This should decrease the accessibility of aggressive thoughts and scripts. As a result, aggressive impulses should be less likely to build up to worrisome intensities. This in turn would allow for more thoughtful appraisals of the situation and make thoughtful actions more and impulsive actions less likely.

The current theorizing and empirical findings also bear important implications for the I^3 model and the role it ascribes to self-control. As mentioned earlier, currently the model sees self-control as a factor that is important for the ultima ratio inhibition of aggressive urges right before they are (not) enacted. Anger rumination is regarded as an impeller that increases aggressive urges and makes aggressive behavior more likely. Factors that lead to less anger rumination including trait self-control will – according to the model – contribute to less pronounced aggressive urges. In other words, trait self-control may lead to less aggressive behavior, but not only due to its role as ultima ratio inhibitory force, but also because of a "wiser" effect on anger rumination that occurs earlier in the process and ultimately reduces the need for ultima ratio inhibition thanks to a dampening effect on aggressive urges. This is an important insight that allows for new theoretical predictions in the context of the I^3 model.

10.2. Practical implications

The present findings bear implications for the prevention of aggression. Even if it may be difficult to reliably and enduringly improve self-control with practice (Friese et al., 2017), the current findings suggest that anger rumination interventions may be a promising way to decrease aggression. Some treatments (e.g., mindfulness and cognitive behavioral therapy) have been shown to be effective to reduce rumination (for a review, see Querstret & Cropley, 2013). Although such interventions have mainly targeted rumination about depressive and anxious thoughts, the rationales and techniques may be readily transferrable to angry thoughts. Actually, research has applied different strategies to regulate anger induced by recalling angry memory, finding that rumination increased anger while distraction reduced anger (Denson, Moulds, & Grisham, 2012). In addition, a recent analysis of the literature suggests that mindfulness training may be an appropriate intervention targeting anger (Wright, Day, & Howells, 2009). Thus, future research may attempt to apply different remedies (e.g., distraction, mindfulness training, etc.) to reduce individuals' ruminative thoughts about anger-inducing events, especially for those low in trait self-control.

10.3. Limitations and future research

Although the evidence across the present seven studies is consistent, there are also limitations. One limitation is that all studies are correlational in nature. These data preclude strong claims regarding a causal influence of trait self-control on anger rumination and/or aggressive behavior. Instead, what these data show is that individual high in trait self-control tend to be less aggressive and this association is partly accounted for by individual differences in anger rumination. Such a pattern of data is consistent with, but not conclusive evidence for the assumptions of a causal influence of trait self-control.

Future research may rely on experiments to further investigate the issue of causality. For instance, it may be possible to experimentally manipulate the proposed mediator anger rumination (Spencer, Zanna, & Fong, 2005). An experimentally induced reduction of anger rumination should break (or at least weaken) the link between low trait self-control and aggression and lead to lower aggression. An experimentally induced increase in anger rumination should do the opposite. Although theoretically plausible, this approach also has its limits. Specifically, research on the person-situation debate revealed large intra-individual variability of behavior (e.g., Fleeson, 2001; 2004). Behavioral consistency as a function of personality traits only emerges across the aggregate of several different behavioral occasions. Thus, ideally, studies that experimentally manipulate anger rumination would do so repeatedly and also assess (aggressive) behavior repeatedly to circumvent the threat of unreliability associated with a single behavioral assessment.

In addition, although we find that anger rumination mediated the relationship between trait self-control and aggression not only in survey studies but also in real life settings (i.e., Study 7), we would like to emphasize again that the wording of the daily

aggression items in this particular study may have influenced the results, because they implied a necessary relationship between experiencing an anger evoking event and subsequent rumination about this event. We recommend independent replications of this particular finding in real-world settings with a different assessment of daily aggression.

Finally, we would like to stress that the implication of the present research is not that anger rumination the only psychological process linking trait self-control and aggression. No behavior is likely brought about by a single psychological process. Instead, it is likely that there are other processes that also contribute to this relationship. Future research should explore further mechanisms underlying the "trait self-control – aggression" link.

10.4. Conclusion

Although the influence of trait self-control on aggression is well-established, the underlying processes are poorly understood. The present research provides evidence that anger rumination is a robust variable linking trait self-control and different forms of aggression. These results bear important implications both for theory and application.

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Appendix A. Supplementary material

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jrp.2019.06.011.

References

Achenbach, T. M., & Rescorla, L. A. (2003). *Manual for the ASEBA Adult Forms & Profiles*. Burlington, VT: University of Vermont, Research Center for Children, Youth, & Families.

Anderson, C. A., & Bushman, B. J. (2002). Human aggression. *Annual Review of Psychology, 53*, 27–51. https://doi.org/10.1146/annurev.psych.53.100901.135231.

Anderson, M. C., & Levy, B. J. (2009). Suppressing unwanted memories. *Current Directions in Psychological Science, 18*, 189–194. https://doi.org/10.1111/j.1467-8721.2009.01634.x.

Anestis, M. D., Anestis, J. C., Selby, E. A., & Joiner, T. E. (2009). Anger rumination across forms of aggression. *Personality and Individual Differences, 46*, 192–196. https://doi.org/10.1016/j.paid.2008.09.026.

Archer, J. (2004). Sex differences in aggression in real-world settings: A meta-analytic review. *Review of General Psychology, 8*, 291–322. https://doi.org/10.1037/1089-2680.8.4.291.

Averill, J. R. (1983). Studies on anger and aggression: Implications for theories of emotion. *American Psychologist, 38*, 1145–1160. https://doi.org/10.1037/0003-066X.38.11.1145.

Baldetti, M., & Bartolozzi, C. (2010). *La validazione italiana dell'Anger Rumination Scale [Italian Validation of Anger Rumination Scale]*. Florence, Italy: Studi Cognitivi, Cognitive Psychotherapy School and Research Centre.

Baumeister, R. F., & Vohs, K. D. (2016). Strength model of self-regulation as limited resource: Assessment, controversies, update. In M. O. James & P. Z. Mark (Eds.). *Advances in Experimental Social Psychology* (Vol. 54, pp. 67–127). San Diego, CA: Academic Press.

Baumeister, R. F., Vohs, K. D., & Tice, D. M. (2007). The strength model of self-control. *Current Directions in Psychological Science, 16*, 351–355. https://doi.org/10.1111/j.1467-8721.2007.00534.x.

Beames, J., Schofield, T. P., & Denson, T. F. (2017). A meta-analysis of improving self-control with practice. In D. T. de Ridder, M. Adriaanse, & K. Fujita (Eds.), *Handbook of self-control in health and well-being* (pp. 405–417). Routledge.

Bjorkqvist, K., Osterman, K., & Kaukiainen, A. (1992). The development of direct and indirect aggressive strategies in males and females. In K. Bjorkqvist & P. Niemela (Eds.), *Of mice and women: Aspects of female aggression*. San Diego, CA: Academic Press.

Borenstein, M., Hedges, L. V., Higgins, J. P. T., & Rothstein, H. R. (2009). *Introduction to meta-analysis*. John Wiley & Sons Ltd..

Buss, A. H., & Perry, M. (1992). The aggression questionnaire. *Journal of Personality and Social Psychology, 63*, 452–459. https://doi.org/10.1037/0022-3514.63.3.452.

Cheung, M. W.-L. (2009). Constructing approximate confidence intervals for parameters with structural equation models. *Structural Equation Modeling: A Multidisciplinary Journal, 16*, 267–294. https://doi.org/10.1080/10705510902751291.

Cheung, M. W.-L. (2015). *Meta-analysis: A structural equation modeling approach*. New York: Wiley.

Cheung, M. W.-L. (2017). Package 'metaSEM'. *Retrieved from* https://cran.r-project.org/web/packages/metaSEM/metaSEM.pdf.

Cheung, M. W.-L., & Cheung, S. F. (2016). Random-effects models for meta-analytic structural equational modeling: Review, issues, and illustrations. *Research Synthesis Methods, 7*, 140–155. https://doi.org/10.1002/jrsm.1166.

Chiu, H.,-L. (2006). Low self-control and different category perpetrations. Crime and Criminal Justice International, 7, 1–33.

De Kemp, R. A., Vermulst, A. A., Finkenauer, C., Scholte, R. H., Overbeek, G., Rommes, E. W., & Engels, R. C. (2009). Self-control and early adolescent antisocial behavior A longitudinal analysis. *The Journal of Early Adolescence, 29*, 497–517. https://doi.org/10.1177/0272431608324474.

De Ridder, D. T., Lensvelt-Mulders, G., Finkenauer, C., Stok, F. M., & Baumeister, R. F. (2012). Taking stock of self-control: A meta-analysis of how trait self-control relates to a wide range of behaviors. *Personality and Social Psychology Review, 16*, 76–99. https://doi.org/10.1177/1088868311418749.

De Ridder, D., & Gillebaart, M. (2017). Lessons learned from trait self-control in well-being: Making the case for routines and initiation as important components of trait self-control. *Health Psychology Review, 11*, 89–99. https://doi.org/10.1080/17437199.2016.1266275.

Delvecchio, E., Mabilia, D., Lis, A., Mazzeschi, C., Nie, Y., & Li, J. B. (2014). From China to Italy: Validation of the adolescent self-consciousness questionnaire. *European Journal of Developmental Psychology, 11*, 120–128. https://doi.org/10.1080/17405629.2013.831760.

Denson, T. F. (2009). Angry rumination and the self-regulation of aggression. In J. P. Forgas, R. F. Baumeister, & D. M. Tice (Eds.), *The psychology of self-regulation* (pp. 233–248). New York, NY: Psychology Press.

Denson, T. F., DeWall, C. N., & Finkel, E. J. (2012). Self-control and aggression. *Current Directions in Psychological Science, 21*, 20–25. https://doi.org/10.1177/0963721411429451.

Denson, T. F., Moulds, M. L., & Grisham, J. R. (2012). The effects of analytical rumination, reappraisal, and distraction on anger experience. *Behavior Therapy, 43*, 355–364. https://doi.org/10.1016/j.beth.2011.08.001.

Denson, T. F., Pedersen, W. C., & Miller, N. (2006). The displaced aggression questionnaire. *Journal of Personality and Social Psychology, 90*, 1032–1051. https://doi.org/10.1037/0022-3514.90.6.1032.

Denson, T. F., Pedersen, W. C., Friese, M., Hahm, A., & Roberts, L. (2011). Understanding impulsive aggression: Angry rumination and reduced self-control capacity are mechanisms underlying the provocation-aggression relationship. *Personality and Social Psychology Bulletin, 37*, 850–862. https://doi.org/10.1177/0146167211401420.

DeWall, C. N., Finkel, E. J., & Denson, T. F. (2011). Self-control inhibits aggression. *Social and Personality Psychology Compass, 5*, 458–472. https://doi.org/10.1111/j.1751-9004.2011.00363.x.

Diamond, A. (2013). Executive functions. *Annual Review of Psychology, 64*, 135–168. https://doi.org/10.1146/annurev-psych-113011-143750.

Duckworth, A. L., Gendler, T. S., & Gross, J. J. (2016). Situational strategies for self-control. *Perspective on Psychological Science, 11*, 35–55. https://doi.org/10.1177/1745691615623247.

Duckworth, A. L., White, R. E., Matteucci, A. J., Shearer, A., & Gross, J. J. (2016). A stitch in time: Strategic self-control in high school and college students. *Journal of Educational Psychology, 108*, 329–341. https://doi.org/10.1037/edu0000062.

Finkel, E. J. (2014). The I^3 model: Metatheory, theory, and evidence. *Advances in Experimental Social Psychology, 49*, 1–104. https://doi.org/10.1016/B978-0-12-800052-6.00001-9.

Finkel, E. J., DeWall, C. N., Slotter, E. B., Oaten, M., & Foshee, V. A. (2009). Self-regulatory failure and intimate partner violence perpetration. *Journal of Personality and Social Psychology, 97*, 483–499. https://doi.org/10.1037/a0015433.

Finkenauer, C., Engels, R. C., & Baumeister, R. F. (2005). Parenting behaviour and adolescent behavioural and emotional problems: The role of self-control. *International Journal of Behavioral Development, 29*, 58–69. https://doi.org/10.1080/01650250444000333.

Fleeson, W. (2001). Toward a structure-and process-integrated view of personality: Traits as density distributions of states. *Journal of Personality Social Psychology, 80*, 1011–1027. https://doi.org/10.1037//0022-3514.80.6.1011.

Fleeson, W. (2004). Moving personality beyond the person-situation debate: The challenge and the opportunity of within-person variability. *Current Directions in Psychological Science, 13*, 83–87. https://doi.org/10.2307/20182916.

Fossati, A., Raine, A., Borroni, S., Bizzozero, A., Volpi, E., Santalucia, I., ... Maffei, C. (2009). A cross-cultural study of the psychometric properties of the reactive-proactive aggression questionnaire among Italian nonclinical adolescents. *Psychological Assessment, 21*, 131–135. https://doi.org/10.1037/a0014743.

Friese, M., & Hofmann, W. (2009). Control me or I will control you: Impulses, trait self-control, and the guidance of behavior. *Journal of Research in Personality, 43*, 795–805. https://doi.org/10.1016/j.jrp.2009.07.004.

Friese, M., Frankenbach, J., Job, V., & Loschelder, D. (2017). Does self-control training improve self-control? A meta-analysis. *Perspectives on Psychological Science, 12*, 1077–1099. https://doi.org/10.1177/1745691617697076.

Friese, M., Loschelder, D. D., Gieseler, K., Frankenbach, J., & Inzlicht, M. (2019). Is ego depletion real? An analysis of arguments. *Personality and Social Psychology Review, 23*, 107–131. https://doi.org/10.1177/1088868318762183.

Gailliot, M. T., Schmeichel, B. J., & Baumeister, R. F. (2006). Self-regulatory processes defend against the threat of death: Effects of self-control depletion and trait self-control on thoughts and fears of dying. *Journal of Personality and Social Psychology, 91*, 49–62. https://doi.org/10.1037/0022-3514.91.1.49.

Galla, B. M., & Duckworth, A. L. (2015). More than resisting temptation: Beneficial habits mediate the relationship between self-control and positive life outcomes. *Journal of Personality and Social Psychology, 109*, 508–525. https://doi.org/10.1037/pspp0000026.

Gottfredson, M. R., & Hirschi, T. (1990). *A general theory of crime*. Stanford University Press.

Grasmick, H. G., Tittle, C. R., Bursik, R. J., & Arneklev, B. J. (1993). Testing the core empirical implications of Gottfredson and Hirschi's general theory of crime. *Journal of research in crime and delinquency, 30*, 5–29. https://doi.org/10.1177/0022427893030001002.

Gross, J. J., & John, O. P. (2003). Individual differences in two emotion regulation processes: Implications for affect, relationships, and well-being. *Journal of Personality and Social Psychology, 85*, 348–362. https://doi.org/10.1037/0022-3514.85.2.348.

Hamama, L., & Ronen-Shenhav, A. (2012). Self-control, social support, and aggression among adolescents in divorced and two-parent families. *Children and Youth Services Review, 34*, 1042–1049. https://doi.org/10.1016/j.childyouth.2012.02.009.

Hampson, S. E. (2012). Personality processes: Mechanisms by which personality traits "get outside the skin". *Annual Review of Psychology, 63*, 315–339. https://doi.org/10.1146/annurev-psych-120710-100419.

Hayes, A. F. (2013). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. New York, NY: The Guilford Press.

Hofmann, W., Baumeister, R. F., Förster, G., & Vohs, K. D. (2012). Everyday temptations: An experience sampling study of desire, conflict, and self-control. *Journal of Personality and Social Psychology, 102*, 1318–1335. https://doi.org/10.1037/a0026545.

Hofmann, W., Friese, M., & Strack, F. (2009). Impulse and self-control from a dual-systems perspective. *Perspectives on Psychological Science, 4*, 162–176. https://doi.org/10.1111/j.1745-6924.2009.01116.x.

Kassinove, H., Sukhodolsky, D. G., Tsytsarev, S. V., & Solovyova, S. (1997). Self-reported anger episodes in Russia and America. *Journal of Social Behavior and Personality, 12*, 301–324.

Kenny, D. A. (2018, September, 25). Mediation. Retrieved from URL: http://davidakenny.net/cm/mediate.htm

Li, J. B., Delvecchio, E., Lis, A., Nie, Y. G., & Di Riso, D. (2016). Positive coping as mediator between self-control and life satisfaction: Evidence from two Chinese samples. *Personality and Individual Differences, 97*, 130–133. https://doi.org/10.1016/j.paid.2016.03.042.

Li, J. B., Nie, Y. G., Boardley, I. D., Situ, Q. M., & Dou, K. (2014). Moral disengagement moderates the predicted effect of trait self-control on self-reported aggression. *Asian Journal of Social Psychology, 17*, 312–318. https://doi.org/10.1111/ajsp.12072.

Li, J. B., & Vazsonyi, A. T. (2019). The utility of joint use of the Low Self-Control Scale and the Brief Self-Control Scale in explaining adolescent deviance. *European Journal of Criminology, accepted.*. https://doi.org/10.1177/1477370819845745.

Li, J. B., Vazsonyi, A. T., & Dou, K. (2018). Is individualism-collectivism associated with self-control? Evidence from Chinese and US samples. *PloS one, 13*(12). https://doi.org/10.1371/journal.pone.0208541 e0208541.

Li, X. Y., Fei, L. P., Zhang, Y. L., Niu, Y. J., Tong, Y. S., & Yang, S. J. (2011). Development, reliability and validity of the Chinese version of Buss & Perry Aggression Questionnaire. *Chinese Journal of Nervous and Mental Diseases, 37*(10), 607–613.

Lipsey, M. W., & Wilson, D. B. (2001). *Practical Meta-Analysis*. Thousand Oaks, California: Sage.

Maxwell, S. E., & Cole, D. A. (2007). Bias in cross-sectional analyses of longitudinal mediation. *Psychological Methods, 12*, 23–44. https://doi.org/10.1037/1082-989X.12.1.23.

Maxwell, S. E., Cole, D. A., & Mitchell, M. A. (2011). Bias in cross-sectional analyses of longitudinal mediation: Partial and complete mediation under an autoregressive model. *Multivariate Behavioral Research, 46*, 816–841. https://doi.org/10.1080/00273171.2011.606716.

Moffitt, T. E., Arseneault, L., Belsky, D., Dickson, N., Hancox, R. J., Harrington, H., & Caspi, A. (2011). A gradient of childhood self-control predicts health, wealth, and public safety. *Proceedings of the National Academy of Sciences, 108*, 2693–2698. https://doi.org/10.1073/pnas.1010076108.

Neuman, J. H., & Baron, R. A. (1998). Workplace violence and workplace aggression: Evidence concerning specific forms, potential causes, and preferred targets. *Journal of Management, 24*, 391–419. https://doi.org/10.1177/014920639802400305.

Özdemir, Y., Vazsonyi, A. T., & Çok, F. (2013). Parenting processes and aggression: The role of self-control among Turkish adolescents. *Journal of Adolescence, 36*, 65–77. https://doi.org/10.1016/j.adolescence.2012.09.004.

Peters, J. R., Smart, L. M., Eisenlohr-Moul, T. A., Geiger, P. J., Smith, G. T., & Baer, R. A. (2015). Anger rumination as a mediator of the relationship between mindfulness and aggression: The utility of a multidimensional mindfulness model. *Journal of Clinical Psychology, 71*, 871–884. https://doi.org/10.1002/jclp.22189.

Preacher, K. J., Zyphur, M. J., & Zhang, Z. (2010). A general multilevel SEM framework for assessing multilevel mediation. *Psychological Methods, 15*, 209–233. https://doi.org/10.1037/a0020141.

Querstret, D., & Cropley, M. (2013). Assessing treatments used to reduce rumination and/or worry: A systematic review. *Clinical Psychology Review, 33*, 996–1009. https://doi.org/10.1016/j.cpr.2013.08.004.

R Core Team. (2017). R: A language and environment for statistical computing [Computer Software]. Vienna, Austria: R Foundation for Statistical Computing. Retrieved from https://www.R-project.org/.

Raine, A., Dodge, K., Loeber, R., Gatzke-Kopp, L., Lynam, D., Reynolds, C., ... Liu, J. (2006). The reactive-proactive aggression questionnaire: Differential correlates of reactive and proactive aggression in adolescent boys. *Aggressive Behavior, 32*, 159–171. https://doi.org/10.1002/ab.20115.

Robinson, S. L., & O'Leary-Kelly, A. M. (1998). Monkey see, monkey do: The influence of work groups on the antisocial behavior of employees. *Academy of Management Journal, 41*, 658–672. https://doi.org/10.2307/256963.

Rosenthal, R. (1984). *Meta-analytic procedures for social research*. Beverly Hills, CA: Sage.

Rosseel, Y. (2011). Lavaan: an R package for structural equation modeling and more Version 0.4-9 (BETA). Retrieved from http://byrneslab.net/classes/lavaan_materials/lavaanIntroduction4-9.pdf.

Situ, Q. M., Li, J. B., & Dou, K. (2016). Reexamining the linear and U-shaped relationships between self-control and emotional and behavioural problems. *Asian Journal of Social Psychology, 19*, 177–185. https://doi.org/10.1111/ajsp.12118.

Slotter, E. B., & Finkel, E. J. (2011). I^3 theory: Instigating, impelling, and inhibiting factors in aggression. In P. R. Shaver & M. Mikulincer (Eds.), *Human aggression and violence: Causes, manifestations, and consequences* (pp. 35–52). Washington, DC: American Psychological Association.

Sofia, R. M., & Cruz, J. F. A. (2015). Self-control as a mechanism for controlling aggression: A study in the context of sport competition. *Personality and Individual Differences, 87*, 302–306. https://doi.org/10.1016/j.paid.2015.08.025.

Spencer, S. J., Zanna, M. P., & Fong, G. T. (2005). Establishing a causal chain: Why experiments are often more effective than mediational analyses in examining psychological processes. *Journal of Personality and Social Behavior, 89*, 845–851. https://doi.org/10.1037/0022-3514.89.6.845.

Sukhodolsky, D. G., Golub, A., & Cromwell, E. N. (2001). Development and validation of the anger rumination scale. *Personality and Individual Differences, 31*, 689–700. https://doi.org/10.1177/0146167211401420.

Tangney, J. P., Baumeister, R. F., & Boone, A. L. (2004). High self-control predicts good adjustment, less pathology, better grades, and interpersonal success. *Journal of Personality, 72*, 271–322. https://doi.org/10.1111/j.0022-3506.2004.00263.x.

Unger, A., Bi, C., Xiao, Y. Y., & Ybarra, O. (2016). The revising of the Tangney self-control Scale for Chinese students. *PsyCh Journal, 5*, 101–116. https://doi.org/10.1002/pchj.128.

Vazsonyi, A. T., Mikuška, J., & Kelley, E. L. (2017). It's time: A meta-analysis on the self-control-deviance link. *Journal of Criminal Justice, 48*, 48–63. https://doi.org/10.1016/j.jcrimjus.2016.10.001.

Wang, L., Liu, H. C., Li, Z. Q., & Du, W. (2007). Reliability and validity of Emotion Regulation Questionnaire Chinese revised version. *Chinese Journal of Health Psychology, 15*(6). 506–505.

Wright, S., Day, A., & Howells, K. (2009). Mindfulness and the treatment of anger problems. *Aggression and Violent Behavior, 14*, 396–401. https://doi.org/10.1016/j.avb.2009.06.008.

Ying, X. H., & Dai, C. L. (2008). Empathy and aggressive behavior of middle school students: The mediating effect of the anger hostility action. *Psychological Development and Education, 24*(2), 73–78.

Yu, Y. Z., Shi, J. X., & Wu, H. R. (2005). Reliability and validity of Direct and Indirect Aggression Scale. *Chinese Journal of School Health, 26*(1), 6–7.

Zhang, S. S., Tang, H., Liu, Y. Y., & Lv, S. B. (2015). Transgression sensitivity and interpersonal forgiveness: Mediating of anger rumination. *Chinese Journal of Clinical Psychology, 23*, 706–708. https://doi.org/10.16128/j.cnki.1005-3611.2015.04.031.

Zhang, Y., & Chen, W. (2011). Analysis of workplace deviant behavior structure based on multidimensional scaling. *Soft Science, 25*, 131–134.