

Trajectories of Mindfulness and Anger Rumination

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Abstract

The purpose of this study was to investigate a longitudinal relationship between trait mindfulness and anger rumination. To date, previous cross-sectional studies have reported that trait mindfulness may be effective for alleviating anger rumination. Few studies, however, have examined the associations between these variables in a longitudinal design. In this study, a sample of 81 Japanese undergraduates was followed over four months, and a latent growth curve model was used to examine the longitudinal relationship. Results indicated that the slopes of mindfulness and anger rumination were negatively covariant to a moderate degree ($r = -.54$, $p = .095$). Furthermore, the estimated correlation between the intercepts of mindfulness and anger rumination was negatively correlated, and its strength was small ($r = -.26$, $p = .049$). The current study may support the idea that interventions to cultivate mindfulness skills could be effective for alleviating anger rumination.

Introduction

The regulation of angry feelings is a major focus in anger treatment. Cognitive-behavioral therapy (CBT) has been focused on anger regulation through both a behavioral component (e.g., acquiring adaptive alternative behaviors to aggression) and a cognitive component (e.g., modifying dysfunctional thoughts about anger; Del Vecchio & O'Leary, 2004). In this field, anger rumination has generated considerable recent research interest. Rumination about anger episodes, known as anger rumination, is a tendency to engage

in unintentional re-occurring thoughts about anger episodes (Sukhodolsky, Golub, & Cromwell, 2001). Several experimental studies reported that anger rumination exacerbates or maintains angry feelings (Denson, Moulds, & Grisham, 2012; Fabiansson, Denson, Moulds, Grisham, & Schira, 2012). Ruminating about anger episodes does not allow feelings of anger to dissipate naturally, increases the probability of anger being aroused in various situations, and predisposes individuals to both reactive and proactive aggression (White & Turner, 2014).

Mindfulness has been demonstrated to have effects on rumination. Mindfulness is defined as the quality of consciousness or awareness that arises through intentionally attending to the present moment experience in a nonjudgmental and accepting way (Kabat-Zinn & Hanh, 2009). It has been found that mindfulness-based interventions (MBIs) are efficacious for treatment of a variety of mental disorders, especially major depressive disorder and anxiety disorders (e.g., Khoury et al., 2013). Mediation analysis has been growing in this field as well. Gu, Strauss, Bond, and Cavanagh (2015) reviewed various studies that systematically tested mediators of MBIs and tried to verify which proposed underlying mechanisms had evidence that is more convincing. In their study, there was moderate and consistent support for rumination as the underlying mechanism of MBIs. Furthermore, rumination was a significant mediator of the effects of MBIs. These results are consistent with theoretical models of mindfulness-based cognitive therapy (MBCT), and rumination is considered a treatment target of MBIs, both theoretically and empirically.

However, attempts to apply mindfulness to anger rumination have lagged far behind. Anderson, Lau, Segal, and Bishop (2007) provided the initial evidence for the effects of mindfulness on anger rumination, and this has been the only intervention study to investigate the impact of MBIs on ruminating anger episodes. Healthy adults were randomly assigned to eight-week Mindfulness-Based Stress Reduction (MBSR) or a wait-list control group. The results indicated that participants assigned to MBSR significantly reduced their tendency to ruminate about angry episodes compared to participants assigned to the wait-list control. Subsequently, Wright, Day, and Howells (2009) systematically reviewed the treatment of anger problems and explored the applicability of mindfulness to anger problems. The review suggested that interventions focused on a non-judgmental stance and de-centering attention to one's thoughts might be helpful to change cognitive

reactivity such as rumination. After this review was published, some studies investigated anger rumination as an underlying mechanism of the effect of mindfulness on anger problems. It has been reported that anger rumination mediated the relationships between mindfulness and anger problems, including some forms of aggression, hostility (Peters et al., 2015), trait anger, and maladaptive suppression of anger (Takebe, Takahashi, & Sato, 2015). These findings supported the suggestion of Wright et al. (2009) and advanced the application of mindfulness to anger problems by suggesting the mediating role of anger rumination.

Previous studies, however, have had a limitation in their study design and statistical methodology. First, most of these studies investigated the relationship between mindfulness and anger rumination adopting a cross-sectional survey; thus, longitudinal changes in these variables remain unclear. The chronic effects of anger regulation are very different from experimentally-induced or cross-sectional effects (Szasz, Szentagotai, & Hofmann, 2011). Although there was one intervention study (Anderson et al., 2007) that was helpful in understanding longitudinal change, it did not directly verify the relationship between the changes in mindfulness and anger rumination.

The current study followed mindfulness and anger rumination for four months. This approach allowed us to explore the longitudinal relationship between these variables. Previous studies reported that some of the mindfulness skills (e.g., “non-react”) changed spontaneously (Taylor, Strauss, Cavanagh, & Jones, 2014). Like Taylor et al., we decided to follow the spontaneous changes of mindfulness.

1. Methods

Participants and procedure

Japanese undergraduates ($N = 81$; 76.5% female) completed questionnaires every month for 4 months (Time 1-Time 4). The age range of the participants was 19 to 24 years ($M = 20.67$, $SD = .99$ years, Range = 19-24). All participants completed an informed consent form before participating in the study.

1.1 Measures

1.2 Mindfulness

The Five Facets of Mindfulness Questionnaire (FFMQ; Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006) is a 39-item self-report questionnaire assessing five facets of mindfulness: *Acting with awareness* (e.g., “I find myself doing things without paying attention”), *Nonjudging of inner experience* (e.g., “I think some of my emotions are bad or inappropriate and I should not feel them”), *Nonreactivity to inner experience* (e.g., “I perceive my feelings and emotions without having to react to them”), *Observing* (e.g., “I notice the smells and aromas of things”), and *Describing* (e.g., “I am good at finding words to describe my feelings”). Total scores of the FFMQ were used for analysis in this study, and the items utilize a Likert scale ranging from 1 (*never or very rarely true*) to 5 (*almost always or always true*). The FFMQ has adequate reliability, adequate convergent, and discriminant validity (Baer et al., 2006). The Japanese Version of the FFMQ (Sugiura, Sato, Ito, & Murakami, 2012) was used in the current study. The alpha coefficients in this sample were .79, .82, .85, and .85, respectively.

1.3 Anger rumination

The Anger Rumination Scale (ARS; Sukhodolsky et al., 2001) is a 19-item self-report questionnaire examining the degree to which individuals tend to focus on angry moods. There are four subscales, including “*Angry afterthoughts*” (e.g., “I re-enact the anger episode in my mind after it has happened”), “*Thoughts of revenge*” (e.g., “I have long-living fantasies of revenge after the conflict is over”), “*Angry memories*” (e.g., “I ponder about the injustices that have been done to me”), and “*Understanding of cause*” (e.g., “I think about the reasons people treat me badly”). The total score of the ARS was used in analysis in this study. Responses are made on a Likert scale ranging from 1 (*almost never*) to 4 (*almost always*). The ARS has adequate reliability, and convergent and discriminant validity is also adequate (Sukhodolsky et al., 2001). The Japanese Version of the ARS (Hatta, Ohbuchi, & Hatta, 2013) was used in the current study. The alpha coefficients in this sample were .94, .95, .95, and .96, respectively.

1.4 *Data analysis*

Our analytic approach to testing the hypothesis had two steps. The first step involved testing one-way repeated ANOVAs using IBM SPSS ver.23 to examine overall changes in mindfulness and anger rumination. The second step involved testing latent growth curve models, estimated using IBM SPSS AMOS ver.23, which can describe individual differences in changes. We examined the association between the slopes of mindfulness and anger rumination.

In the latent growth curve model, we employed criteria from Hu & Bentler (1999) to estimate the model. Goodness of fit of the models to data was evaluated with chi-square statistics (χ^2), the comparative fit index (CFI), and root-mean-square error of approximation (RMSEA). A model is considered to have a good fit when the χ^2 is not significant, the CFI is greater than 0.95, and RMSEA is less than .06.

2. Results

As indicated in the data analysis section, initial overall changes in mindfulness and anger rumination were examined as a preliminary analysis. Next, the relationship between the slopes of these variables was estimated by a latent growth curve model. The results of the preliminary analysis were compared with those of Anderson et al. (2007), who reported that the wait-list control group reported no changes of mindfulness and anger rumination over eight weeks.

2.1 *Preliminary analysis*

Means, standard deviations, and the correlations for the FFMQ and ARS can be found in Table 1 and 2. A one-way repeated ANOVA was conducted to examine a main effect of Time on mindfulness and anger rumination. This analysis revealed that although the main effect of Time on mindfulness is marginally significant, $F(2.65, 211.88) = 2.24, p = .093, \eta^2 = .027$, multiple comparison revealed that there is no significant difference between times. In addition to mindfulness, the main effect of Time on anger rumination is also marginally significant, $F(2.62, 209.76) = 2.40, p = .078, \eta^2 = .029$,

but multiple comparison revealed that there is no difference between times. Figure 1 illustrates the estimated and observed trajectories of mindfulness and anger rumination. Mindfulness showed a downward trend and anger rumination showed an upward trend over time.

These results appear to indicate that the total mindfulness score spontaneously decreased and anger rumination spontaneously increased from time 1 to time 4. This differs from the results of Anderson et al. (2007). However, given that effect sizes were small, Type I error inflation may have occurred. Caution should be taken when drawing conclusions regarding the spontaneous changes in mindfulness and anger rumination.

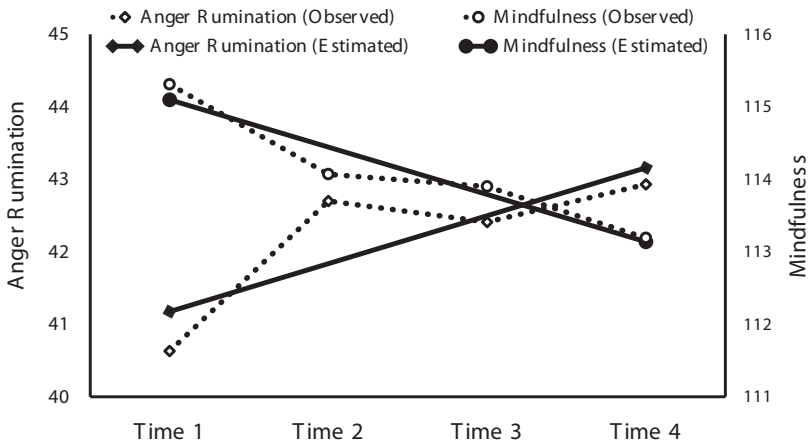


Fig. 1 Trajectories of mindfulness and anger rumination over four months

Table 1—Means and standard deviations of FFMQ and ARS

	Time 1	Time 2	Time 3	Time 4	F value	Multiple Comparison	Effect Size (η^2)
FFMQ	115.31 (11.78)	114.07 (12.30)	113.90 (12.06)	113.19 (12.70)	2.24 [†]	n.s.	.027
ARS	40.63 (12.29)	42.70 (13.75)	42.41 (13.78)	42.93 (13.75)	2.40 [†]	n.s.	.029

N = 81, FFMQ = Five Facets of Mindfulness Questionnaire, ARS = Anger Rumination Scale () = Standard deviation, [†] = *p* < .10

Table 2—Correlations for FFMQ and ARS

	FFMQ T ₁	FFMQ T ₂	FFMQ T ₃	FFMQ T ₄	ARS T ₁	ARS T ₂	ARS T ₃	ARS T ₄	α
FFMQ T ₁	—	.77**	.76**	.76**	-.18	-.16	-.13	-.12	.79
FFMQ T ₂		—	.87**	.84**	-.21 [†]	-.29**	-.22*	-.21 [†]	.82
FFMQ T ₃			—	.88**	-.22*	-.26*	-.23*	-.21 [†]	.85
FFMQ T ₄				—	-.19 [†]	-.23*	-.18	-.24*	.85
ARS T ₁					—	.79**	.75**	.73**	.94
ARS T ₂						—	.80**	.81**	.95
ARS T ₃							—	.89**	.95
ARS T ₄								—	.96

$N = 81$, FFMQ = Five Facets of Mindfulness Questionnaire, ARS = Anger Rumination Scale

T₁ = Time 1, T₂ = Time 2, T₃ = Time 3, T₄ = Time 4,

** = $p < .01$, * = $p < .05$, [†] = $p < .10$

2.2 Slopes and intercepts of mindfulness and anger rumination

In order to describe the individual differences in changes, a latent growth curve model was constructed to examine the relationship between the slopes of mindfulness and anger rumination. The latent growth curve model of mindfulness and anger rumination (see Fig. 2) provided an acceptable fit to the data; $\chi^2 = 46.57$ ($df = 29$), $p = .021$; CFI = .97; RMSEA = .09 (90%CI = .03-.13). The estimated correlation between the slopes of these variables was marginally significant, and the strength of the relationship was moderate ($r = -.54$, $p = .095$). The estimated correlation between the intercepts of mindfulness and anger rumination was significant and the strength of the relationship was small ($r = -.26$, $p = .049$). All other relationships were not significant and omitted from Figure 2. Although the sample size was relatively small in this study, these results suggest that mindfulness and anger rumination are negatively covariant over time.

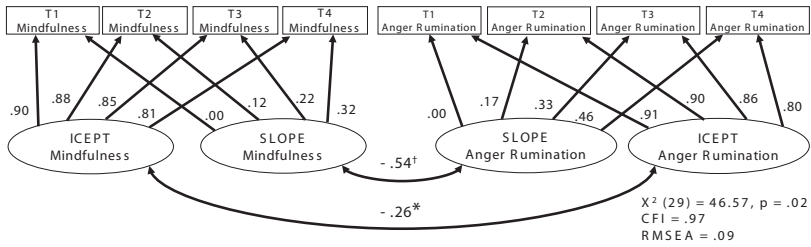


Fig. 2 Latent growth curve model of mindfulness and anger rumination

* $p < .05$, † $p < .10$

3. Discussion

Previous studies (e.g., Anderson et al., 2007) have demonstrated the effects of MBIs on anger rumination. However, few studies has verified the longitudinal relationship between changes in mindfulness and anger rumination. In our study, the results were consistent with both analysis of overall change and considering individual differences with a latent growth curve model. As expected, this analysis revealed that the slopes of these variables were negatively covariant over four months, and this relationship was moderate. Overall changes in these variables appear to reflect the individual differences, but we need to view this result with care.

The latent growth curve model revealed that mindfulness and anger rumination were negatively and moderately covariant over time. Although mindfulness has already been negatively correlated with anger rumination in a cross-sectional study (e.g., Peter et al., 2015), this study may complement such knowledge from a longitudinal perspective. This study included no control of variables; therefore, there is no suggestion of causal links between mindfulness and anger rumination. Combined with the intervention study, however, their covariant relationship over time might be more clear. MBIs have been shown to cultivate mindfulness skills (Gu et al., 2015), leading to the reduction of anger rumination (Anderson et al., 2007). This is the first study to our knowledge to investigate the longitudinal relationship between these variables using a latent growth curve model.

The results indicated that mindfulness decreased and anger rumination spontaneously increased overall over time. This differs somewhat from results of previous research. Anderson et al. (2007) reported that there was no

significant change in the anger rumination score from pre to post in the wait-list control group, which suggested that anger rumination was been stable over the eight weeks. There are two possible reasons for the discrepancy in results. First, given the small effect sizes, Type I error inflation could occur. In other words, our findings may be due to chance and the findings of the previous study, which reported the stability of mindfulness and anger rumination may be true. Second, both studies lacked control of numerous other variables, causing difficulty in identifying the variables that influence changes in mindfulness and anger rumination, so further research is necessary.

The intercepts of mindfulness and anger rumination negatively correlated and the strength of the relationship was small. This result supported the cross-sectional study (e.g., Borders, Earleywine, & Jajodia, 2010), which reported the negative correlation between mindfulness and rumination. The current study may reinforce the idea that interventions to cultivate mindfulness skills could be effective for alleviating anger rumination (e.g., Wright et al., 2009).

However, this study is an exploratory investigation with some notable limitations. First, this study included no control of numerous variables; therefore, we cannot deny the possibility that there is a third variable influencing mindfulness and anger rumination. Trait anger, for example, has been demonstrated to influence both mindfulness and anger rumination (e.g., Takebe, Takahashi, & Sato, 2015). Thus, it would be useful to control for trait anger. Second, the sample was composed entirely of Japanese undergraduate students and was relatively small, thus generalizations beyond this population must be tentative. Third, cultural differences regarding anger (Matsumoto et al., 2008; Gross, 2014) and mindfulness (Christopher et al., 2009) have been discussed. Further work is needed to assess cultural differences and collect a larger sample. Finally, goodness of fit of the models to data was acceptable, but insufficient. Although the current study was an early exploratory one, another model should be examined in the future.

It is necessary to accumulate knowledge about mindfulness and anger rumination because mindfulness may have great potential to improve treatments for anger. We hope that this study serves to encourage future studies on anger treatment and the development of better anger treatment.

4. Compliance with Ethical Standards

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors. Informed consent was obtained from all individual participants included in the study.

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