# **Metacognitive beliefs and rumination as predictors of anger:**

# **A prospective study**

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*Abstract*

**Background:** The metacognitive approach conceptualizes the relationship between anger and rumination as driven by metacognitive beliefs; information individuals hold about their own cognition and about coping strategies that impact on it. The present study aimed to test the prospective predictive impact of metacognitive beliefs and rumination on anger in a community sample. **Method:** Seventy six participants were recruited and engaged in a 2-week anger, rumination and metacognitive beliefs monitoring protocol. A multi wave panel design was employed to test whether metacognitive beliefs and rumination have a prospective impact on anger. **Results:** Metacognitive beliefs and rumination were found to have a significant prospective impact on anger that was independent from the number of triggering events. In addition, metacognitive beliefs about the need to control thoughts were shown to have a direct impact on subsequent anger, independently from rumination. **Implications:** These findings provide support for the potential value for applying metacognitive theory and therapy to anger-related problems.

*Keywords: anger; metacognitive beliefs, metacognitive therapy; prospective study; rumination.*

# **Metacognitive beliefs and rumination as predictors of anger: A prospective study**

*Introduction*

Anger is a basic emotion (Oatley, 1992) which arises when people are prevented from reaching an important personal goal by something or someone external, or when they perceive a damage to the self (Izard, 1977). It is well established that even if anger has an adaptive function (Frijda, 1986), it can lead to negative reactions and consequences (Fitness, 2008), involving different aspects of health and interpersonal relationships (Friedman & Ulmer, 1984).

 Since the early 1990s metacognition has been introduced as a possible central element in understanding the activation and dysregulation of negative emotion such as anger (Wells, 2000; Wells & Matthews, 1994; 1996). In the metacognitive model of psychological distress, Wells and Matthews propose that psychological disturbance is maintained by a style of cognitive-affective management (termed the Cognitive Attentional Syndrome; CAS) which involves perseverative thinking (e.g. worry and rumination), threat monitoring, avoidance, and thought suppression. The CAS is problematic because it causes negative thoughts and emotions to become perseverative (Wells, 2000). The activation and persistence of the CAS in response to cognitive-affective triggers is dependent on maladaptive metacognitive beliefs. Metacognitive beliefs refer to the implicit or explicit information individuals hold about their own cognition and about coping strategies that impact on it. Examples of metacognitive beliefs may include: “Rumination will help me solve problems” or “My thoughts are out of control”. The metacognitive model of psychological distress has led to the development of disorder-specific models of addictive behaviours, depression, generalised anxiety disorder, obsessive-compulsive disorder and post-traumatic stress disorder and to metacognitive therapy (Wells, 2008; 2013) that has been found to be an effective treatment for psychological disorders (Normann, et al., 2014).

 Over the last decade there has been a growing recognition that levels of anger, in terms of its frequency, intensity and duration may be influenced by cognitive processes that in the metacognitive model are conceptualized as components of the CAS, including the tendency to ruminate (Wilkowski & Robinson, 2010). Rumination, a form of repetitive thinking style focused on symptoms and their causes and consequences, has received empirical attention as a dysfunctional process that increases negative emotions and enhances problematic behaviors (Caselli et al., 2008; 2010, 2013; Nolen-Hoeksema, 1991; Watkins, 2008). Rumination in anger experience can be broadly defined as perseverative thinking about a personally meaningful anger-inducing event (Denson, 2013). Chains of anger-related cognitions, in the form of rumination, are an important component of angry mood and have been implicated in the maintenance of anger-control problems (Beck, 1976; Ellis, 1977; Novaco, 1975, 1979; Sukjodolsky, Golub & Cromwell; 2001; Martino et al., 2013). Rumination has generally been considered as a maladaptive regulatory strategy because it tends to magnify feelings of anger (Rusting & Nolen-Hoeksema, 1998), reduce self-control, and encourage aggressive behavior (Denson, Pedersen, Friese, Hahm & Roberts, 2011). Its problematic role has been demonstrated in healthy students (Bushman et al., 2005; Denson, Pedersen& Miller, 2006; Denson, Pedersen, Friese, Hahm & Roberts, 2011; Denson, White & Warburton, 2009; Pedersen et al., 2011), in people with borderline sub-clinical traits (Selby & Joiner, 2012;Selby et al., 2008) and in clinical populations with Borderline Personality Disorder (Abela, Payne & Moussaly, 2003, Baer & Sauer, 2011; Sauer & Baer, 2012; Sauer-Zavala, Geiger & Baer, 2013; Martino et al., 2015). In summary, rumination: (1) increases levels of anger and perception of being out of control; (2) increases accessibility of anger-related information; and (3) interferes with the regulation of anger and behaviour (Denson, 2013).

 Although it has been shown that the role of rumination drives higher levels of anger and problematic behavior, there is a lack of research about what makes angry rumination so perseverative and poorly regulated. Rumination in anger experience, from a metacognitive standpoint, is considered as a maladaptive self-regulatory strategy and a component of the CAS. This entails that the activation and perseveration of rumination should be based on metacognitive beliefs (Wells, 2008). If this were the case, rumination should be a prospective predictor of angry responses, and metacognitive beliefs should contribute to both rumination and anger. The Wells and Matthews model proposes that triggering events lead to difficult to control emotions because of the activation of the CAS (e.g. rumination) and the CAS is more likely to be activated in individuals with elevated metacognitive beliefs. The three broad dimensions of metacognitive beliefs implicated in this process are positive beliefs about rumination (e.g. “Ruminating will help me cope”), negative beliefs about rumination (e.g. “Ruminating cannot be controlled”) and beliefs about importance and need to control anger-related thoughts (“Angry thoughts should always be controlled”).

 To our knowledge, only a few studies have offered preliminary evidence that metacognitive beliefs may play a role in rumination and anger. For example, positive and negative metacognitive beliefs have been associated to the tendency to ruminate about angry emotions in a non-clinical sample (Moeller, 2016). In addition, positive metacognitive beliefs have been shown to have an impact on the prediction of sub-sequent anger, in particular individuals with positive beliefs about rumination were found to have lower levels of anger than individuals with negative beliefs and this may motivate them to easily engage in rumination (Krans et al., 2014). Finally, findings from a preliminary study involving patients with anger-control problems identified the presence of both positive and negative metacognitive beliefs (Simpson & Papageorgiou, 2003).

 The metacognitive model gives rise to several predictions that we tested using a multi-wave panel design where the effects of metacognitive beliefs on rumination and the effects of both metacognitive beliefs and rumination on anger as measured three days later were examined. The specific predictions are as follows:

1. Rumination and metacognitive beliefs will positively correlate with subsequent anger.
2. Rumination would be a prospective predictor of anger. We expected that the relationship between triggering events measured at time 1 and anger measured three days later (lag3) will be mediated by rumination measured 2 days later (lag2).
3. Metacognitive beliefs would be a prospective predictor of rumination and subsequent anger. We expected that chains of mediators that include metacognitive beliefs measured one day later (lag1) and rumination measured two days later (lag2) will mediate the influence of triggering events measured at time 1 to anger measured three days later (lag3).

*Method*

*Design*

Participants were recruited and engaged in a 2-week anger, rumination and metacognitive beliefs monitoring protocol in which 4-day measures packages were pooled to ensure four anchor points (time 1, lag1, lag2 and lag3) we needed for the longitudinal test of specific predictions were obtained (triggering events, metacognitive beliefs, rumination and anger). We pooled 4-day measures packages from a longer period of time to ensure a multi-wave perspective in order to grant more accurate inference of model parameters, this can be considered as an appropriate way to test more complicated behavioural hypotheses (Hsiao, 2007). Data included in the analyses referred to those participants who completed at least 12 times the daily monitoring over the two week programme.

*Participants*

Participants were recruited among undergraduate psychology students at the University of Pavia (Italy) through the newsletter service of the University. For purposes of inclusion participants were required to: (1) be 18 years of age or above; (2) consent to participate; and (3) understand spoken and written Italian. Seventy-nine participants (65 females) answered, three of them withdraw from the study within first three days and stop to complete daily measures. Seventy-six participants (62 females) aged between 19 and 52 years (mean=25.1, SD=6.9) completed the study and were included in the following analysis. The entire sample was Caucasian.

*Materials*

*State–Trait Anger Expression Inventory–Trait* (*STAXI–T*; Spielberger et al., 1983). This is a self-report instrument which assesses individual differences about the predisposition to feel anger; it’s composed of 10 items, rated on a 4-point Likert scale. Higher scores represent higher levels of anger. Factor analysis has shown two related factors: angry-temperament (T-Anger/T) and angry-reaction (T-Anger/R). The first factor refers to the tendency to feel anger without a clear cause (e.g. “I am quick tempered”), and the second factor assesses how frequently a person experiences anger if criticized or unfairly treated (e.g. “I get angry when slowed down”). STAXI-T has been shown to possess good psychometric properties (see for example Forgays, Forgays & Spielberger, 1997). In the present study internal consistency was .80 for temperament and .79 for angry-reaction sub-scale

*Anger Rumination Scale* (*ARS;* Sukhodolsky, Golub & Cromwell, 2001). This is as self-report instrument consisting of 19 items rated on a 4-point Likert-type scale that assesses the tendency to think about anger-provoking situations, to recall anger episodes from the past, and to think about causes and consequences of anger episodes (e.g. “I ruminate about my past anger experiences”). Higher scores represent higher levels of rumination. The ARS has been shown to possess good psychometric properties (Sukhodolsky, Golub, & Cromwell, 2001). In the present study internal consistency was .79.

*Daily Measures.* The measures below were administered daily to each participant for two weeks. Participants were instructed that they should only report anger-inducing episodes and complete all measures regarding anger triggering events.

Daily Number of Triggering Episodes. Participants were asked to report if any anger-inducing episodes occurred during the day and how many they were.

 Daily Anger. Anger was measured with a modified version of the STAXI-State that included 10 items to measure levels of daily anger. Each item is scaled from 1 to 4. In this modified version the general structure was maintained but items were rephrased so as to refer to daily anger episodes. For example “I am furious” was modified to “I was furious”. Instructions were modified accordingly. Higher scores represent higher levels of anger.

 Daily Rumination. Rumination was measured through four questions scaled from 0 (“Not at all”) to 10 (“It cannot be higher”) rating different aspects of rumination (“how much rumination did you experience on the reported episodes?”, “how much did rumination interfere with your daily life?”, “how stressful was rumination?”, “how persistent was rumination?”).

 Daily Metacognitve Beliefs. Metacognitive beliefs were measured through six items, two for each dimension being investigated. The three dimensions were: Positive Metacognitive Beliefs about Rumination (PMR, e.g. “Ruminating helps me to cope”), Negative Metacognitive Beliefs about Rumination (NMR, e.g. “I cannot stop ruminating”), and Importance and Need to Control Thoughts (INCT, e.g. “Negative thoughts should always be controlled”). Items were scaled on a range from 0 “I do not believe at all” to 10 “I completely believe it is true”. Scores for each sub-scale were obtained by the sum of the items.

*Procedure*

The research project was approved by the ethics committee of the Cognitive Psychotherapy School and Research Institute “Studi Cognitivi”, Milan, Italy. Firstly, participants were informed about the nature of the research (that it was an experiment about styles of thinking in anger situations). Secondly, all participants were briefed that the data provided was confidential, and that their personal information was linked to their name only through an ID number inserted in a Participant Debrief Form. Participants were also informed that taking part in the research project was entirely voluntary and they could withdraw any time. After participants had given written informed consent, a demographical data sheet, the STAXI-T and the ARS were administered. A brief description of anger related terms (e.g. anger, rumination, aggression) was also provided to reduce misunderstanding in the interpretation of terms. At the end of this session participants were instructed about procedures for the following weeks.

Ten days later, participants were contacted by e-mail and engaged in a 2-week anger, rumination and metacognitive beliefs monitoring protocol. They were asked to complete an on-line version of daily measures. This procedure was repeated every evening for two weeks. The on-line form could be filled only between 19:30 and 21:30 and in the remaining time the web page was locked and not available. The on-line diary took about ten minutes to complete. Participants who completed at least 12 daily measures received one university credit point.

*Results*

*Data configuration and descriptive statistics*

Descriptive statistics for all variables are presented in Table 1. The data configuration procedure was undertaken considering anger at lag3 as the dependent variable. The monitoring protocol collected 836 combined daily measures.

An inspection of missing data patterns showed that missing data were between 2.6% to 3.2% with a random distribution between time-points as confirmed by a non- significant Little’s MCAR test (*x2=* 10.74, *p>*.05). We then adopted a simple imputation technique with the expectation-maximization model to manage missing data.

An inspection of histograms, skewness and Kurtosis coefficients identified the presence of univariate outliers, considering both symmetry and peakedness. We identified 13 univariate outliers removed (n=810) to achieve normal distribution of the independent variables. We then tested for the presence of multivariate outliers by calculating the distance of Mahalanobis (*D2*), which identified 25 multivariate outliers (n=785). These were eliminated from further analyses to ensure a linear relationship between variables. The coefficient of Mardia, which represents the multivariate kurtosis coefficient, was 61.6. This coefficient was not greater than the critical value (63.0) for an asymmetrical multivariate distribution, indicating a multivariate normal distribution. An inspection of the graphical distribution of *D2*and Q-Q plots supported this finding. We then examined multi-collinearity using the tolerance index (*Ti*) and the variance inflation factor (VIF). A *Ti* of more than 0.02 and a value less than 5.0 for VIF are considered reliable cut-off points for the absence of multicollinearity. The tolerance index increased from .34 to .73 and the VIF from 1.03 to 3.59. These analyses supported the absence of multicollinearity between variables. An analysis of residuals (residual Q-Q plots, skewness, kurtosis, correlations with variables) was performed to identify non-linearity, to support homoscedasticity and to identify the absence of significant correlation. The Durbin-Watson statistic was 1.94 ensuring the absence of autocorrelation. The inspection of Cook’s distance showed that no participants’ data would change the regression analyses coefficients significantly.

*Test of prediction 1*

To test whether rumination and metacognitive beliefs would positively correlate with subsequent anger we ran a series of correlations. Given the number of correlations performed we applied Bonferroni corrections to control for Type I error. Correlations showed that rumination at lag2 and all metacognitive beliefs at lag1 were positively associated to anger at lag3 (See Table 2). All variables positively correlated with trait measures of anger and rumination.

*Test of prediction 2*

To test whether the effect of number of triggering episodes on subsequent anger could be accounted by a mediating effect of rumination we used a mediational analyses. The analyses were carried out using INDIRECT script version 4.1 for SPSS version 21.0 for Windows (Preacher & Hayes, 2008). In our model, number of triggering episodes at time 1 was entered as the independent variable, anger at lag3 was entered as dependent variable and rumination at lag2 was inserted as a the mediator. The bootstrap test for indirect effects (*samples=*5000) confirmed that rumination at lag2 mediated the effect of number of triggering episodes on anger (z=2.77, *p*=.01). The indirect effect estimate was (IE)=.12, 95% CI[.04,.23]. The mediating effect of the unstandardized coefficients is presented in Figure 1.

*Test of prediction 3*

To test whether the effect of triggering episodes at time 1 and rumination at lag2 could be accounted by metacognitive beliefs at lag1 we used a series of multiple-step multiple mediational analyses. This test allows for the verification of the extent to which the proposed chain of mediators carries the influence of an independent variable to a dependent variable. In our model, triggering episodes measured at time 1 was entered as independent variable, while metacognitive beliefs at lag1 and rumination at lag2 were sequentially entered as proposed mediators. Anger measured at lag3 was entered as the dependent variable. Statistical analyses were carried out using the PROCESS script version 2.13 for SPSS version 21.0 for Windows (Hayes, 2013).

The bootstrap test of indirect effects (*samples=*5000) confirmed that the whole chain going from triggering episodes at time1 to subsequent anger at lag3 via metacognitive beliefs at lag1 and rumination at lag2 in serial was significant. The unstandardized coefficients and both direct and indirect, and total effect estimates for all metacognitive beliefs are presented in Figure 3. The total indirect effect estimates was (IE)=.02, 95% CI [.01, .04] for INCT; (IE)=.01, 95% CI [.01, .03] for PMR; and (IE)=.03, 95% CI [.01, .07] for NMR. These results supported the partial prospective mediation of all metacognitive beliefs in the relationship between triggering episodes at time 1 and rumination at lag2 (INCT: *t*=4.81, *p<.*001; PMR: *t*=4.01; *p<.*01; NMR: *t*=6.97, *p<.*001) and the prospective impact of metacognitive beliefs at lag1 on anger at lag3 through the increase of rumination at lag2. In addition, a mediating impact of INCT on subsequent anger was shown to be independent from rumination at lag2 with an indirect effect estimate (IE)=-.16, 95% CI [.07, .29]. Finally, a direct effect of number of triggering events at time 1 on anger at lag3 was significant with effect estimates from .64 to .75 (see Figure 2).

*Discussion*

This study provides evidence for the prospective role of metacognitive beliefs and rumination in predicting levels of anger. Firstly, both rumination and metacognitive beliefs about the importance and need to control thoughts predicted subsequent anger independently from number of triggering events. Secondly, the importance and need to control thoughts prospectively predicted subsequent anger independently from the number of triggering episodes and from rumination. Thirdly, the indirect effects going from number of triggering episodes to anger via metacognitive beliefs and rumination were significant for all sub-types of metacognitive beliefs, supporting a prospective sequence (Figure 2). Finally, findings also highlighted: (1) the prospective impact of positive and negative metacognitive beliefs on levels of rumination; and (2) the prospective impact of metacognitive beliefs about importance and need to control thoughts on anger, independently from levels of rumination.

 These results are consistent with early explorative findings on the role of metacognitive beliefs in anger-related problems (Simpson & Papageorgiou, 2003) and add to the argument for applying metacognitive theory to the understanding of excessive anger and rumination in a similar way to what has been employed for depressive rumination (for a review see Papageorgiou & Wells, 2003).

 At least two pathways regarding the involvement of metacognitive beliefs in anger can be inferred from these findings. The first pathway implies the role of all metacognitive beliefs in enhancing levels and persistency of rumination which in turn has a detrimental impact upon levels of subsequent anger. The finding of the negative impact of rumination on anger also goes to support a well-established body of findings about the influence of rumination on anger (Wilkowski & Robinson, 2010). How should positive metacognitive beliefs about rumination be important in predicting rumination? According to the metacognitive theoretical tenet, positive metacognitive beliefs about rumination can implicitly or explicitly activate rumination as a means of coping with negative intrusive thoughts to achieve self-regulation (Wells, 2008). How should negative metacognitive beliefs about rumination be important in predicting rumination? Negative metacognitive beliefs about the uncontrollability of rumination may prevent the exertion of metacognitive control over rumination (Wells, 2008). This lack of effortful metacognitive control may reduce, in turn, the level of meta-awareness that: (1) promotes the persistency of rumination (people are not aware of the ongoing rumination); and (2) prevents disconfirmation of such metacognitive beliefs (individuals not paying attention to information about the control they can exert on rumination) (Wells, 2008). Why should metacognitive beliefs about the importance and need to control thoughts be important in predicting rumination? These metacognitive beliefs may prevent individuals from experiencing mental events (e.g. negative thoughts about frustrating episodes) as internal transient phenomena which does not necessarily need a coping response. Conversely, they may drive the tendency to focus and monitor negative thoughts and activate maladaptive attempts to reach internal self-regulatory goals (e.g. solve or suppress them) for example by increasing rumination.

 The second pathway implies the role of metacognitive beliefs about the importance and need to control thoughts as a direct mediator in the relationship between triggering episodes and subsequent anger, independently from rumination. The tendency to focus on negative thoughts in order to suppress them may lead to a paradoxical increase of anger because: (1) attentional focus may become fixed on monitoring internal thoughts as important or dangerous signals, thus making them more salient, intrusive and persistent; and (2) monitoring efficacy of suppression efforts implies the recall of angry thoughts people want to suppress, thus producing a well-known paradoxical rebound effect (Wenzlaff & Wegner, 2000).

 Taken together, the findings from our study provide support the application of metacognitive model to understanding the interplay between anger and rumination. Following this line of reasoning, a number of novel clinical interventions from Metacognitive Therapy (MCT, Wells, 2008) could be employed in the assessment, conceptualization and treatment of anger-related problems.

 Firstly, in terms of assessment, information could be gathered not only in relation to the content of angry thoughts and thinking, but also metacognitive beliefs, in order to develop an idiosyncratic case conceptualisation as well as to socialise patients into a metacognitive perspective according to which anger-related distress is associated to metacognitive beliefs about thoughts and rumination (e.g. metacognitive beliefs about the need to control thoughts, need to ruminate in order to cope, or uncontrollability of rumination). Secondly, MCT interventions such as the Attention Training Technique (ATT) and Detached Mindfulness (DM) may prove useful in shifting to a metacognitive mode of processing, gaining awareness of the control we all have over attention, choices and thinking style. Finally, idiosyncratic experiments and Socratic questioning may be applied to modify metacognitive beliefs and develop new plans of processing.

 Results of this study must be considered with regard to some limitations. Firstly, social desirability, self-report biases, context effects and poor recall may have contributed to errors in self-report measurements. Secondly, data collection time points were not randomly allocated throughout the day and are retrospective. This may lead to bias and errors in measurement due to the actual mood state of participants. Thirdly, the presence of a psychological disorder, which could account for level of anger and rumination, was not a assessed but the conservative outliers analysis that has been applied does provide a degree of confidence in the specificity of the results. Fourthly, the sample was relatively small in size and consisted primarily of female participants and results need to be replicated controlling for potential moderating effects of gender.

However, it should be noted that rumination has been found to be higher in females than in males from an early age (e.g. Johnson & Whisman 2013; Jose & Brown, 2008) lending a degree of justification to the predominantly female composition of our sample.

 A number of important questions need to be addressed in future research. The nature and role of metacognitive beliefs in anger and rumination requires further exploration, particularly in relation to clinical populations and to the range of psychopathologies that include anger-related problems (e.g. impulse control or borderline personality disorder). For instance, it would be useful to verify whether metacognitive beliefs can longitudinally predict anger in a clinical population. Secondly, the link between metacognitive beliefs about maladaptive coping strategies (e.g. aggressive behaviour or alcohol use) has not been tested yet. It is plausible to assume that maladaptive behaviour is employed as an attempt to prevent, achieve relief from or directly regulate escalating distress due to the perseveration of self-focused attention and rumination. Thirdly, the construction and validation of a brief measure of beliefs about rumination in anger episodes may be useful to identify and target idiosyncratic metacognitive beliefs.

 In conclusion, the present study provides support for the potential value of metacognitive beliefs in prospectively predicting anger and rumination. It also suggests future directions for research in applying metacognitive theory and therapy to anger-related problems.

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None.

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**Appendix A**

Angry Rumination: Is the tendency to dwell upon events that provoked feelings of anger. It could be considered as a train of thoughts that revolve around what happened, why it happened, what implication it may have, how to cope with it, and how to take revenge.

Anger: Is an intense emotional response that arises when people perceive provocation, hurt or threat and to be unfairly hindered from reaching an important personal goal.

Aggression: Is a verbal or physical social interaction with the aim of inflicting damage or negative feelings upon another individual.