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Depressive Rumination and the Mood-as-Input Hypothesis: The Role of Reverse Catastrophizing

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Depressive Rumination and the Mood-as-Input Hypothesis: The Role of Reverse Catastrophizing

by

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Abstract

The mood-as-input hypothesis (MAIH) has been consistently examined in relation to worry, but few studies have examined its role in depressive rumination. Fewer studies have examined congruency effects, such that conditions of mood and perseverative task are congruent (i.e., negative mood and negative preservative task vs. positive mood and positive perseverative task). The current study thus examines the MAIH's applicability to depressive rumination, includes further investigation on mood congruency, and incorporates a newly constructed positive rumination task to further assess the impact of the valency of a ruminative task. Undergraduate students were randomly assigned to one of eight conditions based on the rumination interview type (positive vs. negative), mood (happy vs. sad), and stop-rule (as-many-as-can (AMA) and feel-like-stopping (FL)). It was hypothesized that participants would generate more perseverative steps in mood-congruent conditions, depending on the assigned stop-rules, and that they would default to that assigned stop-rule in mood-incongruent conditions. Results determined that, under mood-congruent conditions, participants generated more perseverative steps. In particular, they ruminated more if assigned to the AMA stop-rule while in the negative rumination interview and primed with sad mood, whereas more rumination also occurred for participants with the FL stop-rule while in the positive rumination interview and primed with happy mood. These findings are consistent with the MAIH. As hypothesized, participants also defaulted to the AMA stop-rule under mood-incongruent conditions. The current study's findings show support for the body of research relating to the MAIH, but also provides additional findings in the limited studies regarding congruency and the lack of research surrounding positive rumination.

Keywords: rumination, stop rules, catastrophizing, depression, congruency

Depressive Rumination and the Mood-as-Input

Hypothesis: The Role of Reverse Catastrophizing

Major Depressive Disorder (MDD) is characterized by a diminished interest in most

activities, excessive feelings of worthlessness, lessened ability to concentrate, and recurring

depressed mood with symptoms occurring nearly every day (American Psychiatric Association,

2013). The twelve-month prevalence of MDD is estimated to be approximately 7% in the United

States and is approximately three times higher for individuals in the 18- to 29-year age group

than that of individuals over the age of 60 (APA, 2013).

A variety of effective treatments have been created to combat symptoms of MDD and the

debilitating effects of this disorder. Nevertheless, remission rates fall below 30% or less, even

with treatment (Ansseau, Demyttenaere, Heyrman, Migeotte, Leyman, & Mignon, 2009). Studies

have found numerous predictors of the persistence of depression, such as the number of previous

depressive episodes (Sargeant, Bruce, Florio, & Weissman, 1990), absence of early response

(Mulder, Joyce, Frampton, Luty, & Sullivan, 2006), and depression severity (Barkow, Maier,

Üstün, Gänsicke, Wittchen, & Heun, 2003). More research is needed, however, to increase

understanding of mechanisms that maintain depression, such as rumination, which is best

described as a pattern of preservative-type thinking about an individual's distress-inducing

subject and the causes and implications of their distress (Nolen-Hoeksema, 1991). Rumination is

particularly important to consider as it has been shown to directly maintain depression (Nolen-

Hoeksema, 2000), and a longitudinal study on a large sample also found that biological, social,

and circumstantial risk factors of depression were mediated by psychological processes,

including rumination (Kinderman, Schwannauer, Pontin, & Tai, 2013). Moreover, both the

development of depressive symptoms (Broderick & Korteland, 2004) and the onset and duration

of depressive episodes (Robinson & Alloy, 2003) appear to be predicted by rumination. Additional longitudinal studies found that rumination predicted alcohol abuse (Caselli, Ferretti, Leoni, Rebecchi, Rovetto, & Spada, 2010), eating disorders, and general substance abuse (Nolen-Hoeksema, Stice, Wade, & Bohon, 2007). Furthermore, rumination has been determined to be associated with decreased odds of remission from cognitive therapy for individuals with MDD (Jones, Siegle, & Thase, 2008).

Nolen-Hoeksema (1991) originally conceptualized rumination as an element of the Response Styles Theory (RST), which considers an individual's type of response (rumination or distraction) that may intensify depressive symptoms. Expanding upon this theory, individuals engaging in ruminative thought have been found to subsequently prolong their depressed mood as they continuously engage in thinking about their depressive symptoms and the consequences that accompany them. Nolen-Hoeksema and Morrow (1991) then determined that victims of the 1989 earthquake that occurred in the San Francisco Bay area, who responded in a ruminative style had experienced significantly higher levels of depression compared to those who used the distraction-based style.

Other studies have been conducted to better understand the role of rumination in the development and maintenance of depression (Smith & Alloy, 2009). For instance, based on experimental methodology, depressed individuals with induced ruminative thinking tended to have a lack of inhibitory executive control, as measured by their higher count scores on a random generative task (i.e., participants' executive resources are occupied by their ruminative thoughts and thus disrupt their prepotent responses; Watkins & Brown, 2002). Furthermore, rumination has been demonstrated to not only lead to an onset of a future depressive episode (Just & Alloy, 1997), but to lead to more severe depressive episodes as well (Nolen-Hoeksema, 2000). It is

likely that this increase in severity and duration occurs due to difficulties experienced in

attempting to discontinue ruminative thinking (Hawksley & Davey, 2010). In particular,

rumination may serve as an ineffective strategy to relieve stress and allow individuals to attempt

to resolve underlying issues that result from their depression (Papageorgiou & Wells, 2001,

2003). Continued research is nevertheless still needed to examine rumination's role in MDD.

To better understand rumination, researchers have often incorporated models that best

explain worry and its underlying mechanisms. Worry is a cognitive process similar to rumination

in that they both have been referred to as repetitive negative thinking (Segerstrom, Tsao, Alden,

& Craske, 2000; McEvoy, Mahoney, & Moulds, 2010), and both have been determined to be

associated with anxiety, as expected (Nolen-Hoeksema, 2000), and depression (Molina,

Borkovec, Peasley, & Person, 1998). Although both are forms of repetitive negative thinking, a

primary distinction is that worry is often directed towards future events (Borkovec, Ray, &

Stober, 1998) whereas rumination tends to be oriented at the past and/or present (Watkins, 2008).

Overall, based on the similarities between these constructs, it is possible that models originally

focused on the underlying mechanisms of worry, be applicable to rumination.

One such model, the mood-as-input hypothesis (MAIH), predicts that an individual's

mood and pre-existing stop rule (i.e., rules or guidelines that one uses to decide when to

discontinue perseveration) impact how persistent that individual is on a perseverative task, such

as worry (Martin, Achee, Ward, & Harlow, 1993). According to this hypothesis, mood may

prompt individuals to question whether a problem-solving task has been successfully completed.

For instance, negative moods may facilitate more persistence on a task as individuals may feel

that they have not successfully reached their goal (Martin et al., 1993; Schwarz & Bless, 1991).

Stop rules, another facet of the MAIH, help define the goal(s) of a perseverative task. Meeten

and Davey (2012) have identified two stop-rules: the as-many-as-can (AMA) stop-rule and the feel-like (FL) stop-rule. For the AMA stop-rule, individuals persist on a perseverative task for as long as they are able to, and individuals using the FL stop-rule are directed to persist until they wish to discontinue the task. Previous studies have identified that the AMA stop-rule tends to be associated with perseverative worry bouts (Startup & Davey, 2001; Davey, Startup, MacDonald, Jenkins, & Patterson, 2005), as an attempt to address all possible worry-related concerns. In contrast, the FL stop-rule appears to be associated with significantly less perseverative worry (Davey et al., 2005).

As alluded to above, the MAIH was originally examined within the scope of worry, and it suggests that individuals who experience excessive worry tend to have higher levels of negative affect (i.e., mood) relative to those who worry less. Prior research has determined that employing the AMA stop-rule relates to the frequency of worry, such that higher scores on an "as many as can" checklist correlated with worry-relevant variables (e.g., trait worry, beliefs about consequences of worrying, and shame and guilt; Davey et al., 2005). Furthermore, a second study conducted by Davey et al. (2005) determined that the use of AMA stop-rules led to more perseveration in a worry catastrophizing task. These studies demonstrate that chronic worriers make use of the AMA stop-rule to determine whether they should stop perseverating (Davey, Field, & Startup, 2003; Startup & Davey, 2001). In other words, individuals who worry more than others are continuously asking themselves if their worry bout has been successfully terminated, but ongoing negative mood may lead to increased perseveration. This is further supported by Startup and Davey (2001) in their findings in which worriers generated more catastrophizing steps than non-worriers when using AMA stop-rules yet generated lesser steps than non-worriers when using FL stop-rules. This interactive effect suggests that the negative

moods of worriers may lead to them stopping sooner than non-worriers when using FL stop-rules but persist longer under AMA stop-rules.

In addition to worry, the MAIH may provide insight on the mechanisms underlying engagement in depressive rumination. Considering that negative mood, or affect, induces rumination (Lyubomirsky & Nolen-Hoeksema, 1993; 1995), the MAIH posits that higher levels of negative mood combined with a use of AMA stop-rules may facilitate engagement in depressive rumination. Additionally, this engagement is prolonged due to the positive metacognitive beliefs about rumination that individuals have as it has been found to serve as a coping mechanism to regulate mood (Papageorgiou & Wells, 2001; 2003). The first study to show evidence for the MAIH explaining depressive rumination was conducted by Watkins and Mason (2002). In their study, they instructed participants to catastrophize a negative topic using either the AMA or FL stop-rules. It was then determined that high ruminators catastrophized more than low ruminators, which can best be explained by the MAIH in that high ruminators persist in their ruminative bout when a goal has not been met, as previously mentioned. Furthermore, the authors indicated that, as predicted by the MAIH, the AMA stop-rule facilitates this continued persistence to seek understanding of their ruminative thinking, especially for those in negative moods (i.e., high ruminators). In contrast, the authors suggest that the FL stop-rule facilitates a need to discontinue ruminative thinking, as predicted the MAIH. Providing more evidence for this hypothesis, Hawksley and Davey (2009) randomly assigned non-clinical participants to one of four conditions that combined a positive or negative mood and a FL or AMA stop-rule. The participants were then subjected to a rumination interview in which the researcher asks each participant to recall a time when they felt depressed. Following this recall, participants were then asked to answer what it was about that time that made them feel depressed

and subsequently asked additional questions based on their responses. The authors hypothesized and found that participants induced with negative mood and paired with the AMA stop-rule exhibited the most perseveration. Applying this model to a clinical population had also yielded similar results in which participants with a diagnosis of MDD were found to persist significantly longer when using a goal-guided stop rule (i.e., AMA) compared to the control sample of non-clinical participants (Chan, Davey, & Brewin, 2013)

Similar to Hawksley and Davey's study, further support has been found in a non-clinical sample in which participants perseverated more on a rumination task when primed with a negative mood and utilizing the AMA stop-rule (Kissinger, 2014). The author of this study further anticipated that participants would perseverate more in a positive mood condition and utilizing the FL stop-rule. However, the author instead found that participants generated more steps when using the AMA stop-rule. This may be interpreted in terms of mood congruency, such that the incongruency between the rumination task and the positive, or happy, mood led to this outcome. As suggested by Watkins and Baracaia (2001), individuals hold metacognitive beliefs about the utility of rumination such that it allows them to attempt to gain an understanding of their depressive symptoms, and this, therefore, encourages them to continue to perseverate until a point of closure has been reached (i.e., employing AMA stop-rule).

Research surrounding mood congruency is sparse. The role of mood congruency was originally explained in terms of perseverative worry, suggesting that mood, specifically negative, will lead an individual to retrieve congruent negative content from their memory (Vasey & Borkovec, 1992) and therefore reinforce their perseverative worry style. In a later study, worriers were found to persist on a perseverative task even if it was positive (Davey & Levy, 1998), contrary to the explanation of mood congruency. A similar study by Startup and Davey (2001)

included primed moods (i.e., negative, positive, and neutral) and asked participants to catastrophize or reverse-catastrophize a worry. The authors found that perseveration occurred more in participants primed with negative mood, regardless of the valency of the catastrophizing task, suggesting that negative mood facilitates preservation for *any* task and is not restricted to catastrophizing. Davey (2006) suggests that the two previous findings add difficulty in the interpretation of mood congruency but do indicate that negative mood plays a large role in determining how much perseveration occurs and aligns with the MAIH as discussed earlier. Nevertheless, the current study aims at understanding congruency's role in depressive rumination.

Current Study

To the authors' knowledge, only a small number of studies have investigated the MAIH and its relation to depressive rumination. Furthermore, it appears that no study has investigated reverse or "positive" rumination as it relates to the MAIH. Startup and Davey (2001) appear to have utilized "reverse catastrophizing" for participants in different mood conditions, and they determined that participants primed with negative mood had significantly more steps in the reverse-catastrophizing condition than participants in either positive or neutral moods. This provided some insight on mood congruency in that valency may not be a prominent agent for perseveration. However, this study exclusively investigated the MAIH and its role in catastrophic worry rather than depressive rumination. Therefore, more research is needed to examine the role of congruency in depressive rumination, which is the focus of the current study. In doing so, a positive rumination interview was constructed, which was based on the reverse-catastrophizing interview that Startup and Davey (2001) used. This provided an opportunity to further examine

congruency's effect on perseverative tasks, such that both mood congruence and incongruence are investigated.

It was hypothesized that more perseverative steps would occur under two conditions: (1) a negative rumination interview with sad mood and an AMA stop-rule, and (2) a positive rumination interview (i.e., asking participants to recall an event that made them feel happy) with happy mood and a FL stop-rule (see Figure 1). It was also expected that fewer steps would occur under two conditions: (1) negative rumination interview with sad mood and a FL stop-rule, and (2) positive rumination interview with happy mood and an AMA stop-rule. A significant interaction was predicted to occur between mood and stop-rules.

Furthermore, it was hypothesized that participants will default to an assigned stop-rule if mood and interview task are mood-incongruent, with particularly more perseverative steps under the AMA stop-rule (see Figure 2). Thus, a main effect is anticipated for stop-rules.

Method

Participants

Participants were students recruited from the psychology courses at the University of North Florida's Psychology Department (n = 148), who volunteered to participate in exchange for course credit. The sample was 79.7% female and 20.3% male, with a mean age of 23.43 (*SD* = 6.78). Participants self-reported their ethnic background and was as follows: 65.5% Caucasian/White, 16.2% African-American/Black, 8.8% Hispanic, 5.4% Asian, and 4.1% reported "other" or of mixed ethnicity.

Procedure

Participants, in a controlled laboratory setting, provided consent and were randomly assigned to one of eight total conditions. These conditions were established in accordance to

which CIP (negative/positive) they would partake in, to which mood (happy/sad) they were primed with, and to which stop rule (FL/AMA) they were assigned to. The conditions for negative CIP were Happy—FL (n = 16), Sad—FL (n = 17), Happy—AMA (n = 21), Sad—AMA (n = 18). The above-mentioned conditions were the same for positive CIP: Happy—FL (n = 20), Sad—FL (n = 19), Happy—AMA (n = 20), Sad—AMA (n = 17). The overall design of the study is depicted in Figure 3. After providing consent, participants completed self-report measures which included rating their levels of happiness, anxiety, and sadness on a visual analogue scale (VAS) that ranged from 0 to 100. Following this, each participant, based on their previously assigned condition, was primed with either a happy or sad mood through the use of video clips from the animated movie The Lion King, which is a similar procedure that has been used by Meeten and Davey (2012).

After watching the video clips, participants again rated their current levels of happiness, anxiety, and sadness on the VAS. Next, participants, depending on their previous condition assignment, engaged in either a positive rumination interview or a negative rumination, which are both versions of the Catastrophic Interview Procedure (CIP) and were administered in a manner similar to a previously conducted study (Chan, Davey, & Brewin, 2013). Participants were instructed to complete the interview in accordance with the paired stop rule. More specifically, if participants were randomly assigned to the FL stop rule, they were instructed to discontinue when they no longer wished to continue, and if participants were randomly assigned to the AMA stop rule, they were instructed to discontinue when they have generated as many responses as they could. The procedure itself is based on Watkins and Mason (2002) where participants are asked to think about anything that makes them feel depressed or happy, in the instance of the current study.

Measures

The Visual Analogue Scale. The Visual Analogue Scale (VAS) is a 100-point scale that assesses participants' current levels of anxiety, sadness, and happiness. For each level, scores are ranked from 0 (not at all) to 100 (extremely) with participants rating the degree of each feeling by leaving a point on the scale. This measure has been used in previous experimental studies (Chan, Davey, & Brewin, 2013; Meeten & Davey, 2012, Watkins & Moulds, 2005).

Rumination Interview. Two versions of the Catastrophic Interview Procedure (CIP) were developed and administered by asking participants to recall an event in their life that made them feel depressed (i.e., negative rumination interview) or happy (i.e., positive rumination interview, or reverse-catastrophic interview). Participants were then asked to write this event at the top of the page provided and were then instructed, based on the stop-rule condition they were assigned, to write down their answer to the question about why X event makes them feel depressed or happy. This question is then repeated with their most recent answer until they are unable to provide a response (i.e., AMA stop-rule) or wish to stop (FL stop-rule). Similar to the procedures of Hawksley and Davey (2010), participants were instructed to limit their responses to no longer than a sentence such that each response is fitted to each individual line on the response sheet. Additionally, if a participant cannot provide more responses or repeats the same response three times (Meeten & Davey, 2012), the interview is terminated. The number of responses provided by participants was used as the dependent variable and is indicative of more rumination (Dash & Davey, 2012).

Results

Mood Manipulation Check

Manipulation checks were conducted to determine if the intended manipulation was effective. 2x2-mixed model analyses of variance (ANOVA; pre/post VAS scores x sad/happy mood) were run to compare VAS scores before and after participants' mood manipulation. An interaction was expected such that participants in separate mood conditions would significantly differ across post-manipulation scores. As expected, there was a significant interaction between the effects of participants' pre- and post-VAS sadness scores and the effects of their primed moods, $F (1, 146) = 63.02$, $p < 0.001$. However, upon conducting a simple main effects analysis for VAS sadness scores before the primed mood task, a significant difference was found as participants in the sad mood condition reported lower VAS sadness scores, $F (1, 146) = 4.70$, $M_{difference} = -7.26$, $p = 0.03$. A simple main effects analysis was also run for VAS sadness scores *after* the primed mood task, and a significant difference was found that indicated higher VAS sadness scores for participants in the sad mood condition, $F (1, 146) = 39.64$, $M_{difference} = 24.89$, $p < 0.001$. Furthermore, Levene's test revealed a lack of homogeneity among variance in the dependent variable (i.e., there was greater variance after the mood priming task for the sad mood condition). For the analyses following the manipulation checks, VAS scores before mood manipulation were used as a covariate due to the significant difference found above.

The preceding analyses were also run to compare VAS happiness scores before and after participants' mood manipulation. As hypothesized, a significant interaction was found, $F (1, 146) = 79.68$, $p < 0.001$. Regarding VAS happiness scores before mood priming, a simple main effects analysis found that participants' scores did not significantly differ among both sad and happy mood conditions, $F (1, 146) = 0.10$, $M_{difference} = 1.25$, $p = 0.76$. A simple main effect

analysis conducted for VAS happiness scores *after* mood priming revealed that participants in the happy mood condition had significantly higher scores, $F = 73.50$, $M_{difference} = -30.95$, $p < 0.001$. Levene's test also revealed greater variance among the sad mood condition after mood priming.

Mood Congruency and Stop Rules

Two-way between-subjects analyses of covariance (ANCOVA) were run to compare mood-congruent and mood-incongruent conditions. In both ANCOVAs, the number of ruminative steps was entered as the dependent variable while primed mood condition and stop-rules were designated as the independent variables. Additionally, to control for the effect of participants' sadness, pre-manipulation VAS sadness score was included as a covariate. Prior to these analyses, three units were removed as the number of ruminative steps for each unit were over three standard deviations above the mean. To be considered a mood-congruent condition, participants would have had to have been primed with sad mood and completed the negative rumination interview or have been primed with happy mood and completed the positive rumination interview (Figure 1). To be considered a mood-incongruent condition, participants would have had to have been primed with sad mood and completed the positive rumination interview or have been primed with happy mod and completed the negative rumination interview (Figure 2). Variance in the dependent variable among both mood-congruency conditions was found to be homogenous based on Levene's tests.

For the mood-congruent condition (see Figure 1), it was expected that the ANCOVA would yield a significant interaction. As described above, it was hypothesized that more ruminative steps would occur in the Sad—AMA and Happy—FL conditions. A significant interaction was found $F (1, 67) = 19.74$, $p < 0.001$ and determined that more ruminative steps

were observed in the Sad—AMA conditions relative to Happy—FL conditions (see Figure 4). Significant main effects for stop rules, F (1, 67) = 1.50, p = 0.23, and mood conditions, F (1, 67) = 1.44, p = 0.23, were not found in this ANCOVA analysis.

The preceding analysis for the mood-congruent condition was repeated for the mood-incongruent condition (see Figure 2) and yielded, as hypothesized, a main effect for stop-rules F (1, 68) = 18.39, p < 0.001, indicating that participants that were assigned the AMA stop-rule generated more responses overall (see Figure 5). A weak, but significant interaction was also found in the ANCOVA, F (1, 68) = 4.06, p < 0.05. Further investigation shows that a greater difference between the FL and AMA stop-rule groups within the happy mood condition could be producing this significant interaction. Lastly, a significant main effect was not found for mood condition, F (1, 68) = 0.03, p = 0.86.

Discussion

This study assessed the relevance of congruency between mood induction and interview task valence on perseverative thinking. More specifically, both stop rules and mood were manipulated while perseverative steps were measured in either a negative rumination or positive rumination interview.

Previous studies (Davey, Startup, Jenkins, & Patterson, 2005; Hawksley & Davey, 2010) have found that individuals generate more perseverative steps in a rumination task when using an AMA stop-rule relative to a FL stop-rule in combination with a negative mood condition. The current study supported these findings. However, this study is the first to examine the role of congruency on depressive rumination in which both the valency of mood and perseverative task along with the effect(s) of stop-rules have on depressive rumination. Remaining consistent with Davey's (2006) model under conditions of congruency, the authors found that participants

perseverated more in mood-congruent conditions (i.e., when sad mood was paired with negative rumination and when happy mood was paired with positive rumination). Furthermore, under those mood-congruent conditions, participants were determined to persevere more depending on the stop-rule they were assigned. Specifically, those using the AMA stop-rule in the negative rumination interview and primed with sad mood, and those using the FL stop-rule in the positive rumination interview and primed with happy mood generated more perseverative steps, as was hypothesized.

It was also predicted that when participants were assigned to mood-incongruent conditions, they would default to the AMA stop-rule, relative to the FL stop-rule, and thus result in greater perseveration. The current study supported this hypothesis and suggests that individuals will likely resort to continuing with a perseveration task for as long as they are able to (i.e., AMA stop-rule) when confronted with incongruency between a subject and individuals' mood. Previous studies (Chan et al., 2013; Watkins & Mason, 2002) have also determined that persistence on a task is typically related to the AMA stop-rule. In addition, it is inferred from these findings that individuals with a propensity to use the FL stop-rule may ruminate less.

Although participants defaulting to the AMA stop-rule when under mood-incongruent conditions was hypothesized, this should be examined further. Certain methodological differences occurred between the current study and other related studies that could explain this effect. For instance, the current study utilized clips from a movie as the mood induction method, whereas Hawksley and Davey (2010) utilized music. Although it is difficult to explain why this occurred, it is possible that the effect is a result solely of the experimental design. All things considered, individuals' tendencies to use stop-rules in response to incongruency should be researched more, especially in various settings (e.g., natural and/or less experimental).

The current study's construction and use of a positive rumination interview and its relation to depressive rumination is the first of its kind. In a study that examined the MAIH with respect to catastrophic worrying, Startup and Davey (2001) found that participants in a negative mood perseverated more than participants in either a positive or neutral mood, regardless of the type of catastrophizing interview (catastrophizing vs. reverse-catastrophizing), and Davey (2006) suggested that it is difficult to generate an explanation that aligns with mood congruency. Researchers should examine this further in understanding the propensity of individuals who engage in thinking about positive content as it may be protective against depression.

The results of this study are likely to have important clinical implications such that interventions may either be developed or adjusted for clients to cease their rumination episodes. To reiterate, this study found that stop-rules play an important role depressive rumination, so interventions may be applied to help clients mitigate their AMA stop-rule use when thinking of negative content.

Limitations

The current study and its results should be interpreted with certain limitations in mind. These limitations, however, may be of use in conducting future research related to the current findings. First, the generalizability of the current sample is limited. This study was conducted on a sample of non-referred college students which may not be representative of the general population. Furthermore, the implications of the significant results may not generalize to a clinical population, so it is recommended that this line of research be replicated with clinical populations. Second, future research should incorporate an added neutral condition as a control in which a portion of the participants are randomly assigned to a neutral mood and/or no stop-rule condition. Third, it is noteworthy that this study was conducted in a controlled laboratory

setting and may not completely characterize rumination that occurs in a more naturalistic setting (Davey et al., 2005), thus limiting the study's ecological validity. Fourth, the rumination interviews and their procedures may have been susceptible to experimenter bias as the interviewers were informed of the randomly assigned condition for each participant. Future studies may benefit from automating the interview to lessen the impact of experimenter bias, as has been proposed by Chan et al (2003). Fifth, considering that some participants were asked to discuss negative content with a stranger, it is possible that they were hesitant to refer to difficult topics during the negative rumination interview. If this were to have occurred, participants then may have discussed trivial topics which could have significant impact on the results of this study. Previous research found that individuals have shown higher comfort when reporting sensitive topics and psychosocial symptoms to automated systems rather than experimenters (Diamond et al., 2010; Gadomski et al., 2015), so future research would likely benefit from implementing an automated rumination procedure, similar to what was proposed by Chan et al (2003) as previously mentioned.

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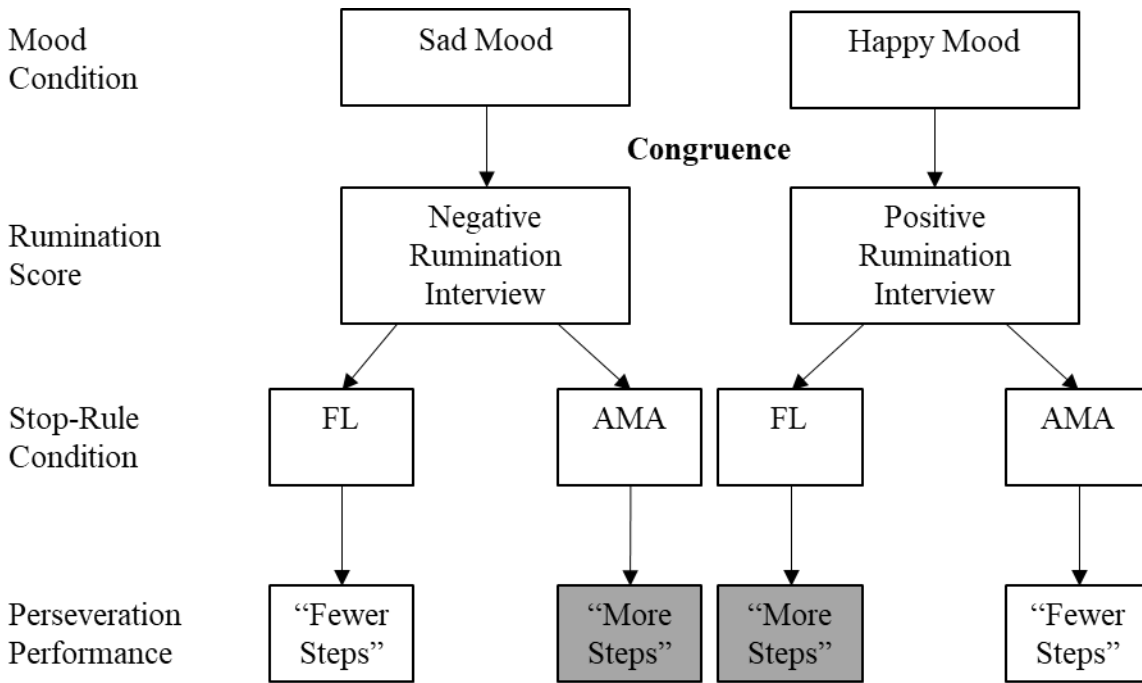
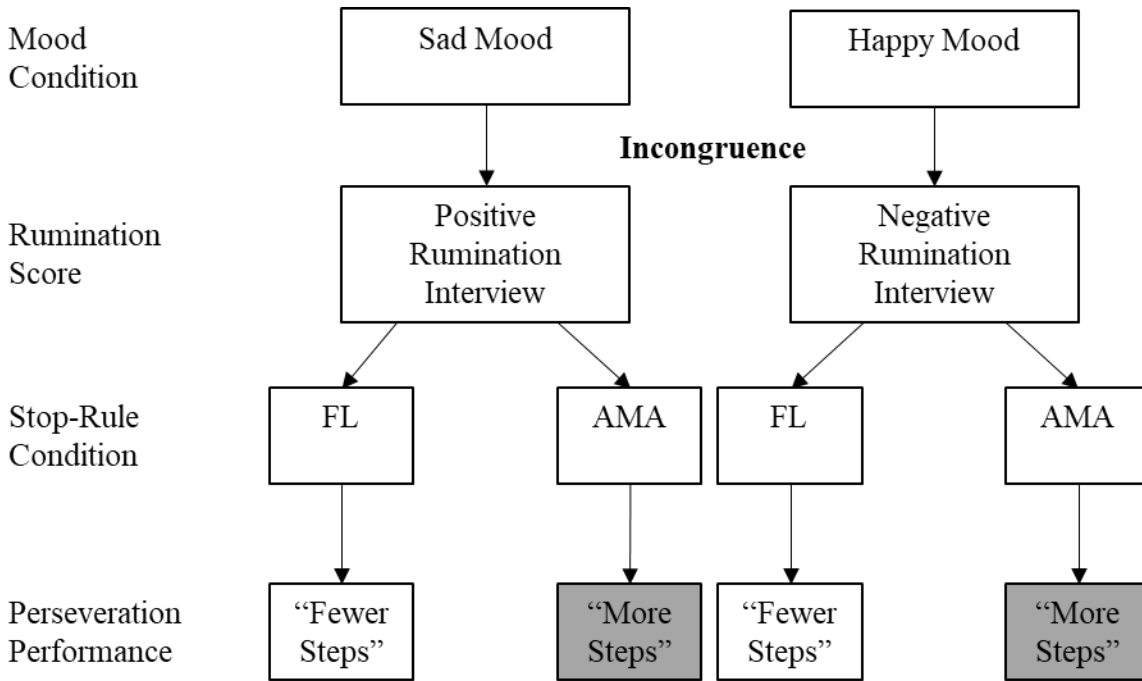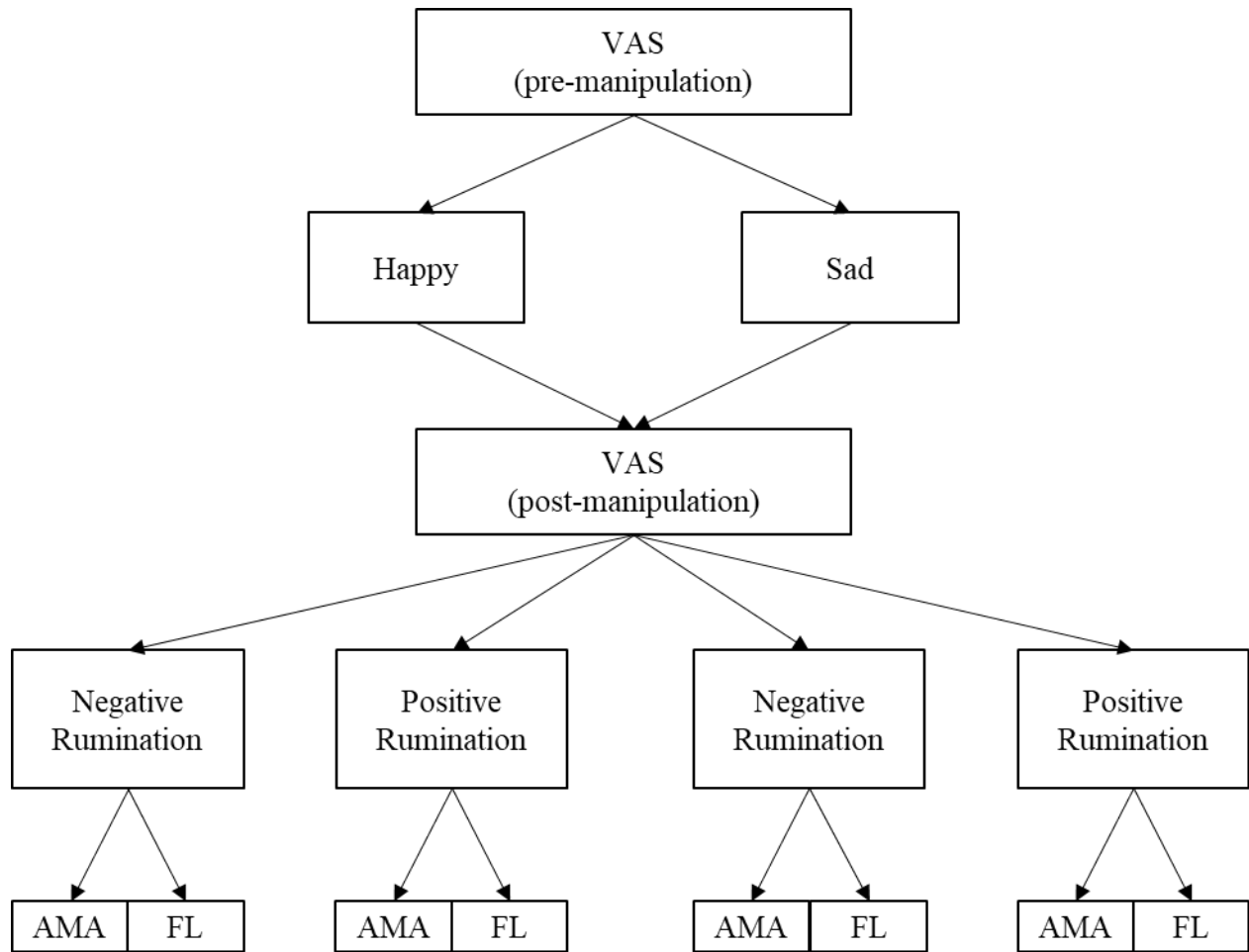*Figure 1*. Flow model of congruence between mood condition and Rumination Score type.

Figure 2. Flow model of incongruence between mood condition and Rumination Score type. It was predicted that under incongruent conditions, participants would default to stop-rule, leading to more perseveration under AMA condition.

Figure 3. Flow model of study procedures. This figure depicts the study design after consent has been acquired and begins with pre-manipulation VAS ratings, followed by a randomly assigned mood condition, post-manipulation VAS ratings, randomly assigned rumination interview (negative or positive), and finally, randomly assigned stop-rule (AMA or FL).
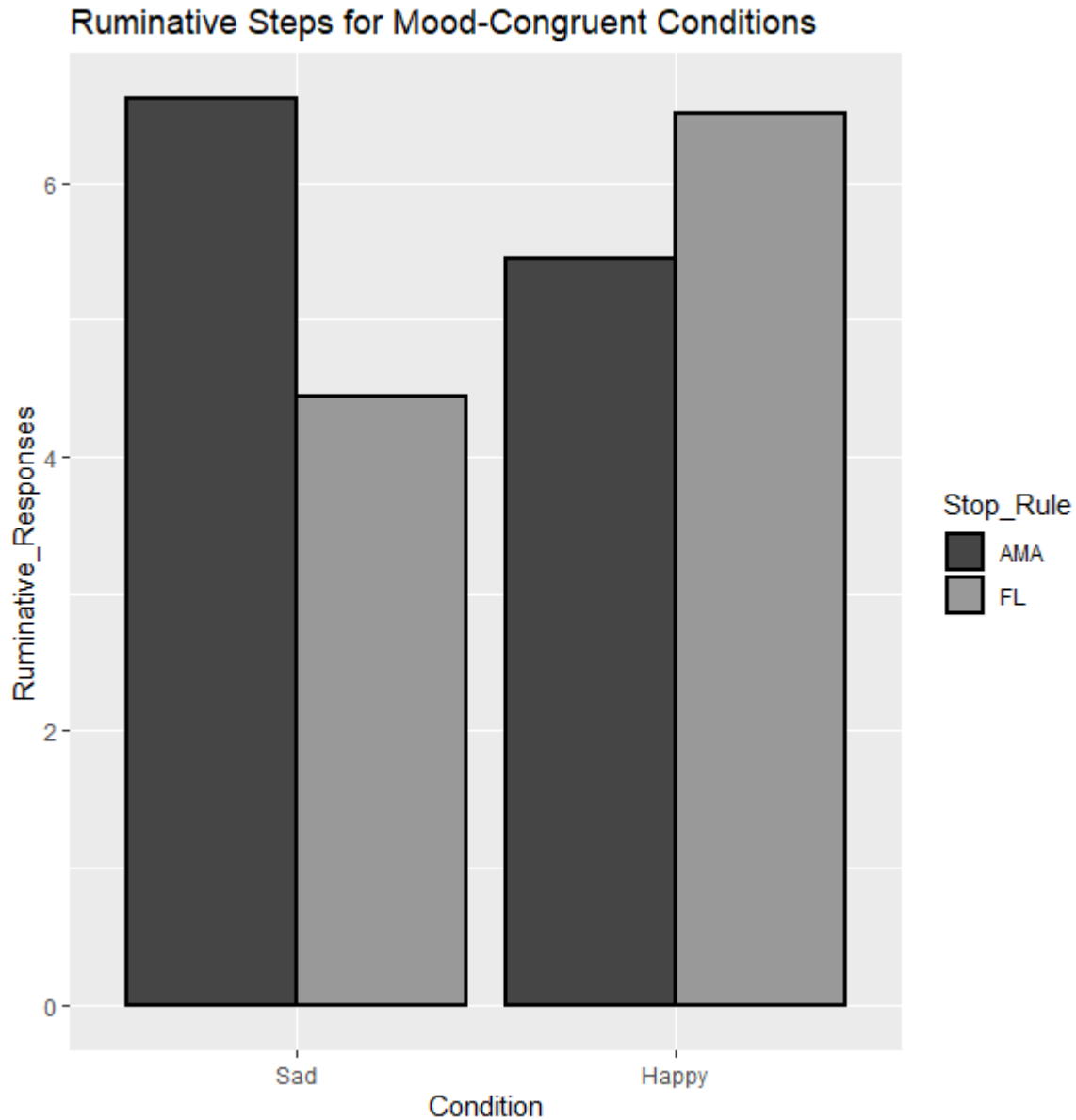
Figure 4. Mean number of ruminative steps for participants in conditions in which interview valence and primed mood are congruent. "Sad" = sad mood condition; "Happy" = happy mood condition; "AMA" = as-many-as-can stop-rule; "FL" = feel-like stop-rule.
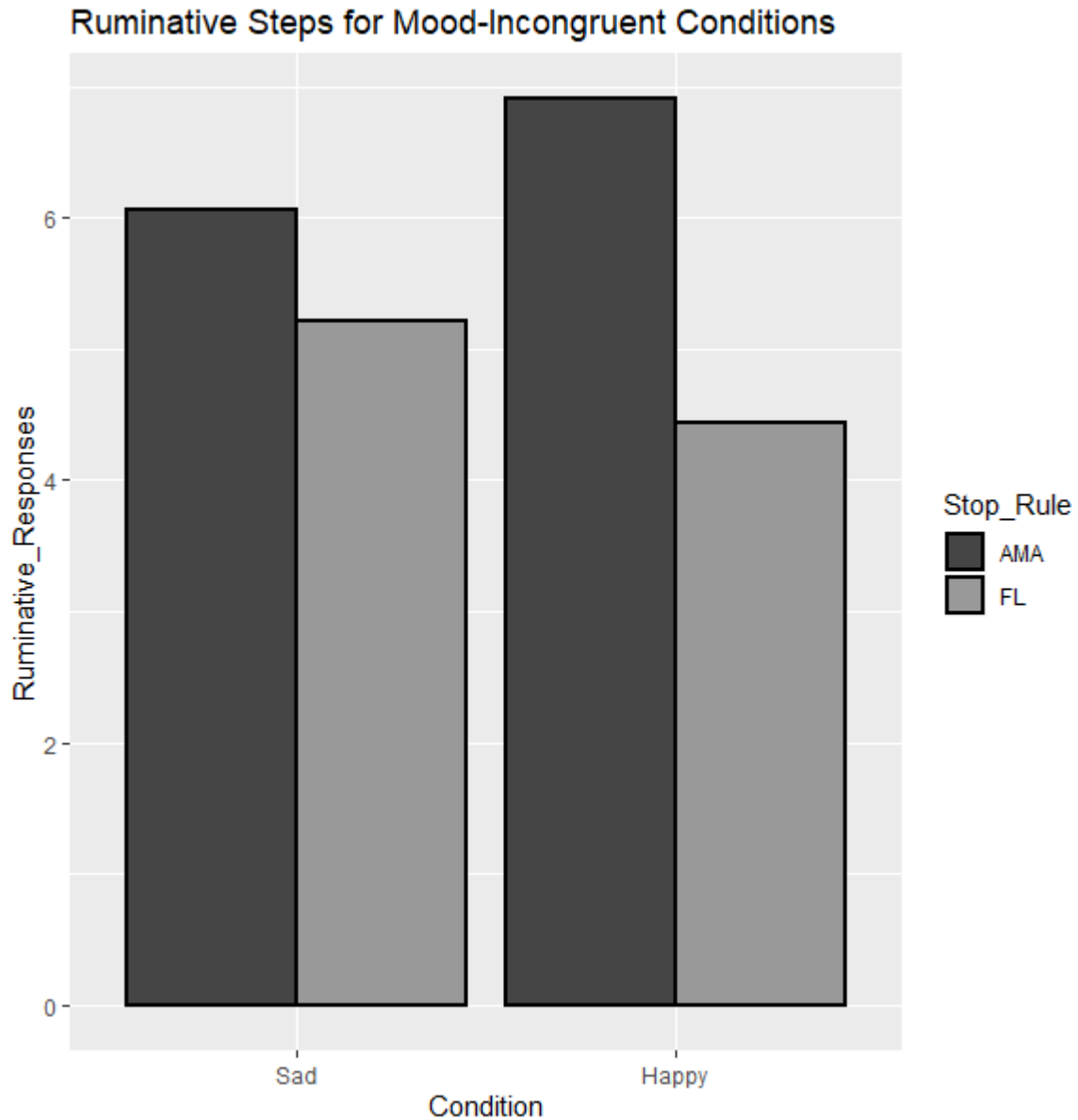
Figure 5. Mean number of ruminative steps for participants in conditions in which interview valence and primed mood are incongruent. "Sad" = sad mood condition; "Happy" = happy mood condition; "AMA" = as-many-as-can stop-rule; "FL" = feel-like stop-rule.