

On the relationship of negative mood and creative performance in light of the Regulatory Focus Hypothesis

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Abstract

Background. The mood-creativity relationship remains poorly understood with most studies focusing solely on positive moods. Yet, mood is one of the most popular predictors for creativity, because of its natural pervasive influence. With regard to mood, three dimensions have been meaningfully related to creativity: Hedonic Tone, Level of Activation, and Regulatory Focus. From these three dimensions, literature on the Regulatory Focus is the least extensive and most contradictory. The Regulatory Focus Hypothesis defines two systems, one with a promotion-focused approach and one with a prevention-focused approach. Research seems to be in consensus about the finding that moods with a promotion focus foster creativity. However, literature on a potential link between moods with a prevention focus and creativity present mixed findings regarding the direction of effects. Therefore, the present study compares two precise negative mood states, each corresponding to one of the two regulatory systems, and measures their effect on creative performance.

Method. A total of 69 participants with an age range from 18 to 32 were recruited through convenience and snowball sampling. The participants were randomly assigned to three different mood conditions (anger, fear, neutral), and they had to conduct a creative performance task focused on divergent thinking. Manipulation was evaluated afterwards.

Result. The manipulation check revealed that mood was just partially manipulated as only the valence but not the arousal level of mood was significantly influenced. Next to that, a one-way ANOVA showed no statistically significant difference between the three mood conditions regarding scores on the creative performance task.

Conclusion. Overall, the present study did not find any differences in effect size or any significant effect for neither the promotion-focused mood nor the prevention-focused mood concerning creative performance. But, since mood was not fully manipulated, these findings should be interpreted with caution. More research is crucial to understanding the relationship between negative moods, the regulatory focus and creativity.

Keywords: creativity, mood, regulatory focus, promotion-focus, prevention-focus, hedonic tone, level of activation

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Introduction

“Feeling and longing are the motive forces behind all human endeavour and human creations”

- Albert Einstein, *Religion and Science*

Creativity possesses essential qualities for human survival and prosperity. Accordingly, it has a far-reaching and substantial research history and has become an important subject to education (Politis & Houtz, 2015). In psychological sciences, it is a well-known fact that emotions nurture creativity (Kaufman & Sternberg, 2019). This actuality has led to another sub-field of creativity research which investigates the less intense and subtle affective states of moods (Kaufman & Sternberg, 2019).

The mood-creativity-relationship is one of the most studied subjects in creativity research. Nonetheless, literature presents mixed findings about the nature of this relationship, as creativity seems to be equally affected by opposing mood states (Kaufman & Sternberg, 2019). For instance, according to research by Baas et al. (2015), happiness facilitates creative thinking and promotes cognitive performance. Yet, the mad genius hypothesis holds that creativity can be associated with negative emotions and even psychopathology (Simonton, 2014). Concurrently, another study states that a relaxed mood is the strongest predictor of creativity (Caballero-García et al., 2018). – Although research on the mood-creativity relationship appears to be conflicting, the body of literature suggests that mood does have an effect on our creative capacity (Baas et al., 2008). This, however, begs the question as to which approach is correct: Which mechanisms underly the complex relationship between mood and creativity?

To date, three dimensions were identified to have a significant relation to creativity: Hedonic Tone, the Level of Activation, and the Regulatory Focus (Table 1) (Baas et al., 2008). From these three, hedonic tone and the level of activation have been studied extensively in the history of creativity research (Baas et al., 2008). For this reason, the regulatory-focus hypothesis will be focused on and introduced in greater detail. To come closer to an understanding of the relationship between mood and creativity, a well-founded conception of both must first be developed, starting with a definition of mood.

Mood

Affect, mood and emotion all define human emotional phenomena and are often mistakenly viewed as interchangeable. Affect is a complex construct that underlies emotional experience and an umbrella term for both emotions and moods (Kleinstäuber, 2013). Emotions are defined as one affective aspect of consciousness; a subjective mental experience that is

directed towards a specific stimulus and tends to result in physiological and behavioural changes (The Merriam-Webster.Com Dictionary, 2022). In contrast to emotions, moods are less specific and less intense subtle affective states that are non-object oriented - they occur without a definite or external cause. They are longer lasting states and can be understood in 'positive' and 'negative' terms i.e., 'good' and 'bad' moods (Kleinstäuber, 2013).

Three approaches to the mood-creativity link

In general, the literature on the mood-creativity relationship can be divided into three separate lines of research. First, large amount of research was conducted on the relation between positive moods and creativity with the majority of studies examining the effects of happiness. This research axis has led to the generalization that positive-mood-enhances-creativity, with consensus among researchers that positive mood fosters creativity across a range of tasks more than negative or neutral moods (Davis, 2009b). In line with this generalization, Ashby, Isen, and Turken (1999) concluded that positive moods can be associated with cognitive flexibility and enhanced creative problem solving across a range of settings. Although, research seems to largely agree that positive moods stimulate creativity, this belief is sometimes contradicted. For example, by a study showing that neutral moods can have an effect over positive moods in enhancing creativity (Baas et al., 2008). The second line of research investigates the relationship between negative mood and creativity and appears to be even more complex. Many studies such as one lead by de Dreu et al. (2008) examined the effects of depressive moods and sadness and came to the conclusion that negative emotions lead to less creative fluency and originality. Concurrently, in her paper 'paradoxical mood effects on creative problem-solving', Vosburg (1997) argued that negative moods play a significant role in the problem-solving facet of creativity. While such inconsistencies lead some to believe that there is no inherent effect of negative mood on creativity, others have suggested that more research and new theories need to be developed to address this complex relationship (Baas et al., 2008). The final line of inquiry compared the effects of negative and positive moods on creativity. To no surprise, the results of this comparison also suffer from contradictory findings. That is, while directly comparing positive with negative moods, some studies concluded that positive moods have a greater effect on creativity than negative moods, although other studies found evidence of a reversed effect (Baas et al., 2008).

Out of all mood states, happiness is believed to be the strongest predictor of creativity. Yet, its relationship is regarded as small with only three percent of its variance explained. For this reason, one might wonder as to why the relationship between mood and creativity is so

intriguing to investigate (Kaufman & Sternberg, 2019). The popularity of mood as a predictor for creativity can be explained by its natural pervasive influence. Kaufman and Sternberg (2019), for example, stated that „mood often serves as an intermediary state between a host of situational and personality predictors on the one hand and creative performance on the other” (p.257). Differently put, if we further investigate the relationship between mood and creativity, we might be able to produce the right circumstances to actively influence mood states and foster creativity in groups and individuals. This could become particularly important for the work field and educational sector because creativity increases the workplace engagement, leads to better teamwork, and positively influences problem solving ability and productivity, which are only some of its benefits (*The Benefits of a Creative Workplace*, 2022). Therefore, while exploring the relationship, we may come to understand how leadership affects and relates to employee/student mood and creativity, or which stress factors have an impact on creativity and under which circumstances (Kaufman & Sternberg, 2019). For instance, if happiness proves to stimulate creativity, employees and students could listen to happy music to be put in a creativity-enhancing mood. Instead, if we learn that relaxation enhances creativity, employees and students could meditate to induce a relaxed mood. This demonstrate the importance of learning how creativity can be influenced and used to our advantage.

To sum, the large variability and conflicting result of these studies indicate that the relationship between mood and creativity is still poorly understood. Additionally, these studies reveal biases in that only a few negative states have been studied to date, whereas positive mood states have been studied far more excessively and detailed in the past (Kaufman & Sternberg, 2019). Finally, investigating the relationship of mood and creativity could be used to create conditions conducive to creativity which could become particularly important for the work field and educational sector (Baas et al., 2008)

Creativity

Creativity is a relatively new concept of complex and multifaceted nature. Our conception of creativity and its definition are in constant change as it is a vast topic subject to personal preferences and science development (Aleinikov, 2013). In scientific terms, creativity is described as the acceleration of the natural process of organization or termed differently, the deceleration of the natural process of disorganization (Aleinikov, 2013, p.399). In more general terms, creativity can be understood as the use of imagination to generate ideas, insights, and problem solutions in novel and original ways (Baas et al., 2008).

Because there is no consensus over the definition of creativity, measuring it is its own challenge. In addition, the concept cannot be assessed by a single test alone as multiple facets of creativity exist that are commonly measured individually (Said-Metwaly et al., 2017). With reference to mood, for example, creativity has been measured with divergent thinking and insight tasks, ideation tasks as well as general creativity performances (Said-Metwaly et al., 2017). This is a problem insofar as research that attempts to measure creativity cannot be compared to others unless the same measurement is used (Baas et al., 2008). For instance, divergent thinking and ideation tasks measure cognitive flexibility, fluency, and originality. They are open-ended and their goal is to develop multiple alternative solutions. Yet, insight tasks are designed to measure the ability to come up with a single provably correct solution. They present a problem that can only be solved through mental restructuring and a sudden awareness of the problem situation (Baas et al., 2008). However, it is important to differentiate the various facets of creative performance as they may correlate with different psychological functions and therefore are affected differently by distinct moods (Baas et al., 2008).

Hedonic Tone, Level of Activation & Regulatory Focus

The hedonic tone, synonymous with valence, is the affective quality of usually a sensory experience that describes the intrinsic attractiveness (positive valence) or averseness (negative valence) of such experience (Friedman & Carterette, 1996). Whereas mood states such as anger, anxiety and sadness have a negative hedonic tone, mood states like happy, cheerful and relaxed have a positive hedonic tone (de Dreu et al., 2008b). The general line of research suggests that mood states with a positive tone promote creativity more than mood states with a negative tone which gave rise to the ‘hedonic tone hypothesis’ which theorizes that a positive mood increases cognitive flexibility and inclusiveness in general (Baas et al., 2008). In comparison to positive mood, research on negative mood happens to be rather small and explores fewer dimensions of it (Baas et al., 2008). Next to the hedonic tone, mood states can differ in their level of activation and relate to either activating or deactivating states. Mood states can be positive in tone and activating (e.g., happy and elated) or deactivating (e.g., relaxed and calm), or negative in tone and activating (e.g., anger and fear) or deactivating (e.g., sad and depressed) (de Dreu et al., 2008b). Baas et al. (2008) concluded that activating mood states correlate with greater motivation and higher levels of dopamine and noradrenaline as well as improved working memory capacity which is said to promote cognitive flexibility, abstract thinking, processing speed and to lead to better long-term memory retrieval. Such effects, however, have not been found for deactivating mood states (de Dreu et al., 2008b). Apart from that, it is important to

mention the Yerkes Dodson Law, which describes the interaction between optimal performance and task difficulty. It holds that too little arousal does not provide enough incentive to affect performance and that too much arousal generates higher levels of stress which degrades performance (Teigen, 1994). Therefore, mood states should have just the right amount of arousal to influence creative performance.

Lastly, mood states can be defined in terms of their regulatory focus. According to the Regulatory Focus Hypothesis, individuals pursue goals for their utilitarian value in either a promotive or preventive way to gain pleasure or avoid pain. Correspondingly, two motivational, self-regulatory approaches can be distinguished: the promotion-focused approach and the prevention-focused approach, from which both can be correlated to specific mood states (Mowle et al., 2014). The promotion-focused approach regulates desired outcomes. It is concerned with opportunities and can be associated with approach-related behaviours toward positive end-states (Baas et al., 2011). Thus, if good progress is being made or the desired end state is attained, the feeling of cheerfulness arises. Concurrently, hindered progress in achieving the desired end state leads to dejection-related negative emotions such as anger or disappointment, while sadness and discouragement is caused by failure (Baas et al., 2011). The prevention-focused approach, on the other hand, regulates aversive end states and is oriented toward security and responsibility. Within this approach, avoidance-related behaviours are used to prevent negative outcomes. Thereby, achieved goals are associated with quiescence-related emotions and unfulfilled goals with feelings of tension, fear, and worry (Baas et al., 2011).

Creativity & the Regulatory Focus

So far, the general line of research has argued that mood states with a promotion-focused approach correlate positively with creativity because they promote cognitive flexibility (Baas et al., 2008). In related work, cheerful and happy moods have been found to stimulate cognitive flexibility as well which led some to argue that these two sets of findings might be connected. According to this reasoning, happy and cheerful moods have a greater activation of the promotion system compared to negative or neutral moods which in turn promote creativity (Baas et al., 2008). Another line of work has focused on the potential for an interaction effect between the regulatory focus and the activation level of mood states. Pursuant to this, high activating and promotive moods are said to foster creativity and high activating and preventive moods to inhibit it (Wang et al., 2021). However, these declarations have not yet been proven as research on prevention-focused moods is less consistent and far less substantial than research on promotion-focused moods (Baas et al., 2011). For instance, contrary to the research of Wang

et al. (2021), mood states with a prevention focus such as fear and anxiety have also been shown to positively relate to creativity and to promote such performance or to have no effect on creativity at all (Carlsson, 2002). Thus far, no consensus on the direction nor the potential of an effect for prevention-focused moods on creativity has been reached. Yet, research seems to agree that promotion-focused moods positively affect creativity.

Table 1
Mood states in Terms of Hedonic Tone, Level of Activation, and Regulatory Focus

Positive hedonic tone				Negative hedonic tone			
Deactivating		Activating		Deactivating		Activating	
Prevention focused	Promotion focused	Prevention focused	Promotion focused	Prevention focused	Promotion focused	Prevention focused	Promotion focused
Calm	Happy	Sad	Uneasy				
Serene	Upbeat	Discouraged	Tense				Angry
Relaxed	Elated	Disappointed	Fear				Frustrated
			Disgust				

Note. Retrieved from “A meta-analysis of 25 years of mood-creativity research: Hedonic tone, activation, or regulatory focus?” by Baas, M., de Dreu, C. K. W., & Nijstad, B. A., 2008, *Psychological Bulletin*, 134(6), p. 786. Copyright 2008 by the American Psychological Association

Present study

The current study will focus on the link between different mood states and creative performance in light of the Regulatory Focus Hypothesis, which is depicted in Table 1. The goal is to investigate how each regulatory system affects creative performance, with special attention to the prevention system, as the direction of its effects remains unclear (Baas et al., 2011). Since the two systems were usually examined individually, both will be included and directly compared in this study to account for potential differences in findings due to study design (Baas et al., 2011). Therefore, two precise mood states, each corresponding to one of the two regulatory systems, and their effect on creative performance will be examined. Furthermore, the study will only address negative moods as these are generally less researched than positive moods (Baas et al., 2008), which will likewise create an incentive for discussing the positive-mood-enhances-creativity generalization (Davis, 2009b). For coherence, this study will only contain activating moods instead of deactivating ones as no inherent effect for these has been found so far (de Dreu et al., 2008b). The current study will answer the ensuing research question: *“Does the direction of effects between promotion-focused and prevention-focused moods on creative performance differ?”*

It is expected that moods with a promotion-focused approach will foster creativity while moods with a prevention-focused approach will impede creativity. The following Hypotheses are derived from this research question:

Hypothesis 1: Activating and promotion-focused moods are positively related to and enhance creative performance.

Hypothesis 2: Activating and prevention-focused moods are negatively related to and impede creative performance.

Methods

Study Design

A cross-sectional quantitative experimental design was used to explore the relationship between the two regulatory systems and creative performance and compare their direction of effects. The study consisted of one experimental condition (fear/anger) and one control condition (neutral) and solely focused on negative moods.

Participants

A convenience and a snowball sample were recruited from the online platform SONA and the social media platforms WhatsApp and Instagram. Participants received 0.25 credits for participating on SONA. To be included in the study, participants had to give online informed consent at the beginning and the end of the study and answer all questions provided. A total of 121 participants signed up for the study. After excluding participants who had not completed the study or who had not met the inclusion criteria, the study contained 69 voluntarily participants, from which 21 were assigned to the anger condition, 19 to the fear condition (experimental condition total = 40) and 29 to the neutral condition (control condition total = 29). The sample consisted of 18 male participants, 45 female participants and 6 who identified as non-binary, with an age range from 18 to 32 ($M= 21,89$, $SD= 2.34$). Furthermore, 52 participants identified as German, 7 identified as Dutch, and 10 identified as other. The study was approved by the BMS Ethics Committee (EC) of the University of Twente in April 2022.

Materials

The study was published and accessible on the web-based survey tool, Qualtrics. For its purpose, demographic questions, the Autobiographical Emotional Memory Task (AEMT), a valence and arousal measure for the manipulation check, and the Divergent Association Task (DAT) were utilized. The materials are described in more detail in the subsequent paragraphs.

Demographics

In the demographical questionnaire, participants were asked to indicate their age (total number), gender (male, female, third gender/non-binary, prefer not to say), and nationality (German, Dutch, other). If “other” was selected, participants were able to write down their nationality (Appendix A).

Autobiographical Emotional Memory Task

The AEMT was used to induce either fear, anger or a neutral mood in the participants (Appendix B). It is a widely used method in which an intense experience involving a specific emotion is recalled in vivid detail and written about to evoke that emotion (Mills & D’Mello, 2014). To induce anger and fear, the same instructions as from the experimental study by Mills and D’Mello’s (2014) were utilized. Since no specific instruction was provided in that study to induce a neutral mood, this was derived from the previous instructions.

In the anger condition, participants were given the following instruction: *“Please describe in detail the one situation that has made you the most angry you have been in your life and describe it such that a person reading the description would become angry just from hearing about the situation.”* For the fear condition the instruction *“Please describe in detail the one situation that has made you the most fearful you have been in your life and describe it such that a person reading the description would become afraid just from hearing about the situation”* was used and for participant in the control condition, following instruction was provided, *“Please remember an event where your mood was average, and you felt neither particularly negative nor particularly positive. Realize this and describe it as concretely, vividly and extensively as possible.”*

Valence and Arousal measure: a manipulation check

A short questionnaire on mood was used to test whether the AEMT had worked and if the specific mood state was indeed evoked (Appendix C). The questionnaire consisted of a written version of the Self-Assessment Manikin (SAM), a usually non-verbal pictorial measurement technique that assesses the pleasure, arousal, and dominance of a person’s affective reaction to various stimuli (Bradley & Lang, 1994). For the purpose of this study, only valence and arousal measurements were used. To evaluate valence, participants were presented with the following task, *“Please rate how positive or negative the emotion is that you feel, ranging from unpleasant feelings to pleasant feelings of happiness”*, on a five-point Likert scale, ranging from ‘very positive’ to ‘very negative’. Arousal was evaluated by, *“Please rate how excited or apathetic the emotion is that you feel, ranging from frantic excitement to sleepiness or boredom”*, on a five-point Likert scale, ranging from ‘excited’ to ‘calm’.

Divergent Association Task

An online version of the Divergent Association Task (DAT) was used to measure creativity (Appendix D). It is a psychological test that involves producing ten nouns that are as different from each other as possible in every respect. The difference between these terms is calculated based on their semantic sense and measured by a special algorithm (Olson et al., 2021). The test is a brief measure of the element of creativity called divergent thinking, which represents the ability to generate multiple solutions to loose-ended questions and involves thinking of unrelated ideas (Olson et al., 2021). Five rules apply to the DAT: First, only single English words should be used; second, only nouns and third no proper nouns like specific people should be used. Fourth, no specialised vocabulary, no technical terms, and fifth and

finally, people should think of their own words and not name objects in their surroundings. The DAT has been validated on ~9000 participants from around 98 countries (Olson et al., 2021).

Procedure

Participants received a link via Sona or the used social media platforms that directed them to Qualtrics. Before partaking in the study, participants were presented with the informed consent form which had to be read and signed in order to proceed with the study (Appendix E). This form contained information about the procedure, participant rights, and anonymity and confidentiality in data collection. Next to that, researchers contact information was provided in case participants had further questions. To avoid biased answers, the true purpose of the study was first withheld and introduced as academic research on the effects of memories on creativity.

Starting data collection, participants had to answer several demographic questions after which they were randomly assigned to one of the three mood conditions and conducted the AEMT in which they wrote about an experience that made them feel either fearful, angry, or neutral. Afterwards, they filled out the short mood questionnaire on valence and arousal. Finally, creative performance was measured as they performed the Divergent association task. In a last step, the participants received information on the true purpose of the study and were asked whether they still want to remain participant or withdraw from the study (Appendix F). Overall, the study took approximately 15 to 20 minutes to complete.

Data Analysis

To statistically analyze the data, IBM SPSS Statistics (Version 25) was utilized. Data from participants who did not meet the inclusion criteria were removed from the dataset and a boxplot for the variable creative performance was created to identify possible outliers. Since no outliers have been found, no more data had to be excluded.

First, a manipulation check was conducted to assess whether participants mood, with regards to its valence and arousal, was significantly influenced by the AEMT. Both experimental conditions (fear and anger) had to be compared to the control condition (neutral). Therefore, the variables 'fear' and 'anger' were recoded into a different variable. Subsequently, a one-way ANOVA was performed to compare the groups mood on each, valence and arousal level. In the analyses, mood (valence and arousal) was the dependent variable and the group condition (experimental or control group) the independent variable. The reported group difference (F-value) had to be significant. To determine this, a p-value of $>.05$ was used.

To test whether the regulatory focus affects creative performance, a one-way between subjects ANOVA was performed to compare the effect sizes of the three different mood conditions (anger, fear, neutral) on creative performance. Therefore, creative performance was used as the dependent variable while the mood condition was used as the independent variable. Any significance in group difference was again determined by the F-value and a p-value of $>.05$.

Results

Manipulation Check

A one-way ANOVA was performed to evaluate the mood manipulation procedure, and thus the effectiveness of the AEMT for each condition. The experimental group was compared to the control group with regard to the participants valence and arousal in moods. Both valence and arousal were assessed using a measurement from the SAM.

Valence

Participants in the experimental group had an average valence score of 3.82 ($SD = .90$), while participants in the control group had an average valence score of 2.71 ($SD = .73$). The manipulation effect on valence, therefore, was significant, $F(1, 67) = 30.36, p = < .001$. With respect to the mood's valence, the participants in the experimental group did feel significantly more negative after the manipulation, compared to the control group where the AEMT was not performed.

Arousal

The participants in the experimental group had an average arousal score of 2.97 ($SD = .89$); and the participants in the control group had an average arousal score of 3.13 ($SD = .99$). No significant difference in effect size, comparing the experimental and control group, was found, $F(1,67) = .77, p = .49$. Contrary to predictions, the experimental group did not score higher on the arousal level than the other group, meaning, no manipulation with regards to the mood's arousal had occurred.

Altogether, the valence of mood could be significantly influenced; indicated by a difference in effect size comparing the experimental and control group. When comparing the groups, no such effect could be found for the level of arousal. Thus, a manipulation of mood by the AEMT did only occur partially.

Descriptive Statistics

The descriptive statistics for the different mood conditions of Anger, Fear, and Neutral are displayed in Table 2.

Table 2

Creative Performance scores as a function of different mood states (N=69)

Variable	N	Minimum	Maximum	Mean	Std. Deviation
Anger	21	69.72	89.13	80.31	5.19
Fear	19	67.66	91.69	79.48	6.46
Neutral	29	67.41	85.31	76.82	5.49
Total	69	67.41	91.69	78.48	5.78

Relation between mood condition and creative performance

A one-way between subjects ANOVA was performed to compare the effects of the three different mood conditions, anger, fear, and neutral, on creativity. The test revealed that there was no statistically significant difference between the three groups ($F(2, 66) = 2.85, p = 0.08$). Because the results were not significant, a post hoc analysis was not conducted. In conclusion, no evidence was found that the regulatory focus influences creative performance in any direction as no group differences between the experimental and control group were recorded. Furthermore, and contrary to predictions, no difference in performance between the prevention focused mood (fear) and the promotion focused mood (anger) was found.

Discussion

The purpose of this study was to investigate the role of the regulatory focus in negative moods on creative performance. More specifically, it compared the direction of effects of the two regulatory systems. In that regard, the research focused on one mood resembling a promotion-focused approach (anger) and one resembling a prevention-focused approach (fear); both activating and of negative valence. The mood of participants was manipulated, and it was

hypothesized that a promotion-focused mood fosters creativity and that a prevention-focused mood impedes it.

The first hypothesis predicted that an activating and promotion-focused mood would enhance creative performance. However, no significant effect was found when comparing the anger condition to the other conditions. This implies that a promotion focused mood has no inherent effect on creativity. Consequently, hypothesis one must be rejected. The second hypothesis predicted that an activating and prevention-focused mood would impede creative performance. Here, again, a non-significant effect when comparing the fear condition with the remaining groups was found. Thus, no evidence that a prevention focused mood affects creative performance was shown and the second hypothesis must be rejected as well.

Regulatory focus and creativity

According to research from Carlsson (2002), more creative individuals have more anxiety than less creative individuals. It was also found that more creative individuals used multiple defence mechanisms which was positively related to fluency in the creativity test. Because anxiety has a prevention-focused approach, the research conducted by Carlsson (2002) does not align with the current study where no relationship between fear (a prevention-focused approach) and creativity was found, nor is it in unison with the common claim that a prevention-focused approach hampers creativity. A possible explanation for this could be the study design and more specifically the tests used to measure creativity. In Carlsson's study (2002), the Creative Functioning Test (CFT) was used. The CFT assesses the individual's ability to create inventive interpretations of a stimulus picture (Carlsson et al., 2000) as opposed to the DAT which was used in this research study and assesses the individual's ability to create new and original solutions to a problem (Olson et al., 2021). Both tests are a measure of a specific cognitive process that can be an indication of creativity or one facet of it and therefore should be best understood as a measure of creative potential rather than a measure of creativity itself (Cropley, 2000). Simply put, the two tests measure different creative abilities and are not an indication of all creativity but of the abilities they measure which could explain differences in findings. For instance, this could mean that a prevention-focused approach in mood does not influence divergent thinking, but it does increase fluency in individuals. Accordingly, moods with a prevention-focused approach might have a different impact on the various facets of creativity or influence the facets in qualitatively different ways. The same goes for promotion-focused moods. For instance, Hinton (1968) utilized a creative-problem solving task and found that frustration, with a promotion-focus, impedes creativity. At the same time, the current study

found neither a negative relationship between a promotion-focused mood, in this case anger, and creative performance, nor a positive relationship, as the regulatory-focus hypothesis would have predicted. In that respect, the performance task and thus the particular creative facet being measured, might play a causal role in studying the relationship between creativity and mood.

Another potential explanation for the difference in results could be the affective states themselves. For instance, Carlsson (2002) found a positive relationship between anxiety and creativity. However, they measured trait anxiety using the Karolinska Scales of Personality (KSP), a self-rating questionnaire that assess personality traits, whereas this research study used the Autobiographical Emotional Memory Task (AEMT) to induce a specific mood state. The important difference here is that anxiety by Carlsson (2002) is measured as a personality trait which implies consistency and stability and reflects individual's characteristic patterns of behaviour, feeling, and thought (*APA Dictionary of Psychology, 2022*). Meanwhile, moods such as in this study are only short-lived affective states of low intensity (*APA Dictionary of Psychology, 2022*). Simply put, the two studies measure different objects: traits as steady over time and moods as changing over time. Yet, they are likely to be compared to one another (Baas et al., 2008). Thus, although Carlsson's study (2002) on anxiety and the current study on fear might both have a prevention focus, they still differ in terms of conceptualization and consistency, which could explain at least part of the differences. In this line of reasoning, personality traits might yield a different effect on creativity than moods that cannot be compared, even if they make use of the same regulatory system.

In an alternative explanation for the same studies, the differences could also be a function of the type of the study, that is, whether the study is correlational or experimental. As compared with the study led by Carlsson (2002) which made use of a correlational design and used a questionnaire to assess anxiety, the current study made use of an experimental design and directly induced a negative mood. This brings about the issue of causality. While Carlsson's (2002) study could only show an association between creativity and anxiety, the current research study could have established causality, in that, a prevention-focused mood causes creativity. This brings about a possible explanation for the differences between the studies and shows how important it is to distinguish between different study designs when comparing results. Additionally, the mood induction procedure must be considered. For example, an experimental study led by Andreasen (2008), very similar to the current one, found a significant negative relationship between fear and creative performance, while measuring cognitive fluency, flexibility, and originality. In contrast to the current study, they successfully induced mood using a two-stage imaginary task technique and were able to show that a negative

prevention-focused mood can impede creativity (as predicted by H2). This could give rise as to why the current study did not find any connection between the regulatory focus and mood; simply because it failed to fully induce the moods of fear and anger as a function of the mood induction procedure used. In that line of reasoning, different mood induction procedures vary in effectiveness. Thus, the mood induction procedure could be a decisive moderator for the potential effects of mood on creativity. To provide an example, Baas et al. (2008) identified four relevant mood-induction procedures; these are emotion inducing materials, emotional treatment, imaginary techniques, and a combination of these procedures.

Next, the studies above all used a different population group. For example, Chen et al. (2014) focused solely on seventh- and eighth grade students, compared to the current study which used data from individuals that were at least 18 years of age. In this case, the developmental stage of the population could give rise to differences in findings. That is, creativity differs depending on age as it seems to quantitatively increase through the years of childhood and adolescence (Urban, 1991). In another study, the population group consisted of adult writers and other highly creative individuals (Andreasen, 2008). To no surprise, participants in this study scored generally higher on creative performance tasks compared to participants from the studies mentioned above. This indicates that different findings in the studies might be caused by the population they used to measure the effect of mood on creativity.

Other possible differences in research might be explained by the task framing and the time on the task. For example, research from Friedman et al. (2007) argues for the importance of task framing. He claims that positive versus negative moods have an influence on creativity that is depended on the task framing. According to this, creative tasks should match the valence of a mood in the motivational orientation they respectively cause. Hence, creativity tasks for negative moods should match serious task framing while fun task framing should be used for positive moods (Friedman et al., 2007). For this reason, the current study made use of a serious task framing to create optimal conditions for testing negative moods on creative performance. Still, many other studies do not consider the task framing as explained by Friedman et al. (2002) and use, for example, fun task framing for negative moods or serious task framing for positive moods, which may explain the differences in findings (Baas et al., 2008).

Next, Kaufmann and Vosburg (2002) provided evidence for a mood-production time interaction. Pursuant to their research, negative moods lead to better task performance in late production. Thus, to evaluate the negative mood-creativity relationship, more time should be given on the task to generate significant results. Consequently, the current study provided unlimited time for the creative performance task. But again, this is not always the case, and

many other studies use a time limit when investigating the effects of negative moods on creativity, which creates more ground for potential differences in findings as well (Baas et al., 2008).

Strengths and limitations

The current research study showed some practical limitations which must be considered when interpreting the results. First, the mood manipulation check revealed only a partial mood induction as only the valence of the participants mood was significantly influenced by the AEMT, compared to the level of arousal which was not significantly influenced. This is a crucial limiting factor because the level of arousal has to be just right to affect performance as according to the Yerkes-Dodson Law (Teigen, 1994). Consequently, the arousal level had no impact on the creative performance of the participants in this study. Another limitation, concerning the manipulation procedure, is that the validity of the AEMT is dependent upon the extent to which it can evoke the precise mood without evoking any other mood concurrently (Mills & D'Mello, 2014). Taken together, mood did become more negative after the AEMT, but it was not effectively influenced in terms of arousal, nor did it become clear which precise moods were actually evoked after the manipulation procedure.

Another limitation to the study was the range of creative facets covered by the performance task. The DAT measures only verbal creativity and divergent thinking which are only two components of the multifarious and complex conception of creativity (Olson et al., 2021). As previously stated, the task is not an indication of all creativity but of one specific characteristic of it. A third limitation is that this study solely focused on negative moods because these are generally less researched (Baas et al., 2008). Thus, no full picture on the relationship between the regulatory focus and creativity including positive as well as negative moods was obtained. Furthermore, after the exclusion of participants who did not meet the inclusion criteria or who did not complete the study, the sample size became a restricting factor which is alarming in terms of the validity and the generalizability of the results (Charter, 1999). Lastly, the group division is problematic since nearly half of the participants were assigned to the mood neutral, the control condition. Compared to that, significantly less participants were assigned to the fear and anger, the experimental conditions. Considering that the sample size is already a restricting factor, the group division is affected all the more. For these reasons, the results should be interpreted with caution.

Next to the limitations, the study also contained some notable strengths. A major strength are the potential benefits in identifying mood states and the right circumstances,

especially for the work field and educational sector which were discussed before (Kaufman & Sternberg, 2019). Besides, the study provides further insights into the less studied negative mood states and the regulatory focus hypothesis, in contrast to previous research, which focused primarily on positive affective states and favourably examined the level of arousal instead of the regulatory focus (Baas et al., 2008). Additionally, the current study directly compared a promotion-focused mood with a prevention-focused mood to account for potential differences in findings due to study design as the two were usually investigated individually (Baas et al., 2011). Another strength is the DAT that was validated on ~9000 participants across the world which makes it a good measure to assess verbal creativity and divergent thinking. Like the AEMT it also enables a comparison between results from different studies. Moreover, the study design allowed for insightful and reliable findings as it used an experimental design that investigated a possible causal association between negative mood and creativity. Next to that, the task framing and the time limit for the task enabled an optimal investigation of the relationship between negative mood and creativity. That is, as consistent with the studies by Friedman et al. (2007), task performance was formulated seriously in the current study; corresponding to the mood in its motivational orientation. The performance task also did not have a time limit which benefited the study as well, because negative moods lead to better task performance in late production (Kaufmann & Vosburg 2002).

Future Recommendations

With regard to creativity measurements, future research must consider using more than one performance task and cover as many characteristics of creativity as possible. By this means, the study's findings are more generalizable and provide greater insight into the relationship between creativity and mood (Charter, 1999). This also facilitates comparisons between the own and other studies, since using multiple creativity measurements allows for comparisons between multiple studies (Charter, 1999).

Moreover, future research should make use of another mood induction procedure alongside the AEMT or extend the manipulation check and include post-writing ratings when using it. These were not covered in the current study, but they are important to assess whether other moods besides the ones intended, were induced as well (Mills & D'Mello, 2014). This way, the mood manipulation can be evaluated more precisely. (again a new paragraph) Next to that, the sample should be more balanced in terms of group division. Therefore, future research should consider using a different group division method alongside Qualtrics or monitor the assignment of participants more frequently. In such wise, the sample becomes more evenly

distributed regarding the mood condition and provides greater insight into the topic at hand. Future studies should also consider using more or a different sampling procedure to obtain a larger sample size and leave more time for data collection. Apart from that, it should be assured that the total number of participants is adequate to obtain significant and generalizable results. For example, a power analysis could be used for this.

Since this study was not able to sufficiently induce the intended moods, more research comparing the promotion-focused approach with the prevention-focused approach should be conducted. As for the scope of this study only negative moods were examined, it is also recommended to include positive moods when comparing the effects of the two regulatory systems with creative performance. This way, a more complete picture of the relationship between the regulatory focus and creativity will be obtained.

Conclusion

The mood-creativity relationship remains poorly understood with most studies focusing solely on positive and activating moods (Kaufman & Sternberg, 2019). In line with this, from the three mood dimensions, Hedonic Tone, Level of Activation, and Regulatory Focus, the latter has been studied the least extensively and continues to be the most contradictory (Baas et al., 2008). With regard to the Regulatory Focus Hypothesis, research seems to agree on the finding that moods with a promotion focus foster creativity. Yet, no such consensus on the direction of effects of moods with a prevention focus has been reached so far (Baas et al., 2008). The aim of the present study was to compare these two regulatory systems and their effects on creativity using negative moods. In contrast to the expectations, this study found no evidence that either of the regulatory systems has an impact on creative performance. No difference between the fear, anger, or neutral mood condition was found. These findings are contradictory to most previous research (Simonton, 2014; Caballero-García et al., 2018; Baas et al. 2015), but they offer important insights and avenues for future implications. However, it is important to mention that the manipulation procedure was not able to fully induce the intended mood which is why the results should be interpreted with caution. Lastly, more research is crucial to understanding the relationship between negative moods, the regulatory focus, particularly prevention-focused moods, and creativity.

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Appendix A: Demographic questions

Please indicate your gender.

- Female
- Male
- Non-binary/third gender
- Prefer not to say

What is your age in numbers?

Please indicate your Nationality.

- German
- Dutch
- Other (please specify)

Appendix B: Autobiographical Emotional Memory Task (AEMT)

Mood induction – Anger condition:

Please describe in detail the one situation that has made you the most angry you have been in your life and describe it such that a person reading the description would become angry just from hearing about the situation.

Mood induction – Fear condition:

Please describe in detail the one situation that has made you the most fearful you have been in your life and describe it such that a person reading the description would become afraid just from hearing about the situation

Mood induction – Neutral condition:

Please remember an event where your mood was average, and you felt neither particularly negative nor particularly positive. Realize this and describe it as concretely, vividly and extensively as possible.

Appendix C: Valence and Arousal measure

Please rate how positive or negative the emotion is that you feel, ranging from unpleasant feelings to pleasant feelings of happiness

Very Positive	Positive	Neutral	Negative	Very Negative
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please rate how excited or apathetic the emotion is that you feel, ranging from frantic excitement to sleepiness or boredom

Excited	Wide-awake	Neutral	Dull	Calm
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Appendix D: Divergent Association Task (DAT)

Instructions:

Please enter 10 words that are as **different** from each other as possible, in all meanings and uses of the words.

Rules:

Only **single words** in English.

Only **nouns** (e.g., things, objects, concepts).

No proper nouns (e.g., no specific people or places).

No specialised vocabulary (e.g., no technical terms).

Think of the words **on your own** (e.g., do not just look at objects in your surroundings).

1 (enter a single noun)	<input type="text"/>
2 (enter a single noun)	<input type="text"/>
3 (enter a single noun)	<input type="text"/>
4 (enter a single noun)	<input type="text"/>
5 (enter a single noun)	<input type="text"/>
6 (enter a single noun)	<input type="text"/>
7 (enter a single noun)	<input type="text"/>
8 (enter a single noun)	<input type="text"/>
9 (enter a single noun)	<input type="text"/>
10 (enter a single noun)	<input type="text"/>

Appendix E: Informed Consent

INFORMED CONSENT

Welcome! I am an undergraduate psychology student at the University of Twente investigating the impact of memories on creativity.

PROCEDURE

The goal of this study is to explore the effects of memories on creativity. Using the Autobiographical Emotional Memory Task (AEMT), you will be asked to recall and write about an experience. You will then be asked to complete a task to measure creativity. It takes approximately 15-20 minutes to complete this survey.

PARTICIPANT RIGHTS

Your participation in this research is entirely voluntary. You have the right to withdraw from the study or refuse to answer any question at any time and do not have to justify your decision.

DATA COLLECTION

During this research you will be asked to provide personal data. Personal data is information that can directly or indirectly identify you as an individual. All recorded data will be anonymous and cannot be tracked back to the participant. It will be handled only by the researcher, supervisor and co-operator. This study is conducted in cooperation with Jay A. Olson, PhD (Harvard University). For more information about this study, please contact me at any time: g.e.frankert@student.utwente.nl

P.S.: This survey contains a completion code for SurveySwap.io

I hereby declare that I have read the above instructions and give consent to participate in this study:

- I agree.
- I do not agree.

Appendix F: Information provided at the of the

Thank you for participating in this study!

Purpose of the study

Before participating in this study, you were informed that the goal is to explore the effects of memories on creativity. More specifically, the recorded data is used to investigate the role of the Regulatory focus Hypothesis in creativity, for which two motivational approaches are explored using negative moods. Therefore, your mood was manipulated and a specific negative mood state, which can be associated with a motivational approach, was induced. Lastly, you were asked to conduct the divergent thinking task to measure your creativity.

The true purpose of the study was not disclosed prior to completion in order to eliminate the possibility that your responses are biased because you were aware of the full purpose.

In case of further questions, please contact me:

(Greta Fränkert, researcher, g.e.frankert@student.utwente.nl)

If you wish to withdraw from this study, you can indicate so and your recorded data will be deleted and not utilized in any way.

- o I want to remain participant in this study.
- o I want to withdraw from this study.