

Can We Think Our Way to Happiness? The Role of Mindfulness and Reappraisal in Emotion Regulation

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Abstract

Mindfulness and cognitive reappraisal have been studied separately, but their overlapping qualities and benefits are still not clear. Extensive research has shown the effectiveness of mindfulness-based interventions, however, it is still uncertain the role these mechanisms play in emotion regulation. Also, past research has demonstrated how sometimes cognitive strategies can increase psychological and physiological arousal. Thus, it is important to further study why and when a cognitive, top-down strategy is more effective and when a bottom-up emotion regulation strategy is better for reducing anxiety. For instance, is a baseline of dispositional mindfulness needed first before cognitive reappraisal can be beneficial to an individual? Emotion regulation strategies are key in not only maintaining an equilibrium in wellbeing, but also being able to thrive. This research tested 40 participants in the lab, giving them either a mindfulness based or a cognitive reappraisal based strategy to regulate their anxiety before watching an anxiety inducing film. Physiological and psychological arousal was measured before, during and after the video. Also, dispositional mindfulness was measured to see if more mindful individuals would perform better, regardless of the condition. The Respiratory Sinus Arrhythmia (RSA) mean values were trending to show a lower average for those in the mindfulness condition compared to the cognitive reappraisal condition. Furthermore, Posttest Anxiety was significantly negatively correlated with several of the Five Facet Mindfulness Measures, including Nonjudging, Nonreactivity, and the overall sum score. These findings suggest cognitive reappraisal is a more effective strategy when dealing with acute anxiety in physiological arousal and dispositional mindfulness can lower psychological arousal after experiencing acute anxiety.

Key Words: Mindfulness, Cognitive Reappraisal, Emotion Regulation

1. Introduction

“The desire for more positive experience is itself a negative experience. And, paradoxically, the acceptance of one’s negative experience is itself a positive experience.” –Mark Manson

The purpose of this research is to further illuminate the differences and similarities between mindfulness and cognitive reappraisal as emotion regulation strategies. By making this distinction, it will help psychologists understand the changes through which mindfulness regulates emotions, identify overlapping qualities between mindfulness and cognitive reappraisal, and understand if mindfulness leads to a more adaptive emotion regulation.

There is growing body of research of the effectiveness of mindfulness based interventions¹. Moreover, when mindfulness was applied to regulating interpersonal emotions, it was found to alter the perception of emotions at the subjective and physiological level². Furthermore, when comparing adaptive emotion regulation, the ability to respond flexibly to emotions that aligns with one’s goals and promotes positive affect, and mindfulness during the transition to college in freshmen students, Finkelstein-Fox et al. found adaptive emotion regulation abilities showed stronger

cross-sectional and longitudinal associations with wellbeing³. Overall, the findings of this study support that mindfulness and adaptive emotion regulation abilities are related but functionally distinct constructs with different effects on wellbeing depending on the individual's disposition³. As seen in some research, these different effects could be due to the fact that adaptive emotion regulation focuses more on a conscious change of an emotional state in line with wellbeing goals versus mindfulness, which focuses on a non-judgmental relationship with emotions and stressors, leading to increased wellbeing⁴. Another study illuminated the potential differences in emotion regulation styles, finding increased amygdala activity during self-reflection, a more cognitive emotion regulation strategy, compared to the emotion-introspection condition, a mindfulness technique, and utilizing the bottom-up emotion regulation system⁵.

Likewise, in a meta-analysis of neurobiological, psychological and clinical studies of mindfulness and emotion regulation, the studies of expert meditators showed increased use of bottom-up emotion regulation systems, such as the activation of subcortical emotion generation regions, and decreased use of top-down emotion regulation systems⁶. However, other aspects of mindfulness target top-down emotion regulation, including mindful detachment and affect labeling, such as removing negative and positive labels from emotions and events⁶. Here, there is overlap with cognitive reappraisal, which Guendelman et al. suggested the regulatory mechanisms are inseparable since they rely on shared neural networks that are used in emotion regulation⁶. From the applied clinical perspective, cognitive reappraisal strategies through CBT strives to change the emotional state while mindfulness-based interventions change the relationship with the emotional state⁷. Furthermore, Hanley and Garland in a recent study explored the relationship between dispositional mindfulness and positive reappraisal⁸. Throughout five different samples, a significant positive relationship was found between dispositional mindfulness and self-reported positive reappraisal, with qualities of non-reacting and describing more related to positive reappraisal than others. They proposed this could be due to increased cognitive flexibility with increased dispositional mindfulness⁸.

This research used physiological as well as psychological measures to capture arousal responses to anxiety and to understand the effectiveness of the two emotion regulation strategies. An ECG, or electrocardiogram, measured the electrical activity of the heart and gave insight on both the parasympathetic and sympathetic nervous systems. Measures from the ECG provided information on the parasympathetic nervous system by measuring heart rate and respiratory sinus arrhythmia (RSA). Mindware software captured several measures of cardiac impedance, the mechanical activation of the heart, as well as heart rate variability (HRV), in order to show how the sympathetic nervous system is performing by measuring the variation in timing between heart beats⁹. Heart rate and HRV are regulated by the autonomic nervous system, and by measuring high frequency HRV, RSA can be distinguished as it is highly correlated to these frequencies⁹. RSA depicts the variability in heart rate and illuminates the parasympathetic innervation of the heart, effected by the vagus nerve¹⁰. Activation of the vagus nerve reduces cortisol levels and inflammation by utilizing the parasympathetic nervous system instead of the sympathetic, which triggers the fight or flight response. Psychologically, the vagus nerve allows individuals to think clearly and process difficult circumstances¹⁰. Thus, activation of the vagus nerve is key in emotion regulation by helping individuals have a lower physiological and psychological arousal.

Previous research has also shown the short term autonomic and cardiovascular effects of meditation increases RSA, leading to activation of the vagus nerve¹¹. In a study of smokers, those who participated in a mindfulness intervention and experienced acute increases in high-frequency heart rate variability during meditation, smoked fewer cigarettes at the follow-up¹². Thus, this research predicted that RSA would be higher in the mindfulness condition compared to the cognitive reappraisal condition as it applies the vagal nerve to the parasympathetic nervous system, allowing for greater self-regulation, emotional expression, and resilience to stress¹³.

Cognitive reappraisal approaches stressors by changing the experience or changing the perspective, while mindfulness accepts the stressor and the emotions with it nonjudgmentally. Cognitive reappraisal is dependent upon context and affective state, and its success is measured in reduction of stress and promotion of positive affect. However, the sustained attention of mindfulness-based emotion regulation is independent of context and affective state, potentially the precursor to emotion regulation itself. Thus, this research proposed mindfulness is related yet separate from cognitive reappraisal as an emotion regulation strategy because it changes a person's relationship to their emotions while cognitive reappraisal changes the reactions to emotions and stressors. Furthermore, this research strove to shed light on the nature of the relationship between mindfulness and cognitive reappraisal within emotion regulation. This research focused on the following questions: Will participants in the mindfulness condition have a lower physiological and psychological reaction than participants in the cognitive reappraisal condition to the anxiety inducing task? Will participants with higher dispositional mindfulness have lower arousal, regardless of condition?

1.1. Hypotheses

Those in the mindfulness condition have lower physiological and psychological arousal than those in the cognitive reappraisal condition. Those with higher dispositional mindfulness have lower physiological and psychological arousal, regardless of the condition.

2. Research Methodology

2.1. Participants

In this study, there were 50 subjects with an age range of 18-26. Students enrolled in Introductory to Psychology and/or any MSU student could participate in this study. Only 40 subjects (20 in each condition) were analyzed as 10 either did not complete the study or they did not have complete results due to errors in the technology. The SONA participant pool comprised of Montana State university introduction to psychology students and any student at MSU who saw the advertisement for the study. Students who currently have existing chronic health conditions and individuals currently taking medication that could affect inflammation and/or blood pressure were excluded from this study. As part of their coursework for PSYX 100, students are asked to participate in research studies to receive credit. Potential participants choose to participate in research time slots that can be located on the SONA online website as part of a requirement for their PSYX 100 course. They were notified on the consent form that participation is voluntary and that there are alternative options to obtain this credit. Also, for students not in PSYX 100, the study was advertised for on campus, leaving it up to the subject whether they chose to participate or not. If the student was not in PSYX 100, they could participate and receive \$20 upon completion of the study.

2.2. Measures And Procedure

The protocol was the same for all participants except they either were instructed to use mindful regulation strategies, or cognitive reappraisal strategies while watching the video segment. Potential participants were first provided a consent form to review and sign if they agree to participate in the outlined research.

2.3. Procedure For Physiological Measures

2.3.1. *procedure for electrocardiogram*

Electrocardiogram (ECG) was recorded to determine heart rate. Six electrodes (circular stickers with a place in the center to attach wires) were placed on the participants. One electrode was placed on the right hip and one electrode was placed on the left hip. One electrode was placed below the left collarbone and one electrode was placed on the lower part of the sternum. One electrode was placed on the back of the neck and the final electrode is placed on the spine, 2 inches above the adjacent location of the electrode located on the sternum. Participants had the option to place the electrodes on themselves or have a researcher assist them. Six wires (one to each electrode) was then attached and participants were given a small box to clip on their pants (MindWare Mobile Impedance Cardiograph, Model 50-2303-00). The ECG data was transmitted to a computer in which the trace of heart rate activity will be recorded. All data transmitted was de-identified. ECG was recorded continuously throughout baseline periods and during the stressor. These values were averaged for each baseline and the stressor period to determine HRV and Impedance data, including mean heart rate, RSA, mean IBI, number of Rs and number of R peaks.

2.3.2. *procedure for blood pressure*

Participants' blood pressure was taken in both of the 10-minute baseline periods, every two minutes, and during the video using an arm-cuff blood pressure measurement machine that was attached at the beginning of the first baseline. Research assistants took and recorded blood pressure.

2.4. Procedure For Psychological Measures

2.4.1. *procedure in-lab surveys*

Participants were asked to take the Perceived Stress Scale (PSS) and the Positive and Negative Affect Schedule (PANAS) after the first baseline period and again immediately after viewing the anxiety-inducing video.

2.4.2. *procedure for in-lab prompts*

Participants were either given a cognitive reappraisal prompt or a mindfulness-based prompt. The cognitive reappraisal prompt, used in prior research,¹⁶ was: “Please try to adopt a detached and unemotional attitude as you watch the film. In other words, as you watch the film clip, try to think about what you are seeing objectively, in terms of the technical aspects of the events you observe. Watch the film clip carefully, but please try to think about what you are seeing in such a way that you don't feel anything at all.”

The mindfulness-based prompt, partially derived from past research,⁵ is: “As you watch the film, feel yourself, be aware about your current emotions and bodily feelings. Notice anything that comes up in your mind or sensations in your body, without judgement and without labeling it.”

2.4.3. *procedure for post-experimental surveys*

Participants were asked to complete a survey that included information about emotion regulation abilities, dispositional mindfulness, general psychological wellbeing and a measurement of mindfulness related practices. The following questionnaires were administered: Five Facet Mindfulness Questionnaire (FFMQ), Difficulties in Emotion Regulation Scale (DERS), Depression, Anxiety and Stress Scale (DASS-21), and the number of times yoga and/or meditation have been practiced in their lifetime, the past year, and weekly habits.

2.5. Procedure For In-Lab Acute Stressor

The ECG electrodes and blood pressure cuff was attached initially and followed by a ten minute baseline period, taking blood pressure every two minutes. Then, participants took the in-lab surveys described above. After the surveys, participants were given one of two prompts to utilize during the video, mindful regulation strategies, or cognitive reappraisal strategies. Participants then watched an anxiety-inducing video film segment, the Russian roulette scene (9'41") from the movie, “The Deer Hunter,” lasting about three minutes while using the strategy they were instructed to use. Two prior studies having used this scene to successfully induce anxiousness^{14, 15}. During the video, two measures of blood pressure were taken. After the video, the participants filled out the in-lab surveys again, followed by a 10 minute baseline period like the first one, taking blood pressure every two minutes.

3. Results

Table 1. An independent samples t-test for psychological measures between the conditions.

		Independent Samples Test								
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Post Test Trait Anxiety	Equal variances assumed	1.982	.167	-.426	38	.673	-.900	2.115	-5.181	3.381
	Equal variances not assumed			-.426	35.629	.673	-.900	2.115	-5.191	3.391
Post Test State Anxiety	Equal variances assumed	.499	.484	.244	38	.809	.650	2.669	-4.754	6.054
	Equal variances not assumed			.244	35.831	.809	.650	2.669	-4.765	6.065
Pre Test Trait Anxiety	Equal variances assumed	.073	.788	.151	38	.881	.500	3.316	-6.213	7.213
	Equal variances not assumed			.151	32.191	.881	.500	3.316	-6.253	7.253
Pre Test State Anxiety	Equal variances assumed	.575	.453	.294	38	.770	.850	2.888	-4.996	6.696
	Equal variances not assumed			.294	35.072	.770	.850	2.888	-5.012	6.712
DERS Score	Equal variances assumed	.074	.787	.644	38	.523	4.650	7.216	-9.957	19.257
	Equal variances not assumed			.644	37.619	.523	4.650	7.216	-9.962	19.262
PANAS Positive Score	Equal variances assumed	3.134	.085	.893	38	.377	1.650	1.847	-2.089	5.389
	Equal variances not assumed			.893	30.694	.379	1.650	1.847	-2.119	5.419
PANAS Negative Score	Equal variances assumed	.993	.325	1.343	38	.187	2.450	1.824	-1.243	6.143

	Equal variances not assumed			1.343	35.098	.188	2.450	1.824	-1.253	6.153
HADS Score	Equal variances assumed	.391	.535	.637	38	.528	1.150	1.807	-2.507	4.807
	Equal variances not assumed			.637	37.866	.528	1.150	1.807	-2.508	4.808
Five Facet Mindfulness Sum Score	Equal variances assumed	.432	.515	-.090	38	.928	-.400	4.424	-9.357	8.557
	Equal variances not assumed			-.090	36.746	.928	-.400	4.424	-9.367	8.567

Table 2. Descriptive statistics of the differences in mean RSA between in the conditions.

Group Statistics					
	condition	N	Mean	Std. Deviation	Std. Error Mean
Video RSA	Cognitive	20	6.12217288974	.933104762234	.208648567848
	Reappraisal		1913	296	466
	Mindfulness	20	5.49098118415	1.25280430184	.280135558143
			0000	8179	669

Table 3. An independent samples t-test between the conditions with Levene's Test for Equality of Variances.

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Video RSA	Equal variances assumed	1.585	.216	1.807	38	.079	.631191705591913	.349299521616737	-.075928207426153	1.338311618609979
	Equal variances not assumed			1.807	35.120	.079	.631191705591913	.349299521616737	-.077837676232155	1.340221087415981

Table 4. Correlation matrix across posttest anxiety and the Five Facet Mindfulness scores.

Correlations

		Condition	Post Test State Anxiety	Five Facet Mindfulness Sum Score	Five Facet Observing	Five Facet Describing Score	Five Facet Acting with Awareness	Five Facet Nonjudging	Five Facet Nonreactivity
Condition	Pearson Correlation	1	-.039	.015	-.020	.092	.147	-.053	-.169
	Sig. (2-tailed)		.809	.928	.902	.572	.364	.748	.298
	N	40	40	40	40	40	40	40	40
Post Test State Anxiety	Pearson Correlation	-.039	1	-.439**	-.118	-.120	-.278	-.440**	-.357*
	Sig. (2-tailed)	.809		.005	.469	.461	.083	.005	.024
	N	40	40	40	40	40	40	40	40
Five Facet Mindfulness Sum Score	Pearson Correlation	.015	-.439**	1	.274	.617**	.713**	.735**	.669**
	Sig. (2-tailed)	.928	.005		.087	.000	.000	.000	.000
	N	40	40	40	40	40	40	40	40
Five Facet Observing	Pearson Correlation	-.020	-.118	.274	1	.207	-.102	-.184	.180
	Sig. (2-tailed)	.902	.469	.087		.199	.531	.257	.266
	N	40	40	40	40	40	40	40	40
Five Facet Describing Score	Pearson Correlation	.092	-.120	.617**	.207	1	.181	.277	.181
	Sig. (2-tailed)	.572	.461	.000	.199		.263	.083	.262
	N	40	40	40	40	40	40	40	40
Five Facet Acting with Awareness	Pearson Correlation	.147	-.278	.713**	-.102	.181	1	.525**	.465**
	Sig. (2-tailed)	.364	.083	.000	.531	.263		.001	.002
	N	40	40	40	40	40	40	40	40
Five Facet Nonjudging	Pearson Correlation	-.053	-.440**	.735**	-.184	.277	.525**	1	.376*
	Sig. (2-tailed)	.748	.005	.000	.257	.083	.001		.017
	N	40	40	40	40	40	40	40	40
Five Facet Nonreactivity	Pearson Correlation	-.169	-.357*	.669**	.180	.181	.465**	.376*	1
	Sig. (2-tailed)	.298	.024	.000	.266	.262	.002	.017	
	N	40	40	40	40	40	40	40	40

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

Table 1 shows an independent two sample t-test of all the psychological measures. There were no significant differences between the conditions in any of the measures. In an independent two sample t-test, see Table 2 and 3, the mean RSA scores during the video trended towards lower values for the mindfulness condition compared to the cognitive reappraisal condition. The mean RSA for cognitive reappraisal ($M = 6.1222$, $SD = 0.9331$) was slightly greater, but not significantly, than the mean for mindfulness ($M = 5.4909$, $SD = 1.2528$). There could be a difference between the conditions for RSA, and perhaps greater power, or more participants, could help detect this. Another finding to note was the negative correlations between the Post Test Anxiety measure, seen in Table 4, which measured both state and trait anxiety after the video, with the Five Facet Mindfulness scores. The Nonjudging and the Nonreactivity sub scores of the Five Facet Mindfulness questionnaire were both significantly negatively correlated with the Post Test Anxiety Score across both conditions, $r(38) = -0.440$, $p = 0.005$, $r(38) = -0.357$, $p = 0.024$. The overall sum Five Facet Mindfulness score is also negatively correlated with Post Test Anxiety, $r(38) = -0.439$, $p = 0.005$. All other physiological measures did not have significant results or clear trends.

4. Discussion

The main physiological finding of RSA trending towards a lower mean in the cognitive reappraisal condition compared to the mindfulness condition did not support the initial prediction of higher RSA occurring in the mindfulness condition. This provides initial evidence that cognitive reappraisal may result in lower physiological arousal in response to an anxiety-inducing task. This study only gave a few sentences of mindfulness-based instruction, and for those not familiar with the techniques may not have been able to utilize them fully. Yet, the Five Facet Mindfulness scores of the participants reflected that all participants had some level of dispositional mindfulness, with the scores ranging from 95-153, and half the participants having scores of 120 or greater. In another study consisting of a population with patients with either a diagnosis of either obsessive-compulsive disorder, major depressive disorder or borderline personality disorder, the participant average sum score was 104, which was significantly lower across all facets compared to the healthy controls¹⁸. Thus, since prior research suggests the regulatory mechanisms involved in mindfulness and cognitive reappraisal are inseparable since they rely on shared neural networks that are used in emotion regulation, and many of the participants had some level of dispositional mindfulness, these two strategies could have worked hand-in-hand⁶. These findings do also help support that cognitive reappraisal could more effectively regulate anxiety in a short term setting. A meta-analysis supports these findings, finding cognitive reappraisal to lead to significant decreases in negative emotions and significant increases in positive emotions in a short term, lab setting¹⁸. While in need of further support, these findings suggest the benefits of a baseline of dispositional mindfulness allowing cognitive reappraisal to be better utilized for acute, anxiety-inducing stressors.

The psychological findings of this research help support the research questions that those in the mindfulness condition will have lower psychological arousal to the anxiety-inducing task, and that those with higher dispositional mindfulness will have less arousal overall, regardless of condition. Dispositional mindfulness was associated with how anxious participants felt after watching the video. Since Posttest State Anxiety measures were negatively correlated with several Five Facet Mindfulness measures, participants with a higher dispositional mindfulness level going into the study either experienced less anxiety overall, or had a faster return to a baseline state after watching the video. The stronger negative correlation of the sub scores, Nonreactivity and Nonjudging, requires further discussion, because perhaps these qualities are more involved with reducing anxiety. Future research should further investigate which facets of mindfulness are most essential in the emotion regulation of anxiety. Overall, those with higher sum Five Facet scores were correlated with lower Posttest Anxiety. While this evidence is preliminary, it could begin to reveal a possible key aspect to the relationship between cognitive reappraisal and mindfulness. A baseline of dispositional mindfulness may allow for other emotion regulation strategies to be used more effectively and more efficiently. Further research is needed in order to demonstrate that mindfulness may create the possibility for successful emotion regulation. The key differences between these strategies are that mindfulness opens the individual up to other strategies by targeting bottom up strategies, first becoming in tune with the body before the mind. In contrast, cognitive reappraisal begins in the mind with a top down, cognitive method⁷. However, since these two strategies may have overlapping qualities and this study did not find strong evidence to support that mindfulness creates a more effective cognitive reappraisal, it is still unclear the exact relationship of these mechanisms in emotion regulation.

4.1. Limitations And Future Directions

There are several weaknesses in this study design. In general, it is difficult to capture actual anxiety in a lab setting. Some people may respond completely differently to a film clip, and this may not represent their normal anxiety response. Also, the ten minute baseline period before the clip could have aided or hindered participants' ability to apply the emotion regulation strategy. For instance, those with higher dispositional mindfulness may have found the ten minute period of sitting in stillness to be meditative. However, those with lower dispositional mindfulness may have felt increased anxiety sitting in silence. This could have impacted how they felt and reacted before, during and after the video. The participants in this study were college students, and these results can only be applied to this population or similar populations. The sample size was small, with only 20 participants in each condition. More diverse demographics and ages along with more participants overall might lead to statistically significant findings.

Future research should keep exploring the origins of dispositional mindfulness, and why some people are innately more mindful than others. Also, research should explore if a baseline of dispositional mindfulness helps with other emotion regulation strategies and with other emotions, besides anxiety.

5. Conclusion

One of the initial goals for this research was to better understand the question: can we think our way to happiness? If mindfulness truly is the necessary precursor, then the answer would be no. However, this study has not been able to determine if this is the correct answer. Perhaps the precise relationship between mindfulness and cognitive reappraisal cannot be found because they are too intricately interconnected; and in this case, there is evidence that both strategies can reduce anxiety-related arousal in different facets.

6. References

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