

A moderated mediation analysis of nightmare lucidity and emotion regulation

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Summary. This study tested whether the mediation effect of nightmare lucidity and volitional control on the association between nightmares and lucid dreams was moderated by dispositional emotion regulation. A total of 238 Chinese young adults were invited to complete the modified Dream Intensity Scale and Perth Emotion Regulation Competency Inventory. The PROCESS Marco analysis supported the mediation effect of nightmare lucidity and volitional control, which was moderated by dispositional emotion regulation. Specifically, the difficulty of regulating positive emotions might paradoxically increase the dreamer's experience of becoming lucid and having volitional control in a nightmare; on the other hand, the competence of regulating negative emotions could enhance the prediction of lucid dreams with nightmare lucidity and volitional control. This suggests that the inclinations toward downregulating negative emotions and losing control over positive emotions in waking life play a part in a transitional state leading from a nightmare to a lucid dream.

Keywords: Emotion Regulation Competency, Lucid Dream, Nightmare, Moderated Mediation, Volitional Control

1. Introduction

There is ample evidence that nightmare frequency is positively related to lucid dream frequency (e.g., Schredl & Erlacher, 2004; Stepansky et al., 1998; Zadra et al., 1992). This relationship appears to be more than merely a correlation in that lucid dreaming could indeed arise from a nightmare episode (Galvin, 1990; Wolpin et al., 1992). Consistently, Stumbrys et al.'s (2014) study revealed that lucid dreams are often triggered by nightmares. According to LaBerge (1985), the awareness or lucidity of dreaming could be triggered by the evolutionary response toward a fearful object. From the functional perspective, consciousness provoked by anxiety enables the dreamer to confront the threat in the dream scene with more cognitive resources. Since nightmare is an anxiety-saturated experience (Belicki & Cuddy, 1991; Zadra et al., 2006), the dreamer in a nightmare is perhaps prone to regaining consciousness and therefore deliberately altering the nightmare scene into the more pleasant one (Schädlich & Erlacher, 2012; Spoomaker & Van Den Bout, 2006; Spoomaker et al., 2003).

Volitional control over dream content, however, does not necessarily cooccur with consciousness during dreaming (Stumbrys & Erlacher, 2017). In other words, the dreamer could become aware of being in a nightmare, yet without the capacity to change the nightmare content. This state of dreaming is labelled as lucid nightmare by Hurd (2009, 2012). In his study, Stumbrys (2018) operationalized lucid nightmare as a nightmare episode with conscious awareness but devoid of volitional control over dream content.

In a content analytical study by Schredl and Bulkeley (2020), however, more than 40% of nightmares showed features similar to lucid dreaming. Of these nightmares with lucid features, 68% of nightmare dreamers were both consciously aware of being in a dream and able to adaptively make a change to the frightening scene (e.g., flying away from the threat); on the other hand, 31% were aware of being in a nightmare without volitionally altering the scene. They observed, furthermore, that the experience of lucid dreaming features in a nightmare might arise from the failure of deliberately awakening from the threatening scene. It is evident that conscious awareness can occur in a nightmare, thereby leading to a lucid nightmare. Moreover, conscious awareness accompanied by volitional control in a nightmare might be a key to turning the alarming scene of a nightmare into a more pleasant experience of lucid dreaming. Therefore, we posited this unique type of nightmares with both the features of conscious awareness and volitional control to be the transitional stage leading from a nightmare to a lucid dream.

Nightmares and lucid dreams are characterized by distinct emotions; fear predominates the affective experience of the former, feeling upbeat and euphoric being common for the latter (Gilchrist et al., 2007; Voss et al., 2013). Intense negative emotions in a nightmare could awaken the dreamer (e.g., Zadra & Donderi, 2000) before the occurrence of conscious awareness and volitional control (Schredl & Bulkeley, 2020), therefore rendering the nightmare-to-lucid-dream transition impossible. The transition from being trapped in a nightmare to lucid dreaming implies a dramatic shift from an unpleasant to a pleasurable experience. This dream process, which mimics the mechanism of affect regulation, is perhaps moderated by the disposition of regulating positive and negative emotions in waking life. It might be that the competencies of upregulating positive emotions and downregulating negative emotions might augment the triadic relation among the occurrence of nightmares, nightmares with lucid features, and lucid dreams.

Thus far, no study has examined whether this triadic relation would be moderated by dispositional emotion regulation. In filling the gap, the present study was carried out to

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test two hypotheses using the PROCESS Marco package (Hayes & Rockwood, 2016). First, nightmare intensity was hypothesized to predict lucid dream intensity via the intensity of nightmare lucidity and volitional control (PROCESS Marco Model 4, see Figure 1). Second, the competencies of regulating positive and negative emotions would moderate the mediation relation proposed in the foregoing hypothesis (Model 75, see Figure 2).

2. Method

2.1. Participants

The convenient sample contained 238 Hong Kong Chinese adults (male = 87; female = 151) recruited primarily through a university’s communication platform. The ages ranged from 18 to 62 years old (M = 32.52, SD = 10.60).

2.2. Measures

Dream Experiences. The subjective intensities of nightmares and lucid dreams were measured by the Bad Dreams subscale and the Altered Dream Episodes factor of the Dream Intensity Scale (DIS; Yu, 2008, 2010, 2012), respectively. The DIS Bad Dreams subscale consists of items measuring the frequencies of nightmares and nightmare awakening. Lucid dreaming can be deliberately induced or arise spontaneously (LaBerge, 1985). The former is captured by the DIS Autosuggestion subscale, the latter being measured by the DIS Lucid Dreaming subscale. Therefore instead of the DIS Lucid Dreaming subscale, the DIS Altered Dream Episodes factor, which comprises both the DIS Lucid Dreaming and Autosuggestion subscales, was utilized. In addition to the DIS Bad Dreams subscale and the Altered Dream Episodes factor, six items were developed to measure the aggregate frequency of experiencing conscious awareness (two items) and volitional control (four items) in nightmares (see Table 1), with reference to the DIS and the Lucidity and Consciousness in Dreams Scale (Voss et al., 2013). These six items constituted the DIS subscale of Nightmare Lucidity and Volitional Control. All items were rated on a 10-point scale (0 = Never to 9 = Almost every night). As indicated by Cronbach’s α coefficients, the internal reliability for all three dream measures was good: DIS Bad Dreams = .75; DIS Altered Dream Episodes = .85; and DIS Nightmare Lucidity and Volitional Control = .89.

Emotion Regulation Competency. The Perth Emotion Regulation Competency Inventory (PERCI; Preece et al.,

Table 1. Items of DIS Nightmare Lucidity and Volitional Control

New Items	
Conscious Awareness in Nightmares	
	Have you ever become aware during a nightmare that you are dreaming?
	Have you ever become aware during a nightmare that the things you are experiencing are not real?
Volitional Control in Nightmares	
	Have you ever been able to control the contents of your nightmares and make things happen in them at will?
	In your nightmares, have you ever become able to manipulate or control other dream characters in a way that would be impossible in waking?
	In your nightmares, have you ever become able to change or move objects in a way that would be impossible in waking?
	In your nightmares, have you ever successfully performed supernatural actions (e.g., flying or passing through walls)?

2018), which was developed based on Gross’s (2015) process model of emotion regulation, was utilized to measure dispositional affect regulation. The PERCI consists of 2 major subscales, which measure respectively the overall levels of difficulties regulating positive and negative emotions. Each item was rated on a 7-point scale (1 = Strongly disagree to 7 = Strongly agree). A larger score indicates a lower level of competency in emotion regulation. The Cronbach’s alpha values of both subscales were excellent in this study (Negative-Emotion Regulation, $\alpha = .89$; Positive-Emotion Regulation, $\alpha = .92$).

2.3. Procedures

The participants were invited to complete either the paper version or the online version of the questionnaire set. Informed consent was obtained prior to the beginning of the study.

2.4. Statistical Analysis

Pearson’s r with the bootstrapping method was used to examine the correlations between the DIS Bad Dreams, DIS Altered Dream Episodes, DIS Nightmare Lucidity and Volitional Control, and the PERCI Negative-Emotion Regulation and PERCI Positive-Emotion Regulation. The mediation analysis using PROCESS Marco model 4 was then con-

Table 2. Correlations between Dream Variables, Emotion Regulation, and Age

	DIS Bad Dreams	DIS Altered Dream Episodes	DIS Nightmare Lucidity and Volitional Control	PERCI Negative Emotion Regulation	PERCI Positive Emotions Regulation
Age	-.180** [-.303, -.065]	-.324*** [-.413, -.224]	-.236*** [-.329, -.139]	-.092 [-.233, .049]	-.066 [-.185, .057]
DIS Bad Dreams		.375*** [.230, .507]	.465*** [.367, .554]	.169* [.031, .311]	.076 [-.056, .201]
DIS Altered Dream Episodes			.759*** [.668, .828]	.152* [.004, .275]	.212** [.093, .323]
DIS Nightmare Lucidity and Volitional Control				.204** [.068, .331]	.280*** [.155, .399]
PERCI Negative Emotion Regulation					.500*** [.382, .606]

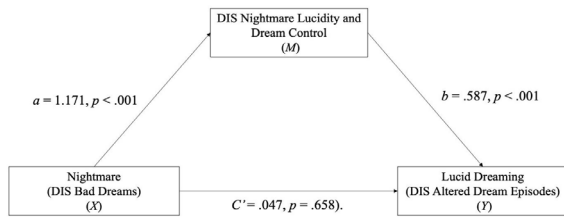


Figure 1. The mediation effect of the intensity of nightmare with lucid features (PROCESS Marco Model 4)

ducted to test the mediation effect of the DIS Nightmare Lucidity and Volitional Control (M) on the relation between the DIS Bad Dreams (X) and DIS Altered Dream Episodes (Y). Finally, the moderated mediation analysis using the model 75 of PROCESS Marco was conducted to test whether the abovementioned mediation effect would be moderated by the PERCI Negative-Emotion Regulation (W) and PERCI Positive-Emotion Regulation (Z).

3. Results

There was a significant correlation between the DIS Bad Dreams and DIS Altered Dream Episodes scores ($r = .375, p < .001, [.230, .507]$; see Table 2). Moreover, the DIS Bad Dreams score was significantly related to the score of PERCI Negative-Emotion Regulation ($r = .169, p = .011, [.031, .311]$), the DIS Nightmare Lucidity and Volitional Control score being significantly correlated with both the PERCI Negative-Emotion Regulation ($r = .204, p = .002, [.068, .331]$) and Positive-Emotion Regulation subscales ($r = .280, p < .001, [-.155, .399]$). Similarly, the DIS Altered Dream Episodes score was correlated with the PERCI subscales.

3.1. The Mediation Effect of Nightmare Lucidity and Volitional Control

Since age was significantly correlated with all three DIS scores, it was statistically controlled in the following me-

Table 3. Summary of Moderated Mediation Effects

PERCI Negative Emotion Regulation	PERCI Positive Emotion Regulation	Moderated Mediation Effect	BCa 95% CI
-1 SD	-1 SD	0.6727	[0.3235, 1.0408]
-1 SD	0 SD	0.9769	[0.5772, 1.3847]
-1 SD	+1 SD	1.3019	[0.6714, 1.9326]
0 SD	-1 SD	0.4601	[0.2228, 0.7898]
0 SD	0 SD	0.7158	[0.5172, 0.9910]
0 SD	+1 SD	0.9922	[0.6536, 1.3644]
+1 SD	-1 SD	0.2877	[0.0004, 0.7269]
+1 SD	0 SD	0.4948	[0.2654, 0.9100]
+1 SD	+1 SD	0.7226	[0.4494, 1.1209]

diation analyses. The mediation analysis using PROCESS Marco Model 4 showed a significant indirect effect of the DIS Nightmare Lucidity and Volitional Control score ($b = .687, BCa\ 95\% CI [.476, .931]$; see Figure 1). Specifically, the DIS Bad Dreams score significantly predicted the DIS Nightmare Lucidity and Volitional Control score (path $a = 1.171, p < .001$), which in turn significantly predicted the DIS Altered Dream Episodes score (path $b = .587, p < .001$). The direct effect of the DIS Bad Dreams score on the DIS Altered Dream Episodes score was not significant (path $c' = .047, p = .658$).

3.2. The Moderation Effects of Emotion Regulation Difficulty

The moderated mediation analysis was conducted using PROCESS Model 75 (see Figure 2). This analysis tested the moderation effects of the PERCI Negative-Emotion Regulation and PERCI Positive-Emotion Regulation on the me-

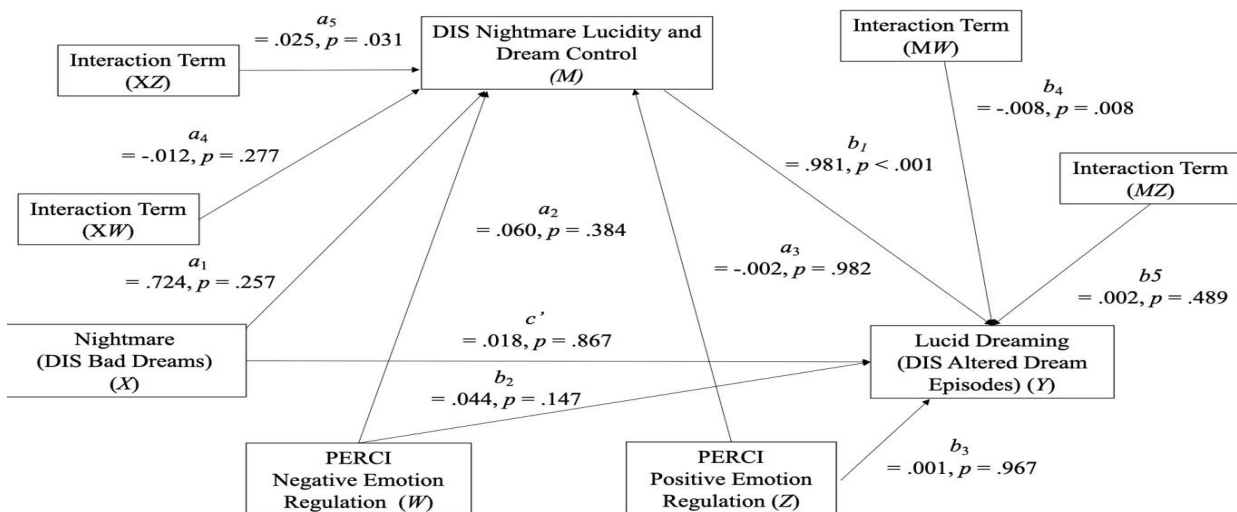


Figure 2. The moderated mediation effect of the intensity of nightmare lucidity and volitional control (PROCESS Marco Model 75)

Table 4. Parameters of the Moderated Mediation Model (PROCESS Marco Model 75)

		Path	DIS Nightmare Lucidity and Volitional Control M	Path	DIS Altered Dream Episodes Y
Covariate	Age		= -.122, p = .012		= -.106, p < .001
X	DIS Bad Dreams	a_1	= .724, p = .257	c'	= .018, p = .867
M	DIS Nightmare Lucidity and Volitional Control			b_1	= -.981, p < .001
W	PERCI Negative Emotion Regulation	a_2	= .060, p = .384	b_2	= .044, p = .147
Z	PERCI Positive Emotion Regulation	a_3	= -.002, p = .982	b_3	= .001, p = .967
XW	DIS Bad Dreams X PERCI Negative Emotion Regulation	a_4	= -.012, p = .277		
XZ	DIS Bad Dreams X PERCI Positive Emotion Regulation	a_5	= .025, p = .031		
MW	DIS Nightmare Lucidity and Volitional Control X PERCI Negative Emotion Regulation			b_4	= -.008, p = .008
MZ	DIS Nightmare Lucidity and Volitional Control X PERCI Positive Emotion Regulation			b_5	= .002, p = .489

mediation effect of the DIS Nightmare Lucidity and Volitional Control. The results revealed a significant moderation effect of the two PERCI scores at high (+1 SD), moderate (0 SD), and low (-1 SD) levels on the indirect effect of the DIS Bad Dreams on the DIS Altered Dream Episodes through the DIS Nightmare Lucidity and Volitional Control (see Table 3).

Table 4 presents the statistics of the model paths, with the effect of age being controlled. The moderated mediation effect was evidenced by the significant interaction effect of the DIS Bad Dreams X the PERCI Positive-Emotion Regulation (XZ) on the DIS Nightmare Lucidity and Volitional Control (path $a_5 = .025, p = .031, BCa\ 95\% CI [.002, .048]$) and the significant interaction effect of the DIS Nightmare Lucidity and Volitional Control X the PERCI Negative-Emotion Regulation (MW) on the DIS Altered Dream Episodes (path $b_4 = -.008, p = .008, BCa\ 95\% CI [-.013, -.002]$).

Figures 3 and 4 show the linear regression charts for the moderation effects of the PERCI scores on the mediation

relation between the DIS Bad Dreams, DIS Nightmare Lucidity and Volitional Control, and DIS Altered Dream Episodes. The positive relation between the DIS Bad Dreams and DIS Nightmare Lucidity and Volitional Control gradually increased along with the increase of the PERCI Positive-Emotion Regulation score. On the contrary, the positive relation between the DIS Nightmare Lucidity and Volitional Control and DIS Altered Dream Episodes increased as the PERCI Negative-Emotion Regulation score decreased. In other words, the positive relation between the DIS Nightmare Lucidity and Volitional Control and DIS Altered Dream Episodes was the strongest at the low level of the PERCI Negative-Emotion Regulation.

4. Discussion

Stumbrys (2018) defined lucid nightmare as a nightmare in which the dreamer is aware of being in a dream but un-

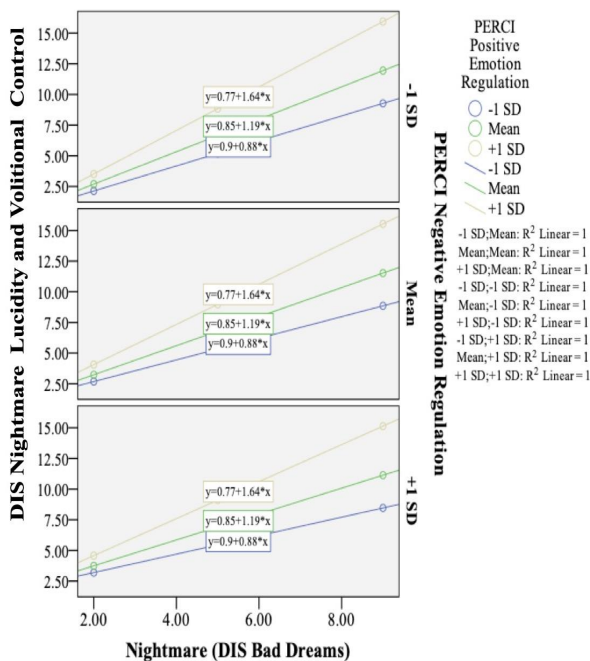


Figure 3. The illustration of the moderation effect of the PERCI Positive-Emotion Regulation

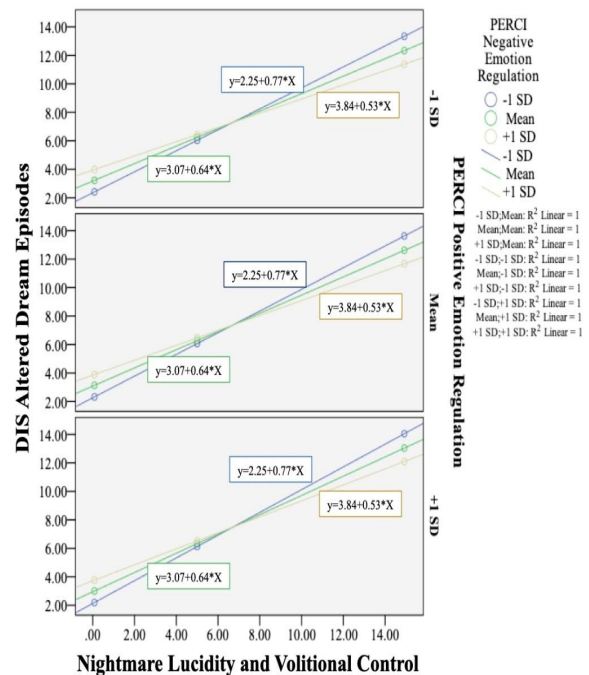


Figure 4. The illustration of the moderation effect of the PERCI Negative-Emotion Regulation

able to alter the frightening scene. However, according to Schredl and Bulkeley (2020), dreamers may indeed experience both conscious awareness and volitional control in their nightmares. We theorized nightmare characterized by both conscious awareness and volitional control to be the intermediate state between a nightmare state and lucid dreaming.

Our findings coincide with Stumbrys's in that the incidence rates of nightmares, nightmare with lucid features, and lucid dreams are intercorrelated. Furthermore, our findings demonstrate that the incidence rate of nightmares with lucid features significantly mediates the relation between those of nightmares and lucid dreams. This lends support to the theory that the hybrid state with both nightmare and lucid dreaming features might serve as a transitional stage bridging a nightmare and a lucid dream (Galvin, 1990; Wolpin et al., 1992). After all, awareness alone is not sufficient for turning a disturbing scene into a pleasurable one within a nightmare.

Dreaming per se might be an implicit process of affect regulation (Cartwright, 2005). The self-initiated transition from a nightmare to a less disagreeable dream, by comparison, was a distinct affect regulation process that entails a higher level of consciousness. This psychological process is akin to the dispositions that the PERCI measures. The PERCI Negative-Emotion Regulation score contains four subscales: Negative-Controlling Experience, Negative-Inhibiting Behavior, Negative-Activating Behavior, and Negative-Tolerating Emotions. These subscales assess respectively the ability to downregulate experiential manifestations of negative emotions, the ability to inhibit behavioral responses triggered by negative emotions, the ability to perform daily functions when experiencing negative emotions, and the competency to know when to regulate negative emotions. Most of these pain-avoidance tasks cannot be accomplished without mobilizing the monitoring functions. This functional feature of the construct measured by the PERCI Negative-Emotion Regulation may explain why the incidence of experiencing lucidity and volitional control in nightmares is more predictive of lucid dreams in people with better competency in regulating negative emotions.

This hybrid state of dream consciousness is thought to serve an adaptive function inasmuch as it allows the dreamer to confront the terror in a nightmare and the conscious confrontation against the nightmare terror can perhaps benefit the dreamer's personal growth (Hurd, 2009, 2012). Also considering the sleep-wake continuity, it is reasonable to find that people who are more capable of managing their adverse emotions during wakefulness are also more likely to triumph over their nightmares. Dreaming is hedonic oriented to the effect that the dreamer's behavior is directed by the pleasure principle (Freud, 1900; Yu, 2001, 2007); this inclination seems to persist even in its lucid form at least for people being able to regulate their detrimental emotions.

The PERCI Positive-Emotion Regulation score depicts a relatively more intricate construct than does its negative counterpart. The PERCI Positive-Controlling Experience subscale assesses the upregulation of positive emotions, as opposed to the downregulation of negative emotions for the PERCI Negative-Controlling Experience subscale. Quite the reverse, the PERCI Positive-Inhibiting Behavior subscale evaluates the competence to suppress behavior triggered by positive emotions. The two positive subscales somehow measure two counteracting tendencies. It is noteworthy, fur-

thermore, that the Positive-Controlling Experience subscale can be combined with all four negative subscales to form the PERCI General-Facilitating Hedonic Goals composite score. This suggests that the propensities of regulating positive emotions are implicated not only in agreeable but also disagreeable feelings. The problem captured by the PERCI Positive-Emotion Regulation may indeed reflect a more acute form of affect dysregulation that can exacerbate psychological distress. The anxiety-saturated experience could prompt the lucidity during dreaming for the evolutionary purpose (LaBerge, 1985). People who have more difficulty regulating their positive emotions may experience nightmares that are more frightening and therefore are more likely to become lucid.

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