Journal of Namibian Studies, 33 S1 (2023): 1464-1496 ISSN: 2197-5523 (online)

The Mediating Role Of Rumination In Breakup Distress After Romantic Relationships And Sleep Disturbance Of The Students And A Five- Day- Proposed Intervention Program

Nguyen Thi Loan, PhD*; Tong Thi Khanh Minh *;
Nguyen Vu Thanh Truc *; Tran Thien Hoan My *

*Faculty of Social Sciences, Department of Psychology,
Hoa Sen University, Ho Chi Minh City, Vietnam

Email: loan.nguyenthi@hoasen.edu.vn (Nguyen Thi Loan)
Email: minh.ttk1768@sinhvien.hoasen.edu.vn (Tong Thi Khanh Minh)
Email: truc.nvt2762@sinhvien.hoasen.edu.vn (Nguyen Vu Thanh Truc)
Email: my.tth2456@sinhvien.hoasen.edu.vn (Tran Thien Hoan My)

ABSTRACT

Post-breakup distress and its aftermath have been of interest to international researchers for nearly two decades. However, this issue has not received adequate attention from the scientific community in Vietnam. Therefore, the objective of this study is to explore the relationship between post-breakup distress and sleep difficulties in university students through the mediating role of rumination. Hence, recommendations for future research and appropriate interventions for the issue can be suggested in order to provide effective coping strategies for university students. Based on the results of the study, a five-day intervention program is developed for those who are disturbed by rumination and breakup distress resulting to sleep issues.

The study utilized a mixed-method approach with a total of 170 university students across Ho Chi Minh City. Precisely, 164 participants were asked to complete a quantitative survey (online or paper-based form) and the other 8 participants were directly interviewed about their last romantic relationship experiences. The results supported the initial hypothesis that rumination plays a mediating role in the relationship between the level of post-breakup distress and sleep difficulties among students. Additionally, our research group discovered that underlying factors contributing to the level of post-breakup distress included the duration of the relationship and the individual's active-passive stance when receiving the breakup event.

Keywords: breakup distress, rumination, sleep difficulties, sleep quality, intervention program

INTRODUCTION

Research problems: The developmental theory proposes that the course of progressing to adulthood involves changes in the nature of romantic relationships, from initial attraction during adolescence to the consolidation of long-term partnerships in adulthood (Seiffge-Krenke, 2003). Erikson's (1950) culturally individualistic model of development suggests that early adulthood is a time focused on establishing equal relationships and building romantic relationships. Notably, for college students, romantic relationships are a key area of concern during early adulthood, and these relationships have the potential to fulfill individuals' basic needs (Baumeister & Leary, 1995; Braithwaite et al., 2010; Hawley et al., 2015), enhance self-esteem, and improve self-concepts (Simon & Barrett, 2010; Slotter et al., 2010). Furthermore, romantic experiences provide a foundation for interpersonal functioning, the development of coping strategies, and problem-solving skills for future relationships (Bravo et al., 2017). It is clear that romantic relationships are necessary in everyone's life, providing companionship, a sense of security, love, and physical intimacy (Simon & Barrett, 2010). They serve an important role in mental (Lee & Ono, 2012) and are associated with less psychological distress (Simon & Barrett, 2010).

However, maintaining a romantic relationship can face many challenges and a breakup is inevitable, leading to a range of negative issues (Reimer & Estrada, 2021; Tan et al., 2015) such as anxiety, depression, sadness, loss, sleep disorders (e.g., insomnia) (Field, 2017; Perilloux & Buss, 2008; Field et al., 2009), rumination, and low self-esteem (Perilloux & Buss, 2008). College students have described the feeling of a romantic relationship breakup as a significant disruption in life, "losing all social connection...losing hope, expectations, and personal identity" (Hebert & Popadiuk, 2008). Rumination is an important predictor of the level of post-breakup distress (del Palacio-González et al., 2017a). Moreover, rumination causes many negative thoughts before sleep, which triggers autonomic arousal and emotional distress (Takano et al., 2012) that negatively impacts sleep quality, specifically, poorer sleep efficiency and longer sleep onset latency (Zoccola et al., 2009). Therefore, in this study, we aimed to investigate the relationship between post-breakup distress and overall sleep quality among college students, mediated by rumination.

The importance of research: During our literature review, we learned that breaking up is similar to other stressful events in life and can lead to a range of psychological problems, such as anxiety, depression, grief, bereavement, and sleep disturbances (e.g., insomnia) (Field, 2017; Reimer & Estrada, 2021; Field et al., 2009). In addition, breaking up is also associated with other negative outcomes, including irritability, difficulty concentrating (Bartels & Zeki, 2000), anxiety (Rhoades et al., 2011), and stimulant abuse (Fleming et al., 2010). After breaking up, many students reported a decreased ability to concentrate, difficulty completing homework, and an overall decline in academic performance (Field et al., 2012). Furthermore, some studies have identified post-breakup distress as a contributing factor to suicidal ideation and suicide attempts among university students (Drum et al., 2009; Wong et al., 2011). It can be seen that the breakup of a romantic relationship causes cognitive, emotional, and physical pain for each individual (Cupit et al., 2016; del Palacio-González et al., 2017b). In terms of physical health, post-breakup rejection is accompanied by increased blood pressure, increased stress hormone (cortisol) (Stroud et al., 2000), disrupted sleep (Shear & Shair, 2005) and reduced immune function (Kiecolt-Glaser et al.,

2002; Shear & Shair, 2005). Additionally, heart attacks and strokes can also occur. Furthermore, breakup is a major source of emotional pain that can lead to issues such as anger and sadness (Sbarra, 2006) or negative emotions such as distressing yearnings, feeling excessively lonely and empty, sleep disturbances, and losing interest in activities (Horowitz et al., 2003). Along with this are erroneous beliefs about oneself and cognitions reflecting self-blame (Boelen & Reijntjes, 2009). Moreover, intrusive and negative thoughts associated with post-breakup distress also appear in an uncontrollable way, leading to behaviors of trying to avoid or suppress emotions and memories (Fisher et al., 2010; Perilloux & Buss, 2008; Saffrey & Ehrenberg, 2007; Field et al., 2009). Although breaking up has the potential to lead to significant emotional, social, and academic difficulties, this topic has not yet received the necessary attention from researchers in the context of Vietnam. Most studies focus on cultural issues or the role of gender in Vietnam affecting attitudes toward marriage (Vu et al., 2014; Vu, 2021). Therefore, understanding more about the factors that make students have difficulties in the process of adjustment when facing this stressful situation, especially Vietnamese students, will be helpful for organizations that provide support services for post-breakup students to develop coping strategies suitable for each individual.

The aim of the study:

To investigate the correlation between the level of post-breakup distress and disturbances in sleep, through the mediating role of rumination.

Research hypothesis:

Rumination plays a mediating role in the relationship between the level of post-breakup distress and sleep disturbances in college students.

Post-breakup distress and sleep disturbances: The role of rumination

Post-breakup distress and rumination

Breakup distress refers to the feeling of pain after a romantic relationship has ended. The term "distress" is used to express the physical and emotional symptoms that are manifested (Sprecher et al., 1998; Myers & DeWall, 2020; Field et al., 2009). Additionally, according to the American Psychological Association [APA] (2022) definition, distress is a negative stress response associated with negative fallouts and physiological reactions that are the result of an overwhelming tension from demands, losses, or threats. It leads to physical and mental instability and poses serious health risks to individuals. Symptoms include intrusive thoughts, loss of sleep, changes in function, feeling helpless, empty, longing for a partner, sadness, and loss of interest in personal activities (Field et al., 2009; Field et al., 2010). Another study by Field (2010) focused on the immediate effects of romantic breakup, including depression, anger, broken heart syndrome, and immune function impairment. The breakup distress group scored higher in negative emotions, depression, anxiety, anger, and specific negative behaviors, such as poor academic performance (Field et al., 2010). Women tend to experience more severe depression, desperation, and might double the risk of depression after a breakup than men (Mearns, 1991). However, men are at a higher risk of suicide than women, up to 3 to 4 times higher after romantic breakups (Mearns, 1991). University students who scored high on the Breakup Distress Scale reported several factors that contributed to stronger feelings of distress, including: first, not being the initiator of the breakup (being

passive); second, the breakup was sudden and unexpected; third, feeling rejected and betrayed; fourth, a shorter time since the breakup occurred; and fifth, not having found a new romantic relationship (Field et al., 2009). In addition, another study on university students reported that intimacy and time since the relationship ended also predicted the level and duration of distress after a breakup (Simpson, 1987).

In accord with the Response Styles Theory, rumination is a coping response to distress that involves repetitively focusing passively on the symptoms, causes, and consequences of distress. Rumination does not aim to proactively solve the problem to change the surrounding circumstances. Instead, those who ruminate focus on their own issues and emotions without actively engaging in coping or addressing stressors to reduce negative emotions (Nolen-Hoeksema, 1991). Skitch & Abela (2008) research concluded that rumination is a common coping response to stress in adolescents. Smith and Alloy's (2009) experimental study identified that rumination is a response to perceived stress. For individuals who ruminate about past stressors, physiological effects of stressors can last longer. For example, high levels of stress hormones may continue to circulate in the body long after a conflict has ended for those who ruminate about the issue (Zoccola & Dickerson, 2012). Several experimental studies indicated that social stressors increase levels of rumination in individuals who are prone to ruminating about previous events (De Witte et al., 2020; Gianferante et al., 2014a; Hilt et al., 2015; Rosenbaum et al., 2018) At an individual perspective, rumination plays an intermediate role in the relationship between stress and depression, anger, and anxiety (Du et al., 2020) At an interpersonal perspective, rumination plays an intermediate role in the relationship between stress and anger (Du et al., 2020). This suggests that individuals who experience high levels of stress report higher levels of rumination and subsequently experience an increase in negative emotions (Du et al., 2020). Consistent with previous research findings, stress has a positive association with rumination (Folkman & Moskowitz, 2000; Skitch & Abela, 2008) as well as negative emotions (Smith & Alloy, 2009). Moreover, individuals with anxious attachment have tendencies to ruminate more on the pain of separation after a breakup and have a more negative view of themselves (Bartholomew & Horowitz, 1991) while also blaming themselves for the breakdown of the relationship (Davis et al., 2003). Additionally, some studies have found that anxious attachment is related to intrusive thinking and passive coping strategies, leading to negative outcomes such as depression and poorer adjustment after a breakup (Burnette et al., 2009; Saffrey & Ehrenberg, 2007). A recent study also found similar results, indicating that anxious attachment is positively associated with post-breakup rumination and distress (Fagundes, 2012). Similarly, in the context of dynamic attachment theory, individuals with a desired attachment still wish for their ex-partner to perform attachment-related functions (e.g., seeking/re-establishing closeness and feeling secure), which is affiliated with increased rumination and poorer psychological adjustment (Eisma et al., 2022).

In addition, a series of studies have shown that rumination is related to gender, specifically that the level of rumination in women is reported to be more frequent than in men (Jose & Brown, 2008; Mezo & Baker, 2012; Morrow & Nolen-Hoeksema, 1990). At the same time, women with high levels of stress tend to exhibit strong rumination behaviors (Nolen-Hoeksema & Jackson, 2001). In

contrast, men tend to ruminate on short-term life experiences and events without leaving the same sad aftereffects as women (Nolen-Hoeksema & Jackson, 2001). Willis & Burnett (2016) also confirms previous findings, showing a significant difference between female and male students in the level of stress and rumination, with female students perceiving and ruminating more than male students. From these analytical sources, it can be seen that the feeling of post-breakup pain is a negative stressor for students and rumination is considered a reaction behavior to this pain. Along with this, the pain has a positive correlation with the level of rumination, leading to depression, emotional issues, and negative behaviors.

The effect of rumination toward sleep in general

The study by Takano et al (2012) outlined that high levels of rumination reduced sleep quality in students. Zoccola et al (2009) reported that rumination was associated with longer sleep onset latency, poorer sleep quality, and worse sleep efficiency. Furthermore, two recent studies by Pillai (Pillai et al., 2014) and Takano (Takano et al., 2014) also highlighted the relationship between rumination at bedtime and sleep onset latency. Consistent with these studies, Thomsen et al (2003) also pointed out the correlation between rumination and sleep quality. Specifically, higher levels of rumination were found to predict poorer sleep quality (Thomsen et al., 2003). Another Carney et al (2006) implied that individuals with poor sleep quality reported significantly higher scores on the Ruminative Response Scale (RRS) compared to those with good sleep quality. In line with these findings, a study by Guastella & Moulds (2007) conducted on university students also reported that pre-sleep rumination after stressful events had a negative impact on sleep quality. Therefore, rumination can be considered a factor that negatively affects sleep quality and prolongs sleep onset latency in students.

Furthermore, rumination can also impact cortisol activity through the activation of the HPA axis. Laboratory studies have found that elevated levels of the hormone cortisol are associated with increased levels of rumination about stressful events (Zoccola et al., 2008) According to the theory proposed by Brosschot et al (2005) continuous rumination is a stressor that activates the HPA axis - a stress response system that evolved to cope with prolonged threats in daily life. When the HPA axis is activated, a cascade of hormones such as corticotropin-releasing hormone (CRH), adrenocorticotropic hormone (ACTH), cortisol or corticosterone, noradrenaline, and adrenaline are released (Han et al., 2012). These hormones play a role in enhancing attention and promoting survival in threatening situations (Han et al., 2012). At this point, heart rate, catecholamines, cortisol, ACTH, and CRH are affected (Han et al., 2012), and may lead to a state of hyperarousal (Nofzinger, 2004) When the body is in a state of hyperarousal, the brain focuses on seeking and resolving potential threats, making it difficult to fall asleep (Kalmbach et al., 2018).

Additionally, reflecting before sleeping depletes the reserve energy, causing the body to overload, leading to conditions of exhaustion, confusion, and tension the following day (Nofzinger, 2004). At this point, individuals not only reflect on the stressful events leading to sleeplessness but also contemplate the symptoms caused by lack of sleep, such as drowsiness, lack of concentration,

physical and emotional exhaustion (Peiris et al., 2008; Poudel et al., 2009). These findings reinforce the belief in the ineffective ability to self-regulate sleep, increasing anxiety about resolving sleep issues that can lead to ineffective coping mechanisms (such as spending more time in bed), poor academic performance, and decreased memory (Carney et al., 2006). Moreover, reflecting on the daytime symptoms of sleep deprivation may act as a catalyst for future anxiety and depression. Therefore, an unfavorable cycle is formed between stress, rumination, and sleep.

In summary, rumination is considered an important factor leading to sleep disturbances in college students. Students who have a high tendency to ruminate are more likely to experience severe sleep problems, specifically difficulty falling asleep, poor sleep quality, and ineffective sleep. Furthermore, continuous rumination about symptoms of stress, fatigue, and sleep deprivation can lead to a decline in memory, poor academic performance, distorted cognition, and future depression.

METHOD

Participant and Procedure

We singled out university students in Ho Chi Minh City who were between the ages of 18 and 25, had gone through at least one significant breakup in a romantic relationship and had not been diagnosed with any psychological disorders. We did not include individuals who had begun new relationships. In addition, we identified a total of 172 participants for the study, with 164 completing the quantitative survey and 8 participating in the qualitative interview. Table 1 presents their characteristics.

Our study employed a mixed-methods approach, utilizing a convenient sampling method. The focus of the study was primarily on quantitative research, using a cross-sectional, correlational design to investigate “The mediating role of rumination in the relationship between breakup distress, sleep disturbance, and a proposed 5-day intervention program for students”. Additionally, we also included qualitative data to provide more in-depth insights into the subject matter. The survey included five sections: (1) demographic information, (2) the Breakup Distress Scale (BDS) to measure the level of distress after a breakup (Field et al., 2009), (3) the Ruminative Response Scale (RRS) to measure rumination (Treynor et al., 2003), (4) the Pittsburgh Sleep Quality Index (PSQI) to measure sleep quality. A total of 164 valid quantitative survey responses were collected.

We applied both online and paper-based survey methods for data collection in our study. The online survey was created using Google Forms and distributed to university students through social media, while the paper-based survey was designed using Microsoft Word and provided directly to participants. After completion, we collected the paper surveys. Data from both methods were processed and stored separately, using Epidata and Excel software. The collected data were then analyzed using SPSS ver 25.0 (IBM Corp, 2017) and PROCESS ver 4.1 (Hayes, 2017) software. Respondents were given 15-20 minutes to complete the survey. We conducted data collection from November 14, 2022, to December 4, 2022.

Following the completion of the quantitative data collection, we moved on to obtain qualitative data by sending interview invitations to university students in the Ho Chi Minh City area who met the research criteria specified in the "research participants" section. The participants were contacted by the research team to confirm their eligibility and schedule an online interview. Eight students agreed to engage and finished the interview session, which lasted between 30 to 90 minutes. The research process was authorized by the university's Institutional Review Board and health center.

Table 1 Characteristic participants

Characteristic	Sample	
	n	%
Gender		
Male	45	26
Female	118	70
Other	06	04
Age		
1997	07	04
1998	03	02
1999	13	08
2000	24	15
2001	54	32
2002	34	20
2003	27	15
2004	02	01
Other	05	03

Scale adaptation

In our study, we chose several assessment scales, namely the Breakup Distress Scale - BDS (Field et al., 2009), Ruminative Response Scale - RRS (Treynor et al., 2003), Pittsburgh Sleep Quality Index - PSQI, all of which have been authorized by their original creators for use. While the PSQI scale has already undergone standardization in Vietnam, the BDS and RRS scales have not been previously utilized or standardized in the country. Hence, our research team performed an adaptation process to incorporate these scales, which included the following procedures:

Step 1: The BDS and RRS scales were translated from English (original version) to Vietnamese by a member of our research team.

Step 2: Back-translation from the completed Vietnamese version in Step 1 to English was performed by a Bachelor of English Language.

Step 3: The back-translated scales in English (Step 2) and the original English scales were reviewed and evaluated by two psychologists, Dr. Nguyen Thi Loan and Ms. Nguyen Hong An, to ensure that they were suitable and relevant in the cultural and contextual setting of Vietnam.

Measures

Quantitative scales:

Breakup Distress Scale - BDS

The Breakup Distress Scale (BDS; Field et al., 2009) was created as a means of assessing the extent of distress experienced following a romantic breakup. It was modeled after the Inventory of Complicated Grief (ICG) by Prigerson et al. in 1995 and is composed of 16 items that measure the experience of loss. The BDS is

scored on a 4-point Likert scale, with responses ranging from 1 (Not at all) to 4 (Very much). The total score of the 16 items reflects the level of post-breakup distress, with higher scores indicating greater levels of distress. The internal consistency of the BDS questionnaire is high (α = 0.91) as demonstrated by the Cronbach's alpha coefficient (Field et al., 2010).

Ruminative Response Scale - RRS

The Ruminative Response Scale-10 item (RRS Short version), developed by Treynor et al (2003), is a tool for measuring the degree of rumination. The RRS Short version is a modified version of the original 22-item scale developed by Nolen - Hoeksema and Morrow in 1991. The original version of RRS has been shown to have good reliability and validity in several countries, including the United States (Cowdrey & Park, 2011; Whisman et al., 2018), Japan (Hasegawa et al., 2013), South Korea (Lee & Kim, 2014), Brazil (Lucena-Santos et al., 2018), and France (Parola et al., 2017). The RRS Short version removes 12 questions related to depression while maintaining a high correlation with the original scale. The scale is self-assessed using a 4-point Likert scale ranging from 1 (almost never) to 4 (almost always) and has demonstrated high internal consistency among Chinese university students (α = 0.82) (He et al., 2021).

The Pittsburgh Sleep Quality Index (PSQI)

The Pittsburgh Sleep Quality Index (PSQI) is a well-established and widely used questionnaire developed in 1989 to evaluate the quality of sleep and identify sleep disorders that have occurred over a 1-month period (Backhaus et al., 2002; Buysse et al., 1989; Mollayeva et al., 2016; Sohn et al., 2011; Tsai et al., 2005). It consists of 19 self-reported items and 7 components that assess different aspects of sleep, including subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medications, and daytime dysfunction. Respondents use a combination of open-ended and 4-point Likert scale responses ranging from 0 (not during the past month) to 3 (3 or more times a week) to rate their sleep experience. Scores on the PSQI range from 0 to 21, and scores greater than 5 indicate the presence of sleep disturbances (To & Nguyen, 2015). The Vietnamese version of the PSQI, standardized by Ms. To Minh Ngoc et al in 2015, demonstrated good internal consistency (α = 0.789).

The reliability of the PSQI has also been demonstrated in other countries such as Italy (α = 0.825; Curcio et al., 2012), Japan (α = 0.77; Doi et al., 2000), South Korea (α = 0.84; Sohn et al., 2011), and China (α = 0.835; Tsai et al., 2005).

Qualitative interviews:

In this study, our group utilized a semi-structured interview approach to collect qualitative data from university students on their experiences following a breakup in a romantic relationship. The researchers aimed to gather in-depth, genuine, and practical insights from the participants. The participants were prompted to share their personal experiences, including the difficulties they faced during the breakup, how they coped with the aftermath, and any sources of support they found helpful (if any).

Data Analysis

Quantitative Analysis

The statistical software SPSS (IBM Corp, 2017) was used by our research team to investigate the connections between different variables. We focused on assessing the associations between the level of post-breakup distress and difficulties in sleep, through the mediating role of rumination. To accomplish this, we used PROCESS macro ver 4.1 (Hayes, 2017) as a tool to perform Bootstrap statistical methods.

Qualitative Analysis

Our team adopted the directed content analysis method proposed by Hsieh & Shannon (2005) to analyze qualitative data. Initially, we developed themes based on previous quantitative findings that examined the relationship between resilience and post-breakup distress, rumination, and sleep disturbances. The data was then organized and grouped according to the appropriate themes. Before the categorization process, the research team carefully read and reflected on the entire data set multiple times to gain a comprehensive understanding of the participant's responses. Any data that did not fit into the pre-existing themes was further examined to determine whether it represented a new theme or belonged to a subset of the original themes. Finally, the research team reported the results and analysis process to demonstrate the connection between the qualitative data collected and the confirmed themes. To ensure reliability, all members of the research team independently participated in the data analysis and synthesis process. Additionally, we recorded the interview sessions accurately and completely throughout the research process to ensure the validity of our results.

RESULTS

Cronbach's alpha

The current study indicated high levels of reliability for all measurements, with Cronbach's alpha coefficients greater than 0.7 (Nunnally & Bernstein, 1994) as outlined in Table 2. Specifically, BDS obtained a coefficient of 0.920, RRS obtained 0.860, PSQI scale obtained a coefficient of 0.807.

Table 2 Cronbach's alpha

	n	M	SD	Max	Min	α
1. BDS	16	29.74	10.66	64	16	.920
2. RRS	10	21.68	6.74	40	10	.860
3. PSQI	14	6.89	3.31	16	01	.807

The correlation between Breakup distress, Rumination, Sleep disturbances.

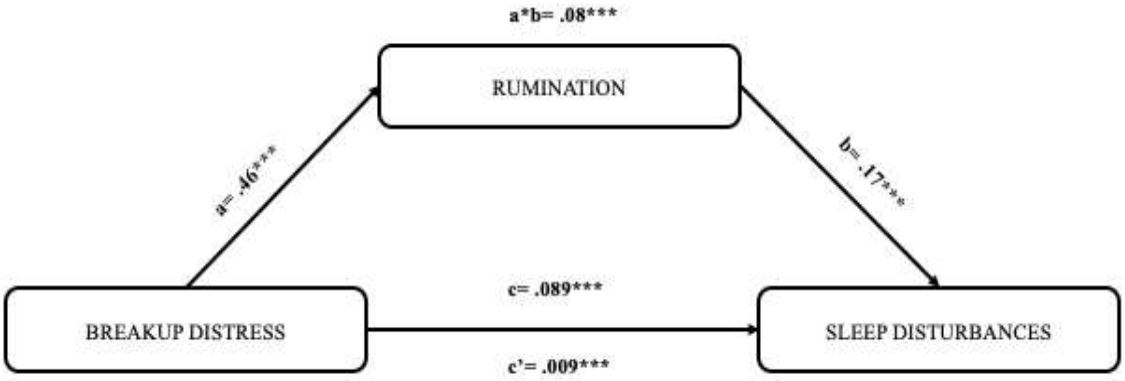
Table 3 The correlation between Breakup distress, Rumination, Sleep disturbances.

Variable	n	M	SD	1	2	3	4
1. Breakup Distress	164	29.73	10.66	—			
2. Rumination	164	21.68	6.74	.730**	—		
3. Sleep Disturbances	164	25.13	8.02	.289**	.377**	—	

Note. *p < .05, **p < .01

The mediating role of rumination between breakup distress and sleep disturbances

Figure 1 *Mediating role of rumination between breakup distress and sleep disturbances*



Firstly, the overall impact level of post-breakup distress on sleep disturbances was statistically significant (R = .289, R2 = .083, F = 14.77, c = .089, t = 3.843, p < .001). Secondly, when rumination behavior was in the mediating role, a direct impact from post-breakup distress to sleep difficulties was found to be statistically significant (c' = .009, SE = .03, 95% CI [-.05, .07]). Thirdly, the result of testing the mediating effect of rumination on the relationship between post-breakup distress and sleep difficulties, using the Boot SE test with 95% confidence level (5000 samples), was statistically significant (a*b = .08, SE = .027, 95% CI [.02, .13]). Thus, rumination plays a mediating role in the impact of post-breakup distress on sleep difficulties (see Figure 1).

Our study confirms the mediating role of rumination in the relationship between post-breakup distress and sleep disturbances. This mediating role means that high levels of distress increase rumination behavior, which in turn contributes to overall sleep difficulties in post-breakup college students, specifically the severity of sleep issues. Previous research has also shown that rumination may mediate the relationship between stressful life events and subsequent sleep disturbances (Amaral et al., 2018; Lamis et al., 2018). A participant in the interview shared, "In the first month after the breakup, I was terribly stressed, I was immersed in that love story, I couldn't do anything... I

thought about all the memories during the 2 years we were together, thought about the times we argued and then got back together, and wondered why this time wasn't like the previous times." These thoughts "mostly appeared at night before going to bed," causing "my biological clock to be disrupted. I didn't sleep enough. Before, I would go to bed at 10:30 pm, but after the breakup, I would only fall asleep around 1-2 am, sometimes I would stay up all night and I think my sleep wasn't as good as before." Additionally, we found a significant positive correlation between distress levels and sleep disturbances even without the involvement of rumination as a mediating factor.

The end of romantic relationships is considered a stressful event for students. The participants commented on their experience as follows: "I feel frustrated, disappointed, and sad. I cried a lot," "I feel disappointed, empty, like I lost a part of my life," or "I feel angry, betrayed, and disappointed". Whilst, rumination is a common and spontaneous reaction to stress, which is associated with increased physiological reactivity and slower recovery to stressors (E. Watkins, 2004; E. Watkins et al., 2008; Zoccola et al., 2008, 2010). One participant expressed, "I think about this issue a lot during the day". The content of their thoughts revolves around self-blame, such as "why did I lose such a good person, I'm afraid that no one will love me and accept me like that person did, no one will sacrifice for me like that again, if I had behaved differently, would the outcome be different?" As can be seen, individuals with high levels of rumination tend to negatively reflect on the past, which increases cognitive arousal and reduces sleep quality. This is reflected by interviewees who stated, "I have been thinking a lot, but these thoughts are not very positive. I blame myself for why I acted that way, I could have done better. These thoughts often appear at night...making me go to bed very late, maybe only able to sleep at 2-3am or some nights, I stay awake all night, so when I wake up, I don't feel comfortable, I feel very tired". Similarly, the result from Zoccola et al (2009) indicates that rumination following a stressful event predicted a longer time spent awake before falling asleep.

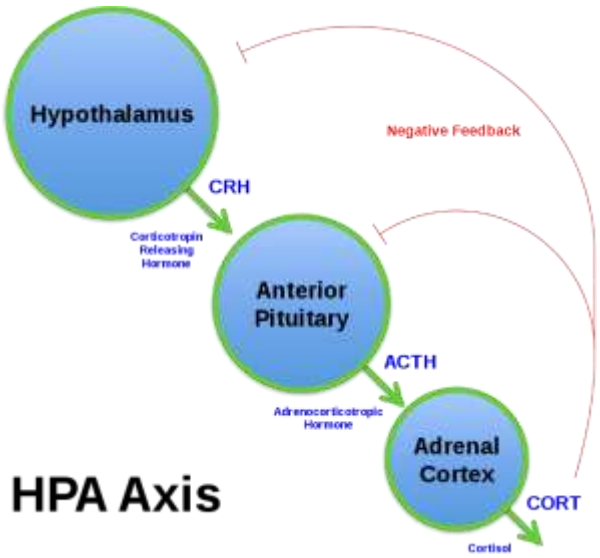
Moreover, in accordance with Harvey's Cognitive Model of Insomnia, individuals who respond to stress by ruminating tend to negatively bias cognitive activity, leading to the activation of autonomic arousal and emotional distress (Harvey, 2002) It is suggested that this anxious state selectively focuses attention on unhelpful beliefs and attitudes towards sleep, worrying about sleep, or ruminating about the consequences of insomnia (Carney et al., 2010; Harvey, 2002; Palagini & Mauri, 2015) which hinders emotional regulation and contributes to maintaining the state of insomnia (Carney et al., 2010; Harvey, 2002; Palagini & Mauri, 2015; Morin, 1993). Another participant shared about this issue that "I think too much so I can't fall asleep, when I close my eyes I just think... when I can't sleep at night, it affects my next day. People sleep at night, I sleep in the morning. My sleep schedule is affected." therefore, "I am easily irritated or if someone disturbs my personal space, I will feel uncomfortable and angry... I am very negative, I just want to be alone, I don't want anyone to bother me."

In summary, the above findings indicate a correlation between stressful events in life and rumination, as well as between rumination and future sleep difficulties. To have a better viewpoint about this relationship, we will explain it through the HPA axis mechanism.

HPA Axis

Stress induces physiological responses like the activation of the hypothalamic-pituitary-adrenal (HPA) axis and the sympathetic nervous system (SNS) (Gianferante et al., 2014b; Gouin et al., 2012). The body processes stress information and elicits responses depending on the level of threat. The body's autonomic nervous system comprises the sympathetic nervous system (SNS) and the parasympathetic nervous system (PNS). During stressful situations, SNS is triggered, and it is responsible for the fight-or-flight response, which generates a series of physiological and hormonal reactions. Amygdala is responsible for processing fear, arousal, and emotions to assess the appropriate response. If needed, the amygdala will signal the hypothalamus with stress signals. Consequently, the HPA axis is activated, and a hormone cascade is initiated by the secretion of corticotropin-releasing hormone (CRH) from the hypothalamus, which stimulates the pituitary gland to secrete adrenocorticotropic hormone (ACTH). ACTH then stimulates the release of cortisol from the adrenal gland, which leads to various physiological responses from the SNS (e.g., adrenaline secretion, heart rate acceleration, and blood pressure elevation). Cortisol is the final product of the HPA axis. Once the stressor is resolved, the response ends via a negative feedback loop, which reduces cortisol levels and prevents the release of additional CRH and ACTH.

Figure 2 HPA Axis (Sweis., 2012)



Sleep disturbances and daytime dysfunction

Matters with sleep, low energy, reduced social activities, or depression can lead to daytime dysfunction (Chen et al., 2013). Among these, sleep-related impairments such as excessive daytime sleepiness (EDS) and fatigue are detrimental to both physical and mental health in university students (Lund et al., 2010; Pilcher et al., 1997; Steptoe et al., 2006; Taylor et al., 2011). The participant

shared that "when I wake up in the morning, I still feel sleepy, my mood is not cheerful, I feel sluggish and don't want to do anything." Additionally, decreased academic performance (Gaultney, 2010) impaired working memory (Durmer & Dinges, 2005) difficulty concentrating (Pilcher et al., 1997) substance misuse (Gaultney, 2010; Lund et al., 2010), reduced physical activity (Carney et al., 2006) and decreased social interaction (Brown et al., 2002) are all concerns that students confront when experiencing sleep disturbances. These issues were also mentioned by the participants as follows: "I go drinking all the time, and after drinking, I get drunk...I'm not okay at all, I have a headache, I'm tired and lazy to get up", "I can't focus on anything, so I can't study normally" or "I am procrastinating on tasks, I go to work later and I keep getting into accidents because I'm not focused". In this study, we will focus on analyzing two factors: academic performance and working memory.

The effect of sleep disturbances toward academic performance

Studies on sleep with control groups in adults have found that sleep is related to a range of cognitive activities including attention (Lim & Dinges, 2010; Van Dongen et al., 2003) divergent thinking (Horne, 1988; Wimmer et al., 1992), decision-making (Harrison & Horne, 2000) and interpretation (Harrison & Horne, 1997). In addition to experimental studies, ecological studies have also found a significant relationship between sleep patterns and academic performance measures, such as grade point average (Curcio et al., 2006; Dewald et al., 2010; Wolfson & Carskadon, 1998). Specifically, insufficient sleep duration, poor sleep quality, and irregular sleep schedules have been associated with poor academic outcomes (Gomes et al., 2011).

Sleep Duration: The lack of sleep entirely or partially reduces the performance of a range of cognitive functions, including attention and information processing speed (Lim & Dinges, 2010). Among these, the importance of getting enough sleep for academic achievement in higher education has been demonstrated to play a crucial role in information processing, memory, planning, and monitoring learning progress. This contended that chronic sleep deprivation can impact academic performance through decreased learning concentration (van der Heijden et al., 2018). Furthermore, continuously poor academic performance in students has been linked to shorter sleep duration (Borisenkov et al., 2010; Medeiros et al., 2001; Trockel et al., 2000). Specifically, those who sleep less (less than 6 hours per night) have lower GPAs (2.74) compared to those who sleep longer (more than 9 hours per night; GPA: 3.24), indicating that individuals with longer total nighttime sleep tend to have higher grades (Kelly & cs., 2001). Additionally, one of the earliest studies on GPAs showed that teenagers aged 13-19 years old with a C average went to bed later and slept less than those with higher grades (B or above) (Wolfson & Carskadon, 1998). Previous similar studies have also found a correlation between shorter sleep duration and lower average grades in students (Okano et al., 2019; Shochat et al., 2014).

Sleep quality: Sleep quality is one of the most commonly used measures in sleep research (Hershner, 2020). It is believed that poor sleep quality can be manifested through difficulties in falling asleep, light sleep, or fragmented sleep, and can also affect academic performance (Gomes & et al., 2011). A recent study revealed that an increase in the total amount of high-quality sleep predicted higher end-of-year

course grades (Baert et al., 2015). As cited earlier, poor sleep quality can increase stress levels due to sleep deprivation, and stress can affect academic performance, or conversely, students with low grades may experience higher stress levels, leading to poorer sleep quality (van der Heijden & et al., 2018). This finding is consistent with previous studies that demonstrated a correlation between poor sleep and lower academic performance in university students (Gilbert & Weaver, 2010; Howell et al., 2004; Johns et al., 1976) and a decline in daytime functioning (e.g., increased levels of depression, stress, and fatigue), not only in clinical samples of sleep, but also in community samples of young adults (Alapin et al., 2000; Oginska & Pokorski, 2006; Pilcher et al., 1997; Pilcher & Ott, 1998)

Sleep regularity is a new measure of sleep quality with increasing important evidence to support it. It measures the consistency of a person's sleep and wake schedule throughout the week. Abrupt changes in sleep-wake schedules lead to desynchronization within biological rhythms (Reinberg et al., 1989), along with symptoms such as drowsiness, inattention, difficulty concentrating, and reduced performance, often experienced by shift workers and frequent travelers across different time zones (AASM, 2005). Inconsistent sleep patterns have been linked to lower academic performance (Okano et al., 2019), while sleep regularity is particularly difficult for college students, whose sleep and wake times vary based on different daily schedules (Raley et al., 2016). Among undergraduate students, irregular sleep-wake schedules of 2-4 hours have been found to be linked with increased fatigue, worsening mood, and lower academic performance (Taub & Berger, 1973). On the other hand, sleep regularity is positively associated with higher GPAs (Hershner, 2020). However, there is a hypothesis that the relationship between later sleep-wake schedules and academic outcomes may not directly affect each other, but may be influenced by other variables, such as sleep restriction, irregular sleep, and fewer class attendance due to conflicts with later sleep-wake schedules (Gomes et al., 2011).

The effect of sleep disturbances toward memory

Sleep is related to different stages of memory consolidation, such as encoding, consolidation, and reconsolidation (Walker & Stickgold, 2006). Specifically, sleep deprivation, poor sleep quality, or insufficient sleep time in students can significantly reduce the level of memory formation and activity during encoding (Diekelmann et al., 2009) hindering the consolidation of previously encoded memories (Walker & Stickgold, 2006). Additionally, poor sleep quality is associated with a decrease of information maintained in working memory (Nelabhotla & Shanmugam, 2021).

Different researches displayed that sleep deprivation can impair the function of the prefrontal cortex (PFC), which is crucial for effective memory encoding, resulting in reduced memory formation and consolidation (Henson et al., 1999; Wagner et al., 1998; Walker & Stickgold, 2006). Yoo's (2007) also suggests that sleep is not only necessary after learning for memory consolidation, but also before learning to prepare the brain for memory formation the next day. Inadequate sleep before learning (sleep deprivation before learning) affects the process of dependent synaptic plasticity of molecules related to memory formation, leading to decreased memory encoding (Walker & Stickgold, 2006).

Specifically, sleep deprivation leads to the accumulation of positive biological factors that inhibit neuronal function (Basheer et al., 2004) and thus affect the encoding of synaptic plasticity related to memory tasks. Prolonged wakefulness results in continuous memory encoding that exceeds the proposed short-term storage capacity of the synaptic plasticity (Frankland & Bontempi, 2005). As a result, there is a reduction in signal from the hippocampal formation at the time of encoding and a concomitant deficit in memory formation (Ahrberg et al., 2012; Ellenbogen et al., 2006; Gomes et al., 2011).

We have found that ruminating before sleep depletes energy reserves and causes the body to become overloaded, leading to exhaustion, confusion, and tension the following day (Nofzinger, 2004). During this time, individuals not only ruminate about the initial stressful event but also about the symptoms caused by lack of sleep, such as sleepiness, lack of concentration, physical and emotional exhaustion (Peiris et al., 2008; Poudel et al., 2009). These reinforce the belief in ineffective self-sleeping, increase anxiety about addressing sleep problems, leading to ineffective coping strategies (e.g., spending more time in bed), poor academic performance, and decreased memory (Carney & et al., 2006). Furthermore, ruminating about the daytime symptoms of sleep deprivation can act as a catalyst for future anxiety disorders and depression. Thus, a vicious cycle of stress-rumination-sleep disturbance is formed.

The impact of active-passive roles in Breakup distress

Table 4 The impact of active-passive roles in Breakup distress

Who initiated the breakup?	I am			My ex-partner			p
	n	M	SD	n	M	SD	
Breakup distress	112	.843	.135	52	.877	.082	.028

The difference was statistically significant when comparing two groups, I am and My ex-partner, in terms of post-breakup distress (p = .028) (see Table 4). We found that initiators experienced less pain compared to those who passively accepted the breakup from their partner. One participant mentioned that "...as the person who takes the initiative to break up, I feel it's easier to move on." Another participant explained this by saying that "when I'm the one who initiates the breakup, I can answer my own questions about the relationship, but when the other person breaks up with me, it's their emotions that I can't fully understand, and I will feel tormented. And if they don't explain the reason for the breakup to me, I will hold onto it in my heart and torment myself even more."

Consistent with our findings, some researchers have pointed out a greater negative impact on non-initiators (Ayduk et al., 2001; Davis et al., 2003; Green et al., 2007; Perilloux & Buss, 2008; Robak & Weitzman, 1998; Saffrey & Ehrenberg, 2007; Sprecher et al., 1998). Specifically, Robak & Weitzman (1998) reported that non-initiators of the breakup reported more intense feelings of loss and sadness, rumination about the breakup, and attempts to understand why the relationship ended (Horwitz & Wakefield, 2007). Individuals passively receiving the breakup message from their partners shared that "I felt surprised and shocked... I couldn't accept the fact that it had happened. I thought the other

person belonged to me, and I wasn't prepared for the breakup." Or, "when I received the breakup message, I was shocked because I didn't expect it, and I wasn't mentally prepared to accept it. Anger, sadness, disappointment, and despair are my representative emotions during the time I couldn't find an answer to the reason for the breakup." In contrast, Sprecher et al (1998) asserted that the breakup provided positive experiences for active individuals because ending a romantic relationship brought a sense of relief, freedom, and happiness. Moreover, Sbarra & Emery (2005) also claimed that breakup initiators felt less sadness and longing afterward because they had the opportunity to prepare themselves before the breakup.

The duration of a relationship and the level of post-breakup distress

Table 5.The correlation between the duration of a relationship and the level of post-breakup distress.

Factor	n	M	SD	1	2	3
The duration of the relationship	149	17.36	15.34	.257**	.180*	—

Note. 1 = Post-breakup distress, 2 = Rumination, 3 = Sleep disturbances; *p < .05, **p < .01

The duration of a relationship is positively correlated with post-breakup distress (r = .257, p < .01) and rumination (r = .180, p < .05) (see Table 5). This confirms that couples who have been together longer tend to experience more distress after a breakup. One individual who went through a breakup after a 10-year long romantic relationship shared that "It was a fairly long period, long enough for me to see my partner as a part of my life, as a habit and as something that naturally existed," and "we had planned to get married in the near future, I thought that day would come anyway, so when the breakup happened, I was shocked that it happened in a way that I didn't expect, and I wondered if I could have done something differently to change the outcome. At first, I felt shocked, then I was angry, I tried to explain myself, then I turned to blame myself, then I was worried, thinking that I was so terrible yet they stuck with me for so long. I felt very afraid, afraid that I would not be able to love anyone else or meet someone as good. I lost my footing." The Interdependence Theory (Hansen et al., 1982) and the Investment Model (Rusbult, 1983) also suggest that individuals who invest more in a relationship, such as spending more time together and being more committed, will endure more post-breakup distress. Additionally, many previous studies have proffered a significant relationship between the duration of a relationship and post-breakup distress (Attridge et al., 1995; Berscheid et al., 1989). Therefore, our study confirms the findings of some previous studies regarding this correlation.

CONTRIBUTIONS AND LIMITATIONS

Contributions

Our study has highlighted the negative aspect of post-breakup distress for individuals when there is no proper and timely coping strategy. In addition, the relationship between post-breakup distress and difficulties related to sleep has been elucidated through the mediating role of rumination. This relationship is explained through the HPA system and demonstrates the impact of sleep on other

aspects of life, such as decreased memory, decreased academic performance, substance abuse, and lack of concentration. Furthermore, our group has found certain characteristics of romantic relationships that contribute to increased distress levels in individuals after the breakup, namely the passive-receptive position when receiving the breakup and the duration of the romantic relationship. These findings indicate that individuals who are passive in accepting the breakup from their partners tend to experience more pain and anguish compared to those who take an active role in initiating the breakup. Moreover, the research results show that the longer the duration of the relationship, the greater the distress experienced when ending it. These findings were also confirmed by the participants in the in-depth interviews.

Based on these findings, we recommend using RFCBT interventions to address post-breakup rumination behaviors in college students. This can help improve sleep and other areas affected by sleep issues. Additionally, we propose a 5-day intervention program.

Day one: Understand the distress and its triggers

The goal of this day is to help the participants understand the process, the cause or reasons of breakup distress.

Day two: Learn about sleep

The goal of this day is to help the participants know about the stages of sleep and the quality of sleep. The participants also experience a good sleep in a safe and comfortable atmosphere.

Day three: Learn about the ways to cope with distress

The goal of this day is to help the participants know about the stages of sleep and the quality of sleep. In addition, the participants also learn how to express the disturbance in a safe place and in daily life situations.

Day four: Educate Cognitive Behavior Therapy Model to overcome distress

The goal of this day is to help the participants analyze their situation and in the perspective of CBT and the techniques to help them change their negative thoughts, emotions, behaviors to the positive ones. From there, they will have the ability to cultivate a rational belief to live healthy.

Day five: Exercise and evaluation

The goal of the last day is to practice techniques and apply them in life to live fruitfully

The five-day intervention program should be applied to help those who have breakup distress overcome their difficulties in sleeping and in their daily lives.

It is highly recommended to those who have breakup distress to have a good sleep and live positively.

The results in our study contribute to providing additional information on the topic of post-breakup distress in college students, particularly in the context of limited research and scientific attention in Vietnam. Furthermore, it provides insight into the developmental progression of individuals during the transitional phase of emerging adulthood in the context of Vietnam.

The five-day intervention program should be applied to help those who have breakup distress overcome their difficulties in sleeping and in their daily lives.

Limitations

Through document analysis, we found that rumination is composed of two factors including reflection and brooding (Treynor, 2003). Items in the reflection factor refer to personal engagement in problem-solving to reduce depressive symptoms, while items in the brooding factor refer to a passive comparison between the current situation and unachieved standards (Treynor, 2003). Marroquin et al. (2010) also indicated that reflection was positively related to active coping, while brooding was viewed as a relatively maladaptive component. In this study, we regarded rumination as a general construct (including both reflection and brooding) playing a mediating role in the relationship between post-breakup distress and sleep difficulties, rather than exploring the unique effects of each factor on sleep (Marroquín et al., 2010).

The second limitation is related to the small sample size and the difference between the male and female groups. This is due to the time constraints in collecting additional data, and also due to the fact that this is a sensitive topic for college students, making it difficult to recruit participants. However, the sample size does not affect the results of our study. Finally, resulting from time constraints, the current research team has not accurately analyzed which component of the sleep structure is most affected by post-breakup distress and the specific impact of each sleep component, but rather stopped at the disturbances in overall sleep.

RECOMMENDATIONS

Recommendations for practical application

With the aim of resolving rumination behavior, we recommend using Rumination-Focused Cognitive Behavioral Therapy (RFCBT). Developed by Watkins (2016), RFCBT is a variant of CBT that focuses on addressing rumination behavior in individuals. As it is based on CBT, RFCBT shares many similarities such as a structured format, agenda setting, using interventions like Socratic questioning, planning, behavioral experiments, and homework exercises (Beck et al., 1979; Watkins, 2016). However, RFCBT also has new features and is seen as highly promising in addressing the limitations of CBT (Watkins, 2016). Firstly, RFCBT emphasizes modifying the process of thinking rather than the content of thinking, as CBT usually approaches. This implies that RFCBT focuses on understanding the context, function, purpose, and usefulness of thinking instead of checking the accuracy and evidence of thinking to restructure cognition in the client (Watkins, 2008). Secondly, the treatment goal changes, so the formulation also differs. RFCBT shifts from a formulation based on core belief templates to one based on the context and function of rumination. Therefore, the re-evaluation of rumination behavior and changing the style of processing from unconstructive thoughts to more constructive, rational, and positive thoughts (Watkins et al., 2011) These changes help clients reduce the challenge of facing their automatic negative thoughts, and prevent the resurgence of rumination behavior. In addition, RFCBT has the advantage of avoiding the risk of disputes or debates about the meaning and interpretation of the client's thoughts and beliefs (Watkins, 2016).

RFCBT instructs individuals to focus on managing their rumination by engaging in more constructive thoughts through the following interventions (Watkins, 2016). First, RFCBT identifies rumination as a habitual behavior and explores the sequence of a rumination/thinking process to perceive the causes, consequences, functions, and stimuli that trigger the behavior. A better insight about the pattern of rumination will be helpful for the individual in the course of eliminating it (Watkins, 2008). Next, RFCBT applies the functional analysis (FA) method to address/intervene in the rumination behavior. FA focuses on the rumination process, examines the conditions that trigger it (when, where, how, what, with whom), and in what conditions it does not occur under? and whether rumination is useful or not - does it help individuals achieve their goals? (Watkins, 2016). The next step is to find a more useful replacement behavior to solve the problem or bring positive results to the individual. For example, instead of using rumination to control their anger, individuals are instructed to switch to a different behavior such as relaxation to regulate their anger without leaving serious aftermaths (Watkins, 2016). Thereupon, RFCBT guides individuals to shift from abstract, maladaptive thinking styles (e.g., "Why did this happen?" "Why me?") to more specific and adaptive thinking styles (e.g., "How did this happen?" "What can I do to help myself?") (Watkins, 2016). Accordingly, encouraging individuals to understand that different thoughts will lead to different outcomes, and they can distinguish between unhelpful rumination behaviors and problem-solving-oriented thinking. Finally, RFCBT uses experiential exercises, including compassionate self-talk, to soothe self-criticism and negative self-evaluation within individuals (Watkins, 2016).

The results indicated that RFCBT is effective in reducing rumination levels (Watkins et al., 2011). Similarly, Topper et al (2017) also pointed out that rumination behavior was significantly improved after RFCBT treatment. Baron & Kenny (1986) stated that changes in rumination behavior were an important factor in the ability to reduce rumination and anxiety. Furthermore, RFCBT was emphasized as having the ability to affect rumination and reduce rumination levels more than other interventions (Watkins et al., 2011). In addition, changing this thinking process helps reduce activation of the HPA system in the body (Brosschot et al., 2005; Han et al., 2012a; Kalmbach et al., 2018), hence improving sleep disturbances in students. Another Schlarb et al (2017) reported that an intervention that targeted rumination contributed to improving sleep and reducing the likelihood of sleep disorders. To understand more clearly, Watkin (2016) stated that rumination often occurs at the end of the day when individuals are lying in bed and trying to fall asleep. Therefore, changing this rumination habit helps minimize the risk of insomnia. Additionally, Sebastian & Dagmar (2018) demonstrates that sleep quality was significantly exceeded after rumination levels decreased. In addition to sleep disturbances, RFCBT has been evaluated as a preventative intervention for adolescents and young adults who are at high risk for future depression (Cook et al., 2019). Overall, RFCBT is a useful and feasible intervention in adjusting rumination behavior, training individuals to shift from unconstructive to constructive thinking, and problem-solving using functional analysis (FA), experiential/imaging exercises, and behavioral experiments. It helps prevent and improve the risks of sleep problems and depression in students in the future.

It is highly recommended to those who have breakup distress to have a good sleep and live positively.

Future research directions

As mentioned in the limitations section, there is a difference in meaning between the two factors of brooding and reflection in rumination. The reflection factor is related to decreasing depressive symptoms over time, although it is correlated with more depression concurrently. This suggests that the negative impact of the reflection factor only occurs in the short term and can be adapted to reduce negative effects over time because reflection aims to effectively solve problems. Meanwhile, the brooding factor of rumination is more related to current depressive symptoms (concurrently) and in longitudinal analyses, brooding shows poor adaptation (Treynor, 2003). Subsequent studies also exhibit a similar view, brooding is often associated with passive coping styles, while reflection is significantly correlated with active coping ability (Debeer et al., 2009; Harris et al., 2008; Joormann et al., 2006; Marroquín et al., 2010).

The expression of passive coping is disengagement or avoidance (Marroquín et al., 2010) evaluative self-focus - versus a more concrete, process-oriented self-focus - is maladaptive in terms of recovery from negative mood following a fallout (Watkins, 2004) and generation of less effective solutions to problems (Watkins & Moulds, 2005). In addition, some studies proffer that coping strategies can directly affect the quality of sleep (El-Sheikh et al., 2014; Grafe et al., 2020; Pillai et al., 2014; Tada, 2017; Zhang et al., 2020) specifically Hoyt et al. (2009) showed that a passive coping style through problem avoidance increases the degree of rumination before sleep, waking up at night, and waking up early in the morning, while approach-oriented coping (cognitive effort to find a solution to the problem, understand and accept it) is not related to the quality of sleep (40). Furthermore, adaptive coping strategies such as primary control engagement, demonstrated through problem-solving and emotional regulation efforts, are associated with better sleep quality (Chen, 2016; Chen et al., 2015; Wood et al., 2010). It can be seen that the reflection factor has a positive impact on sleep over time through active coping strategies, while brooding does not. Therefore, identifying types of rumination that involve reflection and types that involve brooding is very useful in the process of transforming irrational thoughts into rational ones aimed at active coping strategies and improving sleep issues, through the RFCBT intervention method (as we proposed above).

However, in addition to the supporting opinions mentioned above, some opinions suggest that reflection is not entirely harmless (Schoofs et al., 2010) as Hasegawa et al (2013) found a correlation between scores on the reflection scale and scores on the Inventory to Diagnose Depression, Lifetime Version (IDDL) scale, which means that people who frequently engage in reflection also experience increased depression in the future. Moreover, both reflection and brooding have been found to be related to suicidal ideation after one year of follow-up in a large community sample, and reflection also has some maladaptive aspects (Miranda & Nolen-Hoeksema, 2007). This result has been consistently replicated in subsequent studies (Johnson et al., 2008; Surrence et al., 2009). This may explain that efforts to understand the reasons for feeling down can lead to suicidal ideation when individuals are unsuccessful in finding

solutions to their problems or when their reflective efforts turn into brooding. In addition, Kwon & Olson (2007) also suggest that reflection is only adaptive when it is based on reality and constructive. Overall, this is still a controversial topic that needs further investigation. Therefore, to have a more accurate understanding of rumination, we propose that future research could focus on clarifying the confusion between the two factors of reflection and brooding in rumination, as well as providing more effective and in-depth explanations for the aforementioned differences.

CONCLUSIONS

Our study confirms that rumination plays an intermediary role in the relationship between post-breakup distress and sleep disturbances among Vietnamese university students. This implies that individuals who feel more distressed after a breakup tend to ruminate more, and excessive rumination leads to disturbances in sleep in general. Therefore, understanding the behavior of rumination is essential for improving sleep problems and developing strategies to transform unhelpful thoughts into constructive ones through the use of RFCBT techniques. In addition, we also identified other underlying factors in romantic relationships that contribute to the level of post-breakup distress, such as receiving a breakup message and longer relationship duration leading to higher levels of distress. As a result, we propose a 5-day intervention program that includes… to address these issues.

REFERENCES

Ahrberg, K., Dresler, M., Niedermaier, S., Steiger, A., & Genzel, L. (2012). The interaction between sleep quality and academic performance. Journal of Psychiatric Research, 46(12), 1618–1622. https://doi.org/10.1016/j.jpsychires.2012.09.008

Alapin, I., Fichten, C. S., Libman, E., Creti, L., Bailes, S., & Wright, J. (2000). How is good and poor sleep in older adults and college students related to daytime sleepiness, fatigue, and ability to concentrate? Journal of Psychosomatic Research, 49(5), 381–390. https://doi.org/10.1016/S0022-3999(00)00194-X

Amaral, A. P., Soares, M. J., Pinto, A. M., Pereira, A. T., Madeira, N., Bos, S. C., Marques, M., Roque, C., & Macedo, A. (2018). Sleep difficulties in college students: The role of stress, affect and cognitive processes. Psychiatry Research, 260, 331–337. https://doi.org/10.1016/j.psychres.2017.11.072

American Psychological Association. (n.d.). Distress. In APA dictionary of psychology. Retrieved October 23, 2022, from https://dictionary.apa.org/resilience

Attridge, M., Berscheid, E., & Simpson, J. A. (1995). Predicting relationship stability from both partners versus one. Journal of Personality and Social Psychology, 69(2), 254–268. https://doi.org/10.1037/0022-3514.69.2.254

Ayduk, O., Downey, G., & Kim, M. (2001). Rejection Sensitivity and Depressive Symptoms in Women. Personality and Social Psychology Bulletin, 27(7), 868–877. https://doi.org/10.1177/0146167201277009

Backhaus, J., Junghanns, K., Broocks, A., Riemann, D., & Hohagen, F. (2002). Test–retest reliability and validity of the Pittsburgh Sleep Quality Index in primary insomnia. Journal of Psychosomatic Research, 53(3), 737–740. https://doi.org/10.1016/s0022-3999(02)00330-6

Baert, S., Omey, E., Verhaest, D., & Vermeir, A. (2015). Mister Sandman, bring me good marks! On the relationship between sleep quality and academic achievement. Social Science & Medicine, 130, 91–98. https://doi.org/10.1016/j.socscimed.2015.02.011

Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. Journal

of Personality and Social Psychology, 51(6), 1173–1182. https://doi.org/10.1037/0022-3514.51.6.1173

Bartels, A., & Zeki, S. (2000). The neural basis of romantic love. NeuroReport, 11(17), 3829–3834. https://doi.org/10.1097/00001756-200011270-00046

Bartholomew, K., & Horowitz, L. M. (1991). Attachment styles among young adults: A test of a four-category model. Journal of Personality and Social Psychology, 61(2), 226–244. https://doi.org/10.1037/0022-3514.61.2.226

Basheer, R., Strecker, R. E., Thakkar, M. M., & McCarley, R. W. (2004). Adenosine and sleep–wake regulation. Progress in Neurobiology, 73(6), 379–396. https://doi.org/10.1016/j.pneurobio.2004.06.004

Baumeister, R. F., & Leary, M. R. (1995). The need to belong: Desire for interpersonal attachments as a fundamental human motivation. Psychological Bulletin, 117(3), 497–529. https://doi.org/10.1037/0033-2909.117.3.497

Beck, A. T., Rush, A. J., Shaw, B. F., & Emery, G. (1979). Cognitive therapy of depression. Guilford Press.

Berscheid, E., Snyder, M., & Omoto, A. M. (1989). The Relationship Closeness Inventory: Assessing the closeness of interpersonal relationships. Journal of Personality and Social Psychology, 57(5), 792–807. https://doi.org/10.1037/0022-3514.57.5.792

Boelen, P. A., & Reijntjes, A. (2009). Negative cognitions in emotional problems following romantic relationship break-ups. Stress and Health, 25(1), 11–19. https://doi.org/10.1002/smi.1219

Borisenkov, M. F., Perminova, E. V., & Kosova, A. L. (2010). Chronotype, sleep length, and school achievement of 11- to 23-year-old students in northern European Russia. Chronobiology International, 27(6), 1259–1270. https://doi.org/10.3109/07420528.2010.487624

Braithwaite, S. R., Delevi, Raquel., & Fincham, F. D. (2010). Romantic relationships and the physical and mental health of college students. Personal Relationships, 17(1), 1–12. https://doi.org/10.1111/j.1475-6811.2010.01248.x

Bravo, V., Connolly, J., & McIsaac, C. (2017). Why Did It End? Breakup Reasons of Youth of Different Gender, Dating Stages, and Ages. Emerging Adulthood, 5(4), 230–240. https://doi.org/10.1177/2167696817700261

Brosschot, J. F., Pieper, S., & Thayer, J. F. (2005). Expanding stress theory: Prolonged activation and perseverative cognition. Psychoneuroendocrinology, 30(10), 1043–1049. https://doi.org/10.1016/j.psyneuen.2005.04.008

Brown, F. C., Buboltz, W. C., & Soper, B. (2002). Relationship of Sleep Hygiene Awareness, Sleep Hygiene Practices, and Sleep Quality in University Students. Behavioral Medicine, 28(1), 33–38. https://doi.org/10.1080/08964280209596396

Burnette, J. L., Davis, D. E., Green, J. D., Worthington, E. L., & Bradfield, E. (2009). Insecure attachment and depressive symptoms: The mediating role of rumination, empathy, and forgiveness. Personality and Individual Differences, 46(3), 276–280. https://doi.org/10.1016/j.paid.2008.10.016

Butz, S., & Stahlberg, D. (2018) Can self-compassion improve sleep quality via reduced rumination? Self and Identity, 17(6), 666-686. https://doi.org/10.1080/15298868.2018.1456482

Buysse, D. J., Reynolds, C. F., Monk, T. H., Berman, S. R., & Kupfer, D. J. (1989). The Pittsburgh sleep quality index: A new instrument for psychiatric practice and research. Psychiatry Research, 28(2), 193–213. https://doi.org/10.1016/0165-1781(89)90047-4

Carney, C. E., Edinger, J. D., Meyer, B., Lindman, L., & Istre, T. (2006). Daily activities and sleep quality in college students. Chronobiology International, 23(3), 623–637. https://doi.org/10.1080/07420520600650695

Carney, C. E., Edinger, J. D., Morin, C. M., Manber, R., Rybarczyk, B., Stepanski, E. J., Wright, H., & Lack, L. (2010). Examining maladaptive beliefs about sleep across insomnia patient groups. Journal of Psychosomatic Research, 68(1), 57–65. https://doi.org/10.1016/j.jpsychores.2009.08.007

Chen, C. (2016). The Role of Resilience and Coping Styles in Subjective Well-Being Among Chinese University Students. The Asia-Pacific Education Researcher, 25(3), 377–387. https://doi.org/10.1007/s40299-016-0274-5

Chen, H.-M., Huang, M.-F., Yeh, Y.-C., Huang, W.-H., & Chen, C.-S. (2015). Effectiveness of coping strategies intervention on caregiver burden among caregivers of elderly patients with dementia. Psychogeriatrics, 15(1), 20–25. https://doi.org/10.1111/psyg.12071

Chen, H., Shang, D.-G., & Xiong, J. (2013). A coupled plasticity correction approach to estimating notch root strains under multiaxial cyclic loading. International Journal of Fatigue, 52, 39–48. https://doi.org/10.1016/j.ijfatigue.2013.02.020

Connor, K. M., & Davidson, J. R. T. (2003). Development of a new resilience scale: The Connor-Davidson Resilience Scale (CD-RISC). Depression and Anxiety, 18(2), 76–82. https://doi.org/10.1002/da.10113

Cook, L., Mostazir, M., & Watkins, E. (2019). Reducing Stress and Preventing Depression (RESPOND): Randomized Controlled Trial of Web-Based Rumination-Focused Cognitive Behavioral Therapy for High-Ruminating University Students. Journal of Medical Internet Research, 21(5). https://doi.org/10.2196/11349

Cowdrey, F. A., & Park, R. J. (2011). Assessing rumination in eating disorders: Principal component analysis of a minimally modified ruminative response scale. Eating Behaviors, 12(4), 321–324. https://doi.org/10.1016/j.eatbeh.2011.08.001

Cupit, I. N., Servaty-Seib, H. L., Tedrick Parikh, S., Walker, A. C., & Martin, R. (2016). College and the grieving student: A mixed-methods analysis. Death Studies, 40(8), 494–506. https://doi.org/10.1080/07481187.2016.1181687

Curcio, G., Ferrara, M., & Degennaro, L. (2006). Sleep loss, learning capacity and academic performance. Sleep Medicine Reviews, 10(5), 323–337. https://doi.org/10.1016/j.smrv.2005.11.001

Curcio, G., Tempesta, D., Scarlata, S., Marzano, C., Moroni, F., Rossini, P. M., Ferrara, M., & De Gennaro, L. (2012). Validity of the Italian Version of the Pittsburgh Sleep Quality Index (PSQI). Neurological Sciences, 34(4), 511–519.

Davis, D., Shaver, P. R., & Vernon, M. L. (2003). Physical, Emotional, and Behavioral Reactions to Breaking Up: The Roles of Gender, Age, Emotional Involvement, and Attachment Style. Personality and Social Psychology Bulletin, 29(7), 871–884. https://doi.org/10.1177/0146167203029007006

De Witte, S., Baeken, C., Pulopulos, M. M., Josephy, H., Schiettecatte, J., Anckaert, E., De Raedt, R., & Vanderhasselt, M.-A. (2020). The effect of neurostimulation applied to the left dorsolateral prefrontal cortex on post-stress adaptation as a function of depressive brooding. Progress in Neuro-Psychopharmacology and Biological Psychiatry, 96, 109687. https://doi.org/10.1016/j.pnpbp.2019.109687

Debeer, E., Hermans, D., & Raes, F. (2009). Associations between components of rumination and autobiographical memory specificity as measured by a Minimal Instructions Autobiographical Memory Test. Memory, 17(8), 892–903. https://doi.org/10.1080/09658210903376243

del Palacio-González, A., Clark, D. A., & O'Sullivan, L. F. (2017). Distress Severity Following a Romantic Breakup Is Associated With Positive Relationship Memories Among Emerging Adults. Emerging Adulthood, 5(4), 259–267. https://doi.org/10.1177/2167696817704117

Dewald, J. F., Meijer, A. M., Oort, F. J., Kerkhof, G. A., & Bögels, S. M. (2010). The influence of sleep quality, sleep duration and sleepiness on school performance in children and adolescents: A meta-analytic review. Sleep Medicine Reviews, 14(3), 179–189. https://doi.org/10.1016/j.smrv.2009.10.004

Diekelmann, S., Wilhelm, I., & Born, J. (2009). The whats and whens of sleep-dependent memory consolidation. Sleep Medicine Reviews, 13(5), 309–321. https://doi.org/10.1016/j.smrv.2008.08.002

Doi, Y., Minowa, M., Uchiyama, M., Okawa, M., Kim, K., Shibui, K., & Kamei, Y. (2000). Psychometric assessment of subjective sleep quality using the Japanese version of the Pittsburgh Sleep Quality Index (PSQI-J) in psychiatric disordered and control

subjects. Psychiatry Research, 97(2–3), 165–172. https://doi.org/10.1016/s0165-1781(00)00232-8

Drum, D. J., Brownson, C., Burton Denmark, A., & Smith, S. E. (2009). New data on the nature of suicidal crises in college students: Shifting the paradigm. Professional Psychology: Research and Practice, 40(3), 213–222. https://doi.org/10.1037/a0014465

Du, C., Zan, M. C. H., Cho, M. J., Fenton, J. I., Hsiao, P. Y., Hsiao, R., Keaver, L., Lai, C.-C., Lee, H., Ludy, M.-J., Shen, W., Swee, W. C. S., Thrivikraman, J., Tseng, K.-W., Tseng, W.-C., & Tucker, R. M. (2020). Increased Resilience Weakens the Relationship between Perceived Stress and Anxiety on Sleep Quality: A Moderated Mediation Analysis of Higher Education Students from 7 Countries. Clocks & Sleep, 2(3), 334–353. https://doi.org/10.3390/clockssleep2030025

Durmer, J. S., & Dinges, D. F. (2005). Neurocognitive Consequences of Sleep Deprivation. Seminars in Neurology, 25(01), 117–129. https://doi.org/10.1055/s-2005-867080

Eisma, M. C., Tõnus, D., & de Jong, P. J. (2022). Desired attachment and breakup distress relate to automatic approach of the ex-partner. Journal of Behavior Therapy and Experimental Psychiatry, 75, 101713. https://doi.org/10.1016/j.jbtep.2021.101713

El-Sheikh, M., Kelly, R. J., Sadeh, A., & Buckhalt, J. A. (2014). Income, ethnicity, and sleep: Coping as a moderator. Cultural Diversity and Ethnic Minority Psychology, 20(3), 441–448. https://doi.org/10.1037/a0036699

Ellenbogen, J. M., Hulbert, J. C., Stickgold, R., Dinges, D. F., & Thompson-Schill, S. L. (2006). Interfering with Theories of Sleep and Memory: Sleep, Declarative Memory, and Associative Interference. Current Biology, 16(13), 1290–1294. https://doi.org/10.1016/j.cub.2006.05.024

Erikson, E. H. (1950). Childhood and society. W W Norton & Co.

Fagundes, C. P. (2012). Getting over you: Contributions of attachment theory for postbreakup emotional adjustment. Personal Relationships, 19(1), 37–50. https://doi.org/10.1111/j.1475-6811.2010.01336.x

Field, T. (2017). Romantic Breakup Distress, Betrayal and Heartbreak: A Review. International Journal of Behavioral Research & Psychology, 217–225. https://doi.org/10.19070/2332-3000-1700038

Field, T., Diego, M., Pelaez, M., Deeds, O., & Delgado, J. (2009). Breakup distress in university students. Adolescence, 44(176), 705–727.

Field, T., Diego, M., Pelaez, M., Deeds, O., & Delgado, J. (2010). Breakup Distress and Loss of Intimacy in University Students. Psychology, 01(03), 173–177. https://doi.org/10.4236/psych.2010.13023

Field, T., Diego, M., Pelaez, M., Deeds, O., & Delgado, J. (2011). Breakup distress in university students: A review. College Student Journal, 45(3), 461–480.

Fisher, H. E., Brown, L. L., Aron, A., Strong, G., & Mashek, D. (2010). Reward, Addiction, and Emotion Regulation Systems Associated With Rejection in Love. Journal of Neurophysiology, 104(1), 51–60. https://doi.org/10.1152/jn.00784.2009

Fleming, C. B., White, H. R., Oesterle, S., Haggerty, K. P., & Catalano, R. F. (2010). Romantic Relationship Status Changes and Substance Use Among 18- to 20-Year-Olds. Journal of Studies on Alcohol and Drugs, 71(6), 847–856. https://doi.org/10.15288/jsad.2010.71.847

Folkman, S., & Moskowitz, J. T. (2000). Positive affect and the other side of coping. American Psychologist, 55(6), 647–654. https://doi.org/10.1037/0003-066X.55.6.647

Frankland, P. W., & Bontempi, B. (2005). The organization of recent and remote memories. Nature Reviews Neuroscience, 6(2), 119–130. https://doi.org/10.1038/nrn1607

Gaultney, J. F. (2010). The Prevalence of Sleep Disorders in College Students: Impact on Academic Performance. Journal of American College Health, 59(2), 91–97. https://doi.org/10.1080/07448481.2010.483708

Gianferante, D., Thoma, M. V., Hanlin, L., Chen, X., Breines, J. G., Zoccola, P. M., & Rohleder, N. (2014a). Post-stress rumination predicts HPA axis responses to repeated acute stress. Psychoneuroendocrinology, 49, 244–252. https://doi.org/10.1016/j.psyneuen.2014.07.021

Gianferante, D., Thoma, M. V., Hanlin, L., Chen, X., Breines, J. G., Zoccola, P. M., & Rohleder, N. (2014). Post-stress rumination predicts HPA axis responses to repeated acute

stress. Psychoneuroendocrinology, 49, 244–252. https://doi.org/10.1016/j.psyneuen.2014.07.021

Gilbert, S. P., & Weaver, C. C. (2010). Sleep Quality and Academic Performance in University Students: A Wake-Up Call for College Psychologists. Journal of College Student Psychotherapy, 24(4), 295–306. https://doi.org/10.1080/87568225.2010.509245

Gomes, A. A., Tavares, J., & de Azevedo, M. H. P. (2011). Sleep and Academic Performance in Undergraduates: A Multi-measure, Multi-predictor Approach. Chronobiology International, 28(9), 786–801. https://doi.org/10.3109/07420528.2011.606518

Gouin, J.-P., Glaser, R., Malarkey, W. B., Beversdorf, D., & Kiecolt-Glaser, J. (2012). Chronic stress, daily stressors, and circulating inflammatory markers. Health Psychology, 31(2), 264–268. https://doi.org/10.1037/a0025536

Grafe, L. A., O'Mara, L., Branch, A., Dobkin, J., Luz, S., Vigderman, A., Shingala, A., Kubin, L., Ross, R., & Bhatnagar, S. (2020). Passive Coping Strategies During Repeated Social Defeat Are Associated With Long-Lasting Changes in Sleep in Rats. Frontiers in Systems Neuroscience, 14. https://doi.org/10.3389/fnsys.2020.00006

Green, J. D., Campbell, W. K., & Davis, J. L. (2007). Ghosts From the Past: An Examination of Romantic Relationships and Self-Discrepancy. The Journal of Social Psychology, 147(3), 243–264. https://doi.org/10.3200/SOCP.147.3.243-264

Guastella, A. J., & Moulds, M. L. (2007). The impact of rumination on sleep quality following a stressful life event. Personality and Individual Differences, 42(6), 1151–1162. https://doi.org/10.1016/j.paid.2006.04.028

Han, K. S., Kim, L., & Shim, I. (2012). Stress and Sleep Disorder. Experimental Neurobiology, 21(4), 141–150. https://doi.org/10.5607/en.2012.21.4.141

Hansen, D. A., Kelley, H. H., & Thibaut, J. W. (1982). Interpersonal Relations: A Theory of Interdependence. Journal of Marriage and the Family, 44(1), 246–248. https://doi.org/10.2307/351281

Harris, P. W., Pepper, C. M., & Maack, D. J. (2008). The relationship between maladaptive perfectionism and depressive symptoms: The mediating role of rumination. Personality and Individual Differences, 44(1), 150–160. https://doi.org/10.1016/j.paid.2007.07.011

Harrison, Y., & Horne, J. A. (1997). Sleep Deprivation Affects Speech. Sleep, 20(10), 871–877. https://doi.org/10.1093/sleep/20.10.871

Harrison, Y., & Horne, J. A. (2000). The impact of sleep deprivation on decision making: A review. Journal of Experimental Psychology: Applied, 6(3), 236–249. https://doi.org/10.1037/1076-898X.6.3.236

Harvey, A. G. (2002). A cognitive model of insomnia. Behaviour Research and Therapy, 40(8), 869–893. https://doi.org/10.1016/S0005-7967(01)00061-4

Hasegawa, A., Koda, M., Kondo, T., Hattori, Y., & Kawaguchi, J. (2013). Longitudinal Predictions of the Brooding and Reflection Subscales of the Japanese Ruminative Responses Scale for Depression. Psychological Reports, 113(2), 566–585. https://doi.org/10.2466/02.15.PR0.113x24z5

Hawley, A. R., Mahoney, A., Pargament, K. I., & Gordon, A. K. (2015). Sexuality and spirituality as predictors of distress over a romantic breakup: Mediated and moderated pathways. Spirituality in Clinical Practice, 2(2), 145–159. https://doi.org/10.1037/scp0000034

Hayes, A. F. (2017). Introduction to mediation, moderation, and conditional process analysis: A regression-based approach. The Guilford Press.

He, J., Liu, Y., Cheng, C., Fang, S., Wang, X., & Yao, S. (2021). Psychometric Properties of the Chinese Version of the 10-Item Ruminative Response Scale Among Undergraduates and Depressive Patients. Frontiers in Psychiatry. https://doi.org/10.3389/fpsyt.2021.626859

Hebert, S., & Popadiuk, N. (2008). University Students' Experiences of Nonmarital Breakups: A Grounded Theory. Journal of College Student Development, 49(1), 1–14. https://doi.org/10.1353/csd.2008.0008

Henson, R. N. A., Rugg, M. D., Shallice, T., Josephs, O., & Dolan, R. J. (1999). Recollection and Familiarity in Recognition Memory: An Event-Related Functional Magnetic

Resonance Imaging Study. The Journal of Neuroscience, 19(10), 3962–3972. https://doi.org/10.1523/JNEUROSCI.19-10-03962.1999

Hershner, S. (2020). Sleep and academic performance: measuring the impact of sleep. Behavioral Sciences, 33, 51-56. https://doi.org/10.1016/j.cobeha.2019.11.009

Hilt, L. M., Aldao, A., & Fischer, K. (2015). Rumination and multi-modal emotional reactivity. Cognition and Emotion, 29(8), 1486–1495. https://doi.org/10.1080/02699931.2014.989816

Horne, J. A. (1988). Sleep Loss and "Divergent" Thinking Ability. Sleep, 11(6), 528–536. https://doi.org/10.1093/sleep/11.6.528

Horowitz, M. J., Siegel, B., Holen, A., Bonanno, G. A., Milbrath, C., & Stinson, C. H. (2003). Diagnostic Criteria for Complicated Grief Disorder. Focus, 1(3), 290–298. https://doi.org/10.1176/foc.1.3.290

Horwitz, A. V., & Wakefield, J. C. (2007). The loss of sadness: How psychiatry transformed normal sorrow into depressive disorder. Oxford University Press.

Howell, A. J., Jahrig, J. C., & Powell, R. A. (2004). Sleep Quality, Sleep Propensity and Academic Performance. Perceptual and Motor Skills, 99(2), 525–535. https://doi.org/10.2466/pms.99.2.525-535

Hsieh, H.F., & Shannon, S. E. (2005). Three Approaches to Qualitative Content Analysis. Qualitative Health Research, 15(9), 1277–1288. https://doi.org/10.1177/1049732305276687

IBM Corp. Released 2017. IBM Statistic for Window, Version 25.0. Armonk, NY: IBM Corp

Johns, M. W., Dudley, H. A. F., & Masterton, J. P. (1976). The sleep habits, personality and academic performance of medical students. Medical Education, 10(3), 158–162. https://doi.org/10.1111/j.1365-2923.1976.tb00432.x

Johnson, S. L., McKenzie, G., & McMurrich, S. (2008). Ruminative Responses to Negative and Positive Affect Among Students Diagnosed with Bipolar Disorder and Major Depressive Disorder. Cognitive Therapy and Research, 32(5), 702–713. https://doi.org/10.1007/s10608-007-9158-6

Joormann, J., Dkane, M., & Gotlib, I. H. (2006). Adaptive and Maladaptive Components of Rumination? Diagnostic Specificity and Relation to Depressive Biases. Behavior Therapy, 37(3), 269–280. https://doi.org/10.1016/j.beth.2006.01.002

Jose, P. E., & Brown, I. (2008). When does the Gender Difference in Rumination Begin? Gender and Age Differences in the Use of Rumination by Adolescents. Journal of Youth and Adolescence, 37(2), 180–192. https://doi.org/10.1007/s10964-006-9166-y

Kalmbach, D., Cuamatzi-Castelan, A., Tonnu, C., Tran, K. M., Anderson, J., Roth, T., & Drake, C. (2018). Hyperarousal and sleep reactivity in insomnia: current insights. Nature and Science of Sleep, Volume 10, 193–201. https://doi.org/10.2147/NSS.S138823

Kelly, W. E., Kelly, K. E., & Clanton, R. C. (2001). The relationship between sleep length and grade-point average among college students. College Student Journal, 35(1), 84– 86.

Kiecolt-Glaser, J. K., McGuire, L., Robles, T. F., & Glaser, R. (2002). Emotions, Morbidity, and Mortality: New Perspectives from Psychoneuroimmunology. Annual Review of Psychology, 53(1), 83–107. https://doi.org/10.1146/annurev.psych.53.100901.135217

Kwon, P., & Olson, M. L. (2007). Rumination and depressive symptoms: Moderating role of defense style immaturity. Personality and Individual Differences, 43(4), 715–724. https://doi.org/10.1016/j.paid.2007.01.012

Lamis, D. A., Hirsch, J. K., Pugh, K. C., Topciu, R., Nsamenang, S. A., Goodman, A., & Duberstein, P. R. (2018). Perceived cognitive deficits and depressive symptoms in patients with multiple sclerosis: Perceived stress and sleep quality as mediators. Multiple Sclerosis and Related Disorders, 25, 150–155. https://doi.org/10.1016/j.msard.2018.07.019

Lee, K. S., & Ono, H. (2012). Marriage, Cohabitation, and Happiness: A Cross-National Analysis of 27 Countries. Journal of Marriage and Family, 74(5), 953–972. https://doi.org/10.1111/j.1741-3737.2012.01001.x

Lee, S., & Kim, W. (2014). Cross-Cultural Adaptation, Reliability, and Validity of the Revised Korean Version of Ruminative Response Scale. Psychiatry Investigation, 11(1), 59. https://doi.org/10.4306/pi.2014.11.1.59

Lim, J., & Dinges, D. F. (2010). A meta-analysis of the impact of short-term sleep deprivation on cognitive variables. Psychological Bulletin, 136(3), 375–389. https://doi.org/10.1037/a0018883

Lucena-Santos, P., Pinto-Gouveia, J., Carvalho, S. A., & Oliveira, M. D. S. (2018). Is the widely used two-factor structure of the Ruminative Responses Scale invariant across different samples of women? Psychology and Psychotherapy: Theory, Research and Practice, 91(3), 398–416. https://doi.org/10.1111/papt.12168

Lund, H. G., Reider, B. D., Whiting, A. B., & Prichard, J. R. (2010). Sleep Patterns and Predictors of Disturbed Sleep in a Large Population of College Students. Journal of Adolescent Health, 46(2), 124–132. https://doi.org/10.1016/j.jadohealth.2009.06.016

Marroquín, B. M., Fontes, M., Scilletta, A., & Miranda, R. (2010). Ruminative subtypes and coping responses: Active and passive pathways to depressive symptoms. Cognition & Emotion, 24(8), 1446–1455. https://doi.org/10.1080/02699930903510212

Mearns, J. (1991). Coping with a breakup: Negative mood regulation expectancies and depression following the end of a romantic relationship. Journal of Personality and Social Psychology, 60(2), 327–334. https://doi.org/10.1037/0022-3514.60.2.327

Medeiros, A. L. D., Mendes, D. B. F., Lima, P. F., & Araujo, J. F. (2001). The Relationships between Sleep-Wake Cycle and Academic Performance in Medical Students. Biological Rhythm Research, 32(2), 263–270. https://doi.org/10.1076/brhm.32.2.263.1359

Mezo, P. G., & Baker, R. M. (2012). The Moderating Effects of Stress and Rumination on Depressive Symptoms in Women and Men. Stress and Health, 28(4), 333–339. https://doi.org/10.1002/smi.2417

Miranda, R., & Nolen-Hoeksema, S. (2007). Brooding and reflection: Rumination predicts suicidal ideation at 1-year follow-up in a community sample. Behaviour Research and Therapy, 45(12), 3088–3095. https://doi.org/10.1016/j.brat.2007.07.015

Mollayeva, T., Thurairajah, P., Burton, K., Mollayeva, S., Shapiro, C. M., & Colantonio, A. (2016). The Pittsburgh sleep quality index as a screening tool for sleep dysfunction in clinical and non-clinical samples: A systematic review and meta-analysis. Sleep Medicine Reviews, 25, 52–73. https://doi.org/10.1016/j.smrv.2015.01.009

Morrow, J., & Nolen-Hoeksema, S. (1990). Effects of responses to depression on the remediation of depressive affect. Journal of Personality and Social Psychology, 58(3), 519–527. https://doi.org/10.1037/0022-3514.58.3.519

Myers, D. G., & DeWall, C. N. (2020). Psychology in Modules (13th ed.). Worth

Nelabhotla, S., & Shanmugam, S. (2021). Effects of Acute Sleep Deprivation on Working Memory Capacity in Undergraduate Students. The Journal of Science and Medicine, 1–11. https://doi.org/10.37714/josam.vi0.77

Nofzinger, E. A. (2004). Functional Neuroimaging Evidence for Hyperarousal in Insomnia. American Journal of Psychiatry, 161(11), 2126–2128. https://doi.org/10.1176/appi.ajp.161.11.2126

Nolen-Hoeksema, S. (1991). Responses to depression and their effects on the duration of depressive episodes. Journal of Abnormal Psychology, 100(4), 569–582. https://doi.org/10.1037/0021-843X.100.4.569

Nolen-Hoeksema, S., & Jackson, B. (2001). Mediators of the Gender Difference in Rumination. Psychology of Women Quarterly, 25(1), 37–47. https://doi.org/10.1111/1471-6402.00005

Nunnally, J. C., & Bernstein, I. H. (1994). Psychometric Theory (3rd ed.). McGraw-Hill.

Oginska, H., & Pokorski, J. (2006). Fatigue and Mood Correlates of Sleep Length in Three Age-Social Groups: School Children, Students, and Employees. Chronobiology International, 23(6), 1317–1328. https://doi.org/10.1080/07420520601089349

Okano, K., Kaczmarzyk, J. R., Dave, N., Gabrieli, J. D. E., & Grossman, J. C. (2019). Sleep quality, duration, and consistency are associated with better academic performance

in college students. Npj Science of Learning, 4(1), 16. https://doi.org/10.1038/s41539-019-0055-z

Palagini, L., & Mauri, M. (2015). Palagini. Archives Italiennes de Biologie, 153(2.3). https://doi.org/10.12871/0003982920152349

Parola, N., Zendjidjian, X. Y., Alessandrini, M., Baumstarck, K., Loundou, A., Fond, G., Berna, F., Lançon, C., Auquier, P., & Boyer, L. (2017). Psychometric properties of the Ruminative Response Scale-short form in a clinical sample of patients with major depressive disorder. Patient Preference and Adherence, Volume 11, 929–937. https://doi.org/10.2147/ppa.s125730

Peiris, M. T. R., Jones, R. D., Davidson, P. R., & Bones, P. J. (2008). Event-based detection of lapses of responsiveness. 2008 30th Annual International Conference of the IEEE Engineering in Medicine and Biology Society, 4960–4963. https://doi.org/10.1109/IEMBS.2008.4650327

Perilloux, C., & Buss, D. M. (2008). Breaking up Romantic Relationships: Costs Experienced and Coping Strategies Deployed. Evolutionary Psychology, 6(1), 164–181. https://doi.org/10.1177/147470490800600119

Pilcher, J. J., & Ott, E. S. (1998). The Relationships Between Sleep and Measures of Health and Weil-Being in College Students: A Repeated Measures Approach. Behavioral Medicine, 23(4), 170–178. https://doi.org/10.1080/08964289809596373

Pilcher, J. J., Ginter, D. R., & Sadowsky, B. (1997). Sleep quality versus sleep quantity: Relationships between sleep and measures of health, well-being and sleepiness in college students. Journal of Psychosomatic Research, 42(6), 583–596. https://doi.org/10.1016/S0022-3999(97)00004-4

Pillai, V., Steenburg, L. A., Ciesla, J. A., Roth, T., & Drake, C. L. (2014). A seven day actigraphy-based study of rumination and sleep disturbance among young adults with depressive symptoms. Journal of Psychosomatic Research, 77(1), 70–75. https://doi.org/10.1016/j.jpsychores.2014.05.004

Poudel, G. R., Jones, R. D., Innes, C. R. H., Watts, R., Signal, T. L., & Bones, P. J. (2009). fMRI correlates of behavioural microsleeps during a continuous visuomotor task. 2009 Annual International Conference of the IEEE Engineering in Medicine and Biology Society, 2919–2922. https://doi.org/10.1109/IEMBS.2009.5334486

Raley, H., Naber, J., Cross, S., & Perlow, M. (2016). The Impact of Duration of Sleep on Academic Performance in University Students. Madridge Journal of Nursing, 1(1), 11–18. https://doi.org/10.18689/mjn-1000103

Reimer, J. E., & Estrada, A. R. (2021). College Students' Grief Over a Breakup. Journal of Loss and Trauma, 26(2), 179–191. https://doi.org/10.1080/15325024.2020.1757992

Reinberg, A., Motohashi, Y., Bourdeleau, P., Touitou, Y., Nouguier, J., Lévi, F., & Nicolaï, A. (1989). Internal desynchronization of circadian rhythms and tolerance of shift work. Chronobiologia, 16(1), 21–34

Rhoades, G. K., Kamp Dush, C. M., Atkins, D. C., Stanley, S. M., & Markman, H. J. (2011). Breaking up is hard to do: The impact of unmarried relationship dissolution on mental health and life satisfaction. Journal of Family Psychology, 25(3), 366–374. https://doi.org/10.1037/a0023627

Robak, R. W., & Weitzman, S. P. (1998). The nature of grief: Loss of love relationships in young adulthood. Journal of Personal and Interpersonal Loss, 3(2), 205–216. https://doi.org/10.1080/10811449808414442

Rosenbaum, D., Thomas, M., Hilsendegen, P., Metzger, F. G., Haeussinger, F. B., Nuerk, H.-C., Fallgatter, A. J., Nieratschker, V., & Ehlis, A.-C. (2018). Stress-related dysfunction of the right inferior frontal cortex in high ruminators: An fNIRS study. NeuroImage: Clinical, 18, 510–517. https://doi.org/10.1016/j.nicl.2018.02.022

Rusbult, C. E. (1983). A longitudinal test of the investment model: The development (and deterioration) of satisfaction and commitment in heterosexual involvements. Journal of Personality and Social Psychology, 45(1), 101–117. https://doi.org/10.1037/0022-3514.45.1.101

Saffrey, C., & Ehrenberg, M. (2007). When thinking hurts: Attachment, rumination, and postrelationship adjustment. Personal Relationships, 14(3), 351–368. https://doi.org/10.1111/j.1475-6811.2007.00160.x

Sbarra, D. A. (2006). Predicting the Onset of Emotional Recovery Following Nonmarital Relationship Dissolution: Survival Analyses of Sadness and Anger. Personality and Social Psychology Bulletin, 32(3), 298–312. https://doi.org/10.1177/0146167205280913

Sbarra, D. A., & Emery, R. E. (2005). The emotional sequelae of nonmarital relationship dissolution: Analysis of change and intraindividual variability over time. Personal Relationships, 12(2), 213–232. https://doi.org/10.1111/j.1350-4126.2005.00112.x

Schlarb, A., Friedrich, A., & Claßen, M. (2017). Sleep problems in university students – an intervention. Neuropsychiatric Disease and Treatment, 13, 1989–2001. https://doi.org/10.2147/NDT.S142067

Schoofs, H., Hermans, D., & Raes, F. (2010). Brooding and Reflection as Subtypes of Rumination: Evidence from Confirmatory Factor Analysis in Nonclinical Samples using the Dutch Ruminative Response Scale. Journal of Psychopathology and Behavioral Assessment, 32(4), 609–617. https://doi.org/10.1007/s10862-010-9182-9

Shear, K., & Shair, H. (2005). Attachment, loss, and complicated grief. Developmental Psychobiology, 47(3), 253–267. https://doi.org/10.1002/dev.20091

Shochat, T., Cohen-Zion, M., & Tzischinsky, O. (2014). Functional consequences of inadequate sleep in adolescents: A systematic review. Sleep Medicine Reviews, 18(1), 75–87. https://doi.org/10.1016/j.smrv.2013.03.005

Simon, R. W., & Barrett, A. E. (2010). Nonmarital Romantic Relationships and Mental Health in Early Adulthood. Journal of Health and Social Behavior, 51(2), 168–182. https://doi.org/10.1177/0022146510372343

Simpson, J. A. (1987). The dissolution of romantic relationships: Factors involved in relationship stability and emotional distress. Journal of Personality and Social Psychology, 53(4), 683–692. https://doi.org/10.1037/0022-3514.53.4.683

Skitch, S. A., & Abela, J. R. Z. (2008). Rumination in Response to Stress as a Common Vulnerability Factor to Depression and Substance Misuse in Adolescence. Journal of Abnormal Child Psychology, 36(7), 1029–1045. https://doi.org/10.1007/s10802-008-9233-9

Slotter, E. B., Gardner, W. L., & Finkel, E. J. (2010). Who Am I Without You? The Influence of Romantic Breakup on the Self-Concept. Personality and Social Psychology Bulletin, 36(2), 147–160. https://doi.org/10.1177/0146167209352250

Smith, J. M., & Alloy, L. B. (2009). A roadmap to rumination: A review of the definition, assessment, and conceptualization of this multifaceted construct. Clinical Psychology Review, 29(2), 116–128. https://doi.org/10.1016/j.cpr.2008.10.003

Sohn, S. I., Kim, D. H., Lee, M. Y., & Cho, Y. W. (2011). The reliability and validity of the Korean version of the Pittsburgh Sleep Quality Index. Sleep and Breathing, 16(3), 803–812. https://doi.org/10.1007/s11325-011-0579-9

Sprecher, S., Felmlee, D., Metts, S., Fehr, B., & Vanni, D. (1998). Factors Associated with Distress Following the Breakup of a Close Relationship. Journal of Social and Personal Relationships, 15(6), 791–809. https://doi.org/10.1177/0265407598156005

Steptoe, A., Peacey, V., & Wardle, J. (2006). Sleep Duration and Health in Young Adults. Archives of Internal Medicine, 166(16), 1689–1692. https://doi.org/10.1001/archinte.166.16.1689

Stroud, L. R., Tanofsky-Kraff, M., Wilfley, D. E., & Salovey, P. (2000). The Yale Interpersonal Stressor (YIPS): Affective, physiological, and behavioral responses to a novel interpersonal rejection paradigm. Annals of Behavioral Medicine, 22(3), 204–213. https://doi.org/10.1007/BF02895115

Surrence, K., Miranda, R., Marroquín, B. M., & Chan, S. (2009). Brooding and reflective rumination among suicide attempters: Cognitive vulnerability to suicidal ideation. Behaviour Research and Therapy, 47(9), 803–808. https://doi.org/10.1016/j.brat.2009.06.001

Sweis, B. M. (2012). HPA Axis Diagram [Infographic]. Wikimedia Commons. https://commons.wikimedia.org/wiki/File:HPA_Axis_Diagram_(Brian_M_Sweis_2012).png

Tada, A. (2017). The Associations among Psychological Distress, Coping Style, and Health Habits in Japanese Nursing Students: A Cross-Sectional Study. International Journal of Environmental Research and Public Health, 14(11). https://doi.org/10.3390/ijerph14111434

Takano, K., Iijima, Y., & Tanno, Y. (2012). Repetitive Thought and Self-Reported Sleep Disturbance. Behavior Therapy, 43(4), 779–789. https://doi.org/10.1016/j.beth.2012.04.002

Takano, K., Sakamoto, S., & Tanno, Y. (2014). Repetitive Thought Impairs Sleep Quality: An Experience Sampling Study. Behavior Therapy, 45(1), 67–82. https://doi.org/10.1016/j.beth.2013.09.004

Tan, K., Agnew, C. R., VanderDrift, L. E., & Harvey, S. M. (2015). Committed to us: Predicting relationship closeness following nonmarital romantic relationship breakup. Journal of Social and Personal Relationships, 32(4), 456–471. https://doi.org/10.1177/0265407514536293

Taub, J. M., & Berger, R. J. (1973). Performance and Mood Following Variations in the Length and Timing of Sleep. Psychophysiology, 10(6), 559–570. https://doi.org/10.1111/j.1469-8986.1973.tb00805.x

Taylor, D. J., Gardner, C. E., Bramoweth, A. D., Williams, J. M., Roane, B. M., Grieser, E. A., & Tatum, J. I. (2011). Insomnia and Mental Health in College Students. Behavioral Sleep Medicine, 9(2), 107–116. https://doi.org/10.1080/15402002.2011.557992

Thomsen, D. K., Yung Mehlsen, M., Christensen, S., & Zachariae, R. (2003). Rumination—relationship with negative mood and sleep quality. Personality and Individual Differences, 34(7), 1293–1301. https://doi.org/10.1016/S0191-8869(02)00120-4

To, N., & Nguyen, N. (2015). Validity of the Vietnamese version of the Pittsburgh sleep quality index. Sleep Medicine, 16, S52. https://doi.org/10.1016/j.sleep.2015.02.128

Topper, M., Emmelkamp, P. M. G., Watkins, E., & Ehring, T. (2017). Prevention of anxiety disorders and depression by targeting excessive worry and rumination in adolescents and young adults: A randomized controlled trial. Behaviour Research and Therapy, 90, 123–136. https://doi.org/10.1016/j.brat.2016.12.015

Treynor, W. (2003). Rumination Reconsidered: A Psychometric Analysis. Cognitive Therapy and Research, 27(3), 247–259. https://doi.org/10.1023/A:1023910315561

Treynor, W., Gonzalez, R. & Nolen-Hoeksema, S. (2003). Rumination Reconsidered: A Psychometric Analysis. Cognitive Therapy and Research, 27, 247–259. https://doi.org/10.1023/A:1023910315561

Trockel, M. T., Barnes, M. D., & Egget, D. L. (2000). Health-Related Variables and Academic Performance Among First-Year College Students: Implications for Sleep and Other Behaviors. Journal of American College Health, 49(3), 125–131. https://doi.org/10.1080/07448480009596294

Tsai, P. S., Wang, S. Y., Wang, M. Y., Su, C. T., Yang, T. T., Huang, C. J., & Fang, S. C. (2005). Psychometric Evaluation of the Chinese Version of the Pittsburgh Sleep Quality Index (CPSQI) in Primary Insomnia and Control Subjects. Quality of Life Research, 14(8), 1943–1952. https://doi.org/10.1007/s11136-005-4346-x

van der Heijden, K. B., Vermeulen, M. C. M., Donjacour, C. E. H. M., Gordijn, M. C. M., Hamburger, H. L., Meijer, A. M., van Rijn, K. J., Vlak, M., & Weysen, T. (2018). Chronic sleep reduction is associated with academic achievement and study concentration in higher education students. Journal of Sleep Research, 27(2), 165–174. https://doi.org/10.1111/jsr.12596

Van Dongen, H. P. A., Maislin, G., Mullington, J. M., & Dinges, D. F. (2003). The Cumulative Cost of Additional Wakefulness: Dose-Response Effects on Neurobehavioral Functions and Sleep Physiology From Chronic Sleep Restriction and Total Sleep Deprivation. Sleep, 26(2), 117–126. https://doi.org/10.1093/sleep/26.2.117

Vu, H. S., Schuler, S., Hoang, T. A., & Quach, T. (2014). Divorce in the context of domestic violence against women in Vietnam. Culture, Health & Sexuality, 16(6), 634–647. https://doi.org/10.1080/13691058.2014.896948

Vu, T. T. (2021). Love, Affection and Intimacy in Marriage of Young People in Vietnam. Asian Studies Review, 45(1), 100–116. https://doi.org/10.1080/10357823.2020.1798873

Wagner, A. D., Schacter, D. L., Rotte, M., Koutstaal, W., Maril, A., Dale, A. M., Rosen, B. R., & Buckner, R. L. (1998). Building Memories: Remembering and Forgetting of Verbal Experiences as Predicted by Brain Activity. Science, 281(5380), 1188–1191. https://doi.org/10.1126/science.281.5380.1188

Walker, M. P., & Stickgold, R. (2006). Sleep, Memory, and Plasticity. Annual Review of Psychology, 57(1), 139–166. https://doi.org/10.1146/annurev.psych.56.091103.070307

Watkins, E. (2004). Adaptive and maladaptive ruminative self-focus during emotional processing. Behaviour Research and Therapy, 42(9), 1037–1052. https://doi.org/10.1016/j.brat.2004.01.009

Watkins, E. R. (2008). Constructive and unconstructive repetitive thought. Psychological Bulletin, 134(2), 163–206. https://doi.org/10.1037/0033-2909.134.2.163

Watkins, E. R. (2016). Rumination-focused cognitive-behavioral therapy for depression. Guilford Press.

Watkins, E. R., Mullan, E., Wingrove, J., Rimes, K., Steiner, H., Bathurst, N., Eastman, R., & Scott, J. (2011). Rumination-focused cognitive–behavioural therapy for residual depression: phase II randomised controlled trial. British Journal of Psychiatry, 199(4), 317–322. https://doi.org/10.1192/bjp.bp.110.090282

Watkins, E., & Moulds, M. (2005). Distinct modes of ruminative self-focus: Impact of abstract versus concrete rumination on problem solving in depression. Emotion, 5(3), 319–328. https://doi.org/10.1037/1528-3542.5.3.319

Watkins, E., Moberly, N. J., & Moulds, M. L. (2008). Processing mode causally influences emotional reactivity: Distinct effects of abstract versus concrete construal on emotional response. Emotion, 8(3), 364–378. https://doi.org/10.1037/1528-3542.8.3.364

Willis, K. D., & Burnett, H. J., Jr. (2016). The power of stress: Perceived stress and its relationship with rumination, self-concept clarity, and resilience. North American Journal of Psychology, 18(3), 483–498

Wimmer, F., Hoffmann, R. F., Bonato, R. A., & Moffitt, A. R. (1992). The effects of sleep deprivation on divergent thinking and attention processes. Journal of Sleep Research, 1(4), 223–230. https://doi.org/10.1111/j.1365-2869.1992.tb00043.x

Wolfson, A. R., & Carskadon, M. A. (1998). Sleep Schedules and Daytime Functioning in Adolescents. Child Development, 69(4), 875–887. https://doi.org/10.1111/j.1467-8624.1998.tb06149.x

Wong, Y. J., Brownson, C., & Schwing, A. E. (2011). Risk and Protective Factors Associated With Asian American Students' Suicidal Ideation: A Multicampus, National Study. Journal of College Student Development, 52(4), 396–408. https://doi.org/10.1353/csd.2011.0057

Wood, S. K., Walker, H. E., Valentino, R. J., & Bhatnagar, S. (2010). Individual Differences in Reactivity to Social Stress Predict Susceptibility and Resilience to a Depressive Phenotype: Role of Corticotropin-Releasing Factor. Endocrinology, 151(4), 1795–1805. https://doi.org/10.1210/en.2009-1026

Zhang, W., Yan, C., Shum, D., & Deng, C. (2020). Responses to academic stress mediate the association between sleep difficulties and depressive/anxiety symptoms in Chinese adolescents. Journal of Affective Disorders, 263, 89–98. https://doi.org/10.1016/j.jad.2019.11.157

Zoccola, P. M., & Dickerson, S. S. (2012). Assessing the relationship between rumination and cortisol: A review. Journal of Psychosomatic Research, 73(1), 1–9. https://doi.org/10.1016/j.jpsychores.2012.03.007

Zoccola, P. M., Dickerson, S. S., & Lam, S. (2009). Rumination predicts longer sleep onset latency after an acute psychosocial stressor. Psychosomatic Medicine, 71(7), 771–775. https://doi.org/10.1097/PSY.0b013e3181ae58e8

Zoccola, P. M., Dickerson, S. S., & Zaldivar, F. P. (2008). Rumination and Cortisol Responses to Laboratory Stressors. Psychosomatic Medicine, 70(6), 661–667. https://doi.org/10.1097/PSY.0b013e31817bbc77

Zoccola, P. M., Quas, J. A., & Yim, I. S. (2010). Salivary cortisol responses to a psychosocial laboratory stressor and later verbal recall of the stressor: The role of trait and state rumination. Stress, 13(5), 435–443. https://doi.org/10.3109/10253891003713765