

The interaction of emotion regulation and sleep quality: does social media usage duration play a role? ☆

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Abstract

The bidirectional association of emotion regulation with sleep quality has received increased attention in recent years. In this research, we investigated the correlation between the habitual use of different emotion regulation strategies (i.e., Expressive Suppression and Cognitive Reappraisal) and different components of sleep quality. Considering that previous research revealed that using social media could influence emotion regulation and sleep quality in different ways, we controlled for the effect of social media usage duration on the interplay of emotion regulation strategies and sleep quality components. Our results showed that the habitual use of Cognitive Reappraisal was associated with improved daytime functioning; while, the tendency to use Expressive Suppression in various situations was associated with shorter sleep duration. Our findings supported the view that the habitual use of Cognitive Reappraisal and Expressive Suppression have different well-being consequences. We also observed that using any of the strategies was negatively correlated with more frequent use of sleeping medications. Additionally, we did not observe any correlation between social media usage duration and other variables. We proposed that understanding the role of social media usage on the interplay between sleep quality and emotion regulation requires a comprehensive evaluation of individual differences in using social media as well as a careful analysis of the social media platforms' characteristics.

Keywords: Cognitive Reappraisal, Emotion regulation, Expressive Suppression, Sleep quality, Social media usage.

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1. Introduction

Emotional experiences and expressions are inevitable parts of our mental life; however, to adapt to the needs and expectations of the social life, we have to be able to regulate the internal experience (e.g., subjective experience) and external expressions (e.g., behaviors) of emotions [9, 10]. According to the process model of emotion regulation [10], cognitive reappraisal and expressive suppression are key strategies for regulating emotions: Cognitive reappraisal (CR) entails redefining of an emotional event in order to modify its impacts. This strategy influences the early stages of the regulatory process and could change the subjective experience of the situation as well as the subsequent behavior. Expressive suppression (ES), on the other hand, involves inhibiting or modulating ongoing expressive behaviors aroused by emotional situations. The main goal of expressive suppression is to decrease the consequences of behaviors; so, it does not necessarily influence the internal experience of the emotional situation [9]. Ample studies on emotion regulation have focused on the consequences of using different strategies e.g. [12, 26]. That is, habitual use of CR or ES is associated with different mental e.g. [31, 15] and physiological outcomes [6]. For example, using CR more frequently is connected with a better ability to solve interpersonal conflicts [10]. On the other hand, a tendency to the frequent use of ES is linked with emotional disorders [4]. ES is also associated with significant sleep problems [14].

A careful analysis of previous research shows that studying the effects of different emotion regulation strategies on sleep quality has been of interest to researchers. It could be because the link between emotion regulation and sleep is bidirectional, which means not only the efficiency of emotion regulation influences the sleep quality, but sleep quality could also have an impact on the utilization of emotion regulation strategies [7, 29, 38]. For example, participants who evaluated their overall sleep quality as poor, compared to those who rated their sleep quality as good, were more likely to utilize maladaptive emotion regulation strategies [11, 23, 38].

The interplay between emotion regulation and sleep quality is influenced by various variables [18, 38]. For example, positive and negative affective states [18], rumination [28], and age differences [32] play a role in the interplay between emotion regulation and sleep quality. Another variable that has recently received attention is social media use [20]. The widespread use of social media has encouraged researchers to investigate the association between social media use and sleep. The available studies have mostly shown that frequent use of social media could impair sleep quality and quantity e.g. [19] for a review, see [33]; however, their findings do not permit firm conclusions regarding the nature of the impairments. For example, in some studies, the correlation between social media use and sleep problems was weak e.g. [27]. Studying the effects of social media usage on emotion regulation is a new area of research; so, it is not surprising that the few available studies have only explained this link theoretically e.g. [2]. For example, [17] suggested that involvement with social media facilitates successful emotion regulation and helps maintaining positive emotions. [39] proposed that social media platforms enable users to share their thoughts and feelings 24/7, and receive feedback about their shared materials. This digital emotion regulation is a new strategy for regulating emotions. However, not all findings support that social media usage helps successful emotion regulation: For example, some studies showed people who use social media, experience more negative emotions in comparison to those who do not use it [8], and despite experiencing negative emotions, users feel forced to continue using that specific online networking platform [37]. Therefore, using social media could also result in emotional dysregulation and damage a person's well-being [37].

Considering the possible effects of social media use on the interplay of emotion regulation and sleep, the aim of this research was to study the relationship of emotion regulation strategies (i.e, CR & ES) and different components of subjective sleep quality, while adjusting for the effect of social

media usage duration on this association. We investigated this relation in female participants because sleep problems are more frequent among women [35]. We hypothesized that the habitual use of CR strategy would be associated with good sleep quality; while, the habitual use of ES strategy would be correlated with poor sleep quality. If using social media assists emotion regulation (as suggested by [17]), we expected those who spent more time on social media, compared to those who spent less time, would tend to use CR – the adaptive emotion regulation strategy - more frequently, and as a result, would have a better sleep quality. While, if using social media disrupts sleep quality (as suggested by [19]), we expected participants who used social media for a longer duration, in comparison to those who used it for a shorter duration, would have poor sleep quality and consequently, would use ES – the maladaptive emotion regulation strategy - more often.

2. Methods

2.1. Participants

Ninety-one female adults, ranging in age from 35 to 65 participated in this study. Due to incomplete questionnaires, data from 17 participants were excluded from further analysis. The final number of the participants was 74.

2.2. Measures

Emotion Regulation Questionnaire (ERQ): This questionnaire was developed by Gross and John [10] to evaluate individuals' habitual use of two emotion regulation strategies (i.e., Cognitive Reappraisal and Expressive Suppression). ERQ includes 10 items in which ES and CR are measured by 4 and 6 items, respectively. [13] showed that the Persian version of the questionnaire has an acceptable internal consistency (Cronbach's $\alpha = 0.81$ and 0.91 for CR and ES, respectively). Participants were requested to score each item on a 7-point Likert scale, in which "1" represented strong disagreement and "7" represented strong agreement with the item's content.

Pittsburg Sleep Quality Index (PSQI): This questionnaire was developed by [3] to measure subjective sleep quality. The global PSQI score is yielded by adding up the seven subscale scores (i.e., sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction). The global PSQI scores range from 1 to 21 in which lower scores represent an overall better sleep quality. In this study, the participants were asked to complete the Persian version of PSQI. This version has an acceptable internal consistency (Cronbach's $\alpha = 0.77$) [25].

Social Media Use Questionnaire: To evaluate the average duration of involvement with online social media during the wake time per day, participants were asked to report the amount of time they approximately spend on social media (e.g., Instagram) in a day. They defined whether their daily usage duration is less than (or equal to) one hour or more than that.

2.3. Procedure

Volunteers were given three questionnaires (ERQ, PSQI, & Social media use questionnaire) and were asked to complete them. They were allowed to ask their questions. On average, it took 20 minutes for each participant to complete three questionnaires.

3. Results

The data were analyzed with SPSS version 26. Descriptive statistics were presented in Table 1. Kolmogorov-Smirnov test was used to examine normality of data, which showed that none of the

Table 1: Descriptive Statistics for social media usage duration, emotion regulation strategies and global score of sleep quality.

	Category	Participants(35-65 years)
social media use	≤ 1 hours	40
	> 1 hours	29
	none	5
Emotion regulation strategies M(SD)	Suppression	5.75 (3.14)
	Reappraisal	6.83 (4.63)
global PSQI score M(SD)		7.78 (3.80)
N		74

ES ($D = .11$, $p = .02$), CR ($D = .10$, $p = .04$), and the global PSQI ($D = .13$, $p = .002$) scores were normally distributed. Therefore, we conducted Spearman's correlation analysis between (1) emotion regulation strategies (i.e., ES & CR) and subjective sleep quality, (2) social media usage duration and emotion regulation strategies, and (3) social media usage duration and subjective sleep quality (Table 2). The results showed that habitual use of ES strategy was positively correlated with sleep duration ($r_s = .24$, $p < .05$) and negatively correlated with the use of sleeping medications ($r_s = -.25$, $p < .05$). Habitual application of CR strategy was negatively correlated with daytime dysfunction ($r_s = -.30$, $p < .05$) and the use of sleep medications ($r_s = -.25$, $p < .05$). None of the other correlations were significant.

Next, we conducted a non-parametric partial correlation analysis¹, in order to adjust the influence of social media usage duration on the relation of emotion regulation strategies and sleep quality. As it was shown in Table 3, controlling for the effect of social media usage duration did not change the link of ES and CR with the global score of PSQI and other sleep quality components.

4. Discussion

To have an improved understanding of the interplay of emotion regulation and sleep, in this research, we studied the association of ES and CR strategies with different components of sleep quality while controlling for the effect of social media usage duration. The results of zero-order correlation analysis (A similar procedure was recommended and used by Kwon et al. (2017)[16]) and partial correlation analysis showed that ES and CR strategies are correlated with some components of sleep quality, but social media usage duration did not have any correlation with the emotion regulation strategies or the sleep quality components. Controlling for the effect of social media usage duration did not change the pattern of relations between emotion regulation strategies and sleep quality components, too. In this section, we will first discuss the results of the interaction between emotion regulation and sleep quality components; then, we will discuss the probable reasons behind the lack of a significant link between social media usage and emotion regulation- sleep relationship:

Emotion regulation strategies and sleep quality interplay

We observed that the tendency to use each of the emotion regulation strategies had different impacts on sleep quality components: that is, the habitual use of ES strategy was accompanied by a decrease in the sleep duration component of PSQI. While a tendency to use CR strategy was associated with a better score in the daytime functioning subscale of PSQI. In general, these results

¹ A similar procedure was recommended and used by [16].

Table 2: The correlation matrix of variables. **. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed). Note: ERQ: Emotion Regulation Questionnaire [10]. PSQI: Pittsburg Sleep Quality Index[3]. PSQI-Component 1: subjective sleep quality; PSQI-Component 2: sleep latency; PSQI-Component 3: sleep duration; PSQI-Component 4: habitual sleep efficiency; PSQI-Component 5: sleep disturbances; PSQI-Component 6: use of sleep medications; PSQI-Component 7: daytime dysfunction.

Variable	1	2	3	4	5	6	7	8	9	10	11
CR (measured by ERQ)	1										
ES (measured by ERQ)	.30**	1									
Social media usage duration	.14	.02	1								
Sleep Quality (measured by PSQI)	PSQI – Global score	-.09	.18	.003	1						
	PSQI – Component 1	-.09	.09	.07	.76**	1					
	PSQI – Component 2	.001	.13	.15	.77**	.61**	1				
	PSQI – Component 3	.04	.24*	-.07	.60**	.39**	.24*	1			
	PSQI – Component 4	.01	.21	-.03	.61**	.38**	.32**	.51**	1		
	PSQI – Component 5	-.08	.14	.15	.56**	.44**	.41**	.28**	.12**	1	
	PSQI – Component 6	-.25*	-.25*	-.08	.30*	.23*	.19	.16	.11	.16	1
	PSQI – Component 7	-.30*	.04	-.07	.45**	.26*	.20	.11	.13	.35**	.21
Sleeeee											

Table 3: The relationship between emotion regulation strategies (expressive suppression/ cognitive reappraisal) and sleep quality adjusted for social media usage duration.

Controlling for social media usage duration				
PSQI's global score and components	sleep duration	sleeping medications	daytime dysfunction	PSQI_global score
CR	$r_s = -.24$ (df=65)		$r_s = -.29$ (df=64)	$r_s = -.09$ (df=62)
	p = .05		p = .02	p = .46
ES	$r_s = .25$ (df=66)	$r_s = -.25$ (df=65)		$r_s = .18$ (df=62)
	p = .04	p = .05		p = .16

are in line with the common direction of studies, showing that ES is a maladaptive strategy and CR is an adaptive strategy for regulating emotions [9, 12, 26, 30, 34]. Our results also showed that habitual use of any of the emotion regulation strategies was associated with decreased use of sleeping medications. To the best of our knowledge, the association between a specific emotion regulation strategy and different components of sleep quality has not been researched before, however, in one study Minkel and associates (2012)[24] examined the relations of sleep quality components and appraisal strategy. In their study participants were shown different photos with negative contents and were asked to try to dampen their sad emotions through using the CR strategy. During the reappraisal task, participants' brain activity was recorded using fMRI. The results showed that in participants who used more sleeping medications (as assessed by PSQI components) reappraisal task is associated with weak activation of PFC [24]. Minkel and colleagues (2012)[24] suggested sleeping medications should be consumed with caution because it might interfere with the efficient use of CR strategy. In line with their findings, we observed that using sleeping medications is associated with a diminished tendency to use both emotion regulation strategies. Although our correlational study cannot warrant a causal relationship, this effect should be considered in future studies.

Finally, we did not observe any relation between emotion regulation strategies (i.e., CR & ES) and the global score of sleep quality. Similar to our results, Tally and Shelly-Tremblay (2020)[36], did not find any relation between habitual use of emotion regulation strategies (i.e., ES and CR) and the global score of PSQI. However, our finding is not in line with the results of Latif and colleagues' study (2019)[18]. Latif et al.[18] observed that the tendency to use ES strategy was associated with poor sleep quality (lower global score in PSQI), but they did not observe and a link between habitual use of CR strategy and the global score of PSQI. At first glance, the findings of our study and Tally and Shelly-Tremblay' (2020)[36] study might look inconsistent with Latif et al.'s (2019)[18] results, but, a closer look at participants' characteristics and experimental procedure of three studies reveals possible reasons behind inconsistent findings: (1) participants in Latif et al.'s (2019)[18] research consisted of males and females, while we recruited only female participants and the ratio of females in Tally and Shelly-Tremblay's (2020)[36] study was also very high. Previous studies showed that males and females are different in emotion regulation choice preferences [22]. That is, reappraisal is not a preferred emotion regulation strategy among males. Therefore, we assume that the participants' gender differences influence the results of these studies. (2) in Latif et al.'s (2019)[18] study participants were undergraduate students with a mean age of 22.5 years, while our participants were middle-aged women (35 to 65 years). Considering that younger adults, compared to middle-aged adults, tend to use more passive emotion regulation strategies – e.g., suppression[1], we suggest that in different ages, individuals have a different evaluation about the outcomes of using a particular emotion regulation strategy. Namely, Blanchard-Fields and colleagues (2004)[1] explained that younger adults may prefer using passive emotion regulation strategies - such as suppression- because they do not have enough experience and skill to deal with the outcomes of using more proactive strategies. Therefore, for a young adult, using ES might be accompanied by positive emotions because it could decrease the level of internal conflicts[1]. (3) In Tally and Shelly-Tremblay's (2020)[36] study, one question from ERQ was omitted. Considering that the number of questions in ERQ is relatively low (10 questions), this elimination might influence the results. To conclude, we suggest that in addition to the global score of PSQI, considering the sleep quality components could offer a better insight into understanding the emotion regulation – sleep interaction.

Social media usage duration and its role on the emotion regulation-sleep interplay

The results of this study showed that neither of ES, CR strategies, or sleep quality components had a correlation to social media usage duration. The relation of social media usage and emotion

regulation has not been experimentally tested before, but, theoretical studies have proposed that understanding this relation requires establishing clear concepts and methodologies [39]. A similar problem could be found in studies targeting social media usage and sleep problems, as in most of these studies there is no consensus regarding the definition of “social media usage”. For example, in some studies the impact of social media usage on sleep has been limited to investigating how the blue light emitted by the device’ screen could interfere with sleep e.g. [5]; while others focused on social media use pre-bedtime e.g. [19]. In one study, similar to our design, Nasirudeen and colleagues (2017)[27] examined the usage duration on sleep quality. They observed that social media usage duration has a weak correlation with poor sleep quality[27]. It seems that an improved understanding of the effect of social media usage duration on sleep quality requires additional information about the time of usage. That is, one-hour social media usage if occurs pre-bedtime, may affect sleep quality differently than if it occurs during the day [27]. Recent studies suggest that for investigating the role of social media usage on sleep quality, emotion regulation, or any other aspect of people’s mental and physiological well-being, researchers should also consider social media platform characteristics, the emotional contents of shared materials as well as individual differences in coping strategies and personality characteristics [20, 21, 33], see [39] for a review.

To conclude, it seems that emotion regulation and sleep have a complex interaction. Investigating this interplay required careful consideration of confounding and mediating variables.

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