Emotion Regulation in Autobiographical Memories

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When facing a negative event, people implement different strategies to regulate ongoing emotions. Although the previous literature has suggested that the emotional intensity of a negative episode is associated with the characteristics of the subsequent autobiographical memory, it is still unknown whether emotion regulation (ER) moderates this relationship. In the present study, we provided undergraduate students with a smartphone-based diary to report a negative episode immediately after its occurrence and rate the momentary use of two ER strategies: cognitive reappraisal and rumination. To explore autobiographical memory, two “surprise” recall tasks were performed one week and one month after the event. According to the results, cognitive reappraisal was linked with better memory performances, and a tendency to retrospectively underestimate the negativity of highly intense events was observed only in participants adopting high rates of this strategy. Conversely, intense rumination was found to be associated with less detailed memories of emotionally intense events, as well as with higher emotional involvement with negative episodes over time, regardless of their intensity. The results support the maladaptive role of rumination and the adaptive influence of cognitive reappraisal on autobiographical memory.

Keywords: emotion regulation ; rumination ; cognitive reappraisal ; ecological momentary assessment ; autobiographical memory

1. Introduction

For a long time, emotion and cognition were considered two independent aspects of the human being [1], but current evidence shows that cognitive and emotional processes are reciprocally determined and interact continuously [2][3]. Autobiographical memories are no exception, and a growing body of literature has revealed the essential role played by emotions in encoding, storing, and recalling past personal events [4][5][6][7].

The term ‘autobiographical memory’ refers to people’s set of memories of their own lives [8], which can include both marginal episodes or emotionally intense events [9]. Autobiographical memories are essential to guide future behaviors and decisions, as well as to promote a sense of continuity of the Self and facilitate social interactions [10]. Interestingly, the emotional correlates of an event have been shown to influence the characteristics of the subsequent memory. According to previous studies, highly arousing memories are associated with enhanced retrieval of central details [11] and increased vividness [12]. Furthermore, whereas positive memories are characterized by an enhanced recall of peripheral and sensory details [13][14][15], negative memories have been linked to greater recall of central features [16][17] and increased accuracy [18].

Despite ample evidence of the relationship between emotions and autobiographical memories, the specific role of emotion regulation (ER) in shaping memory retrieval processes has been less explored. ER is the ability to implicitly or explicitly modify an emotional state to create adaptive emotional responses and reach desirable goals [19][20]. People may attempt to regulate their emotions at different timepoints in the emotion generation process [21]. This includes before the emotion is generated (i.e., antecedent-focused strategies such as situation selection, situation modification, attentional deployment, or cognitive change) or after the emotion occurs (i.e., response-focused strategies such as response modulation). In this vein, a recent revision of the literature has pointed out the different cognitive, behavioral, and affective correlates of ER strategies [22], which have been traditionally classified as adaptive or maladaptive based on the associated outcomes [23][24][25]. Of these, cognitive reappraisal and rumination are among the most frequently investigated ER strategies in relation to mnemonic processes, being the former an adaptive strategy and the latter a maladaptive one.

Cognitive reappraisal and rumination are both antecedent-focused strategies that imply cognitive engagement with an emotion-eliciting stimulus. Though, there is evidence showing their different cognitive, behavioral, and affective implications. Cognitive reappraisal refers to the attempt to reconstruct and re-elaborate a stimulus to change its meaning and emotional impact [21]. Because it is cognitively demanding [26], this strategy has been shown to be implemented more often in situations that are less emotionally intense [27]. On the other hand, rumination refers to the process of persistently

thinking about one's feelings and the associated causes and consequences [28]. Unlike reappraisal, this strategy is more likely to be adopted when experiencing intense negative emotions [29][30]. Thus, cognitive reappraisal and rumination are opposite in their nature and entail different consequences. The use of cognitive reappraisal implies an active and explicit attempt to change the interpretation of a stimulus to modify its emotional impact [26]. On the contrary, rumination involves a passive attitude toward the experience, characterized by negative and repetitive thoughts that do not promote a positive reframing of the situation [31]. In this sense, reappraisal has been shown to be effective in reducing negative emotions [32], whereas the use of rumination has been shown to maintain and prolong negative affect [24].

Consistent with these findings, these two strategies have been shown to entail different outcomes on memory. The previous literature has suggested that reappraisal promotes a more in-deep analysis of a situation [33], thus being associated with enhanced memory performances and higher recall of details [33][34][35][36]. Reappraisal has been proposed as a strategy that encourages a more positive reframing of a negative situation, thus leading to more positively valenced recalls [37][38]. Differently, rumination has been indicated as a potential mechanism underlying overgeneral memories (i.e., memories that lack details), which might be the consequence of the continuous rehashing and emphasis on the negative emotional correlates of an episode [39][40]. More specifically, ruminative thinking has been hypothesized to lead to focus one's attention on the general information rather than on specific details, which in turn is likely to result in the retrieval of less specific memories [41][42][43][44].

Interestingly, the previous literature has been mainly based on laboratory studies and retrospective assessments of events [33][34][35][36][37][38], thus making these findings not completely generalizable to real-life situations [45]. First, the role of ER in the recall of a negative stimulus (e.g., a video or a picture) might strongly differ from its role in the recall of a real-life negative episode. Second, the previous studies typically adopted a trait-based conceptualization of ER [46], which was considered a stable and cross-situational tendency of an individual [22]. There is evidence, however, that ER is a situated process shaped by momentary situational and contextual factors, which are difficult to capture through trait-based questionnaires [47][48]. Third, the previous literature assumed that there was a direct association between ER and memory. However, it is also possible that ER influences memory in a more complex manner. Although it is true that the emotional intensity of an event is associated with the qualities of the subsequent memory, ER could affect this relationship so that the intensity of the event is more or less strongly associated with memory qualities depending on the strategy adopted (i.e., moderation). Finally, the use of free recall tasks, which has been the mainstream method to assess the number of details recalled in laboratory settings, seems challenging in the case of autobiographical memories. Applying this methodology would, for instance, require recording an eliciting event in a controlled setting, which could be subsequently compared to the associated recalled memory (see for example [33]). As noted in past research, however, emotionally relevant situations and the associated ER mechanisms are more easily captured in real-life settings [22]. Alternatively, the recalled memory could be compared to the description of the episode provided by the individual at the time of its occurrence, which in turn might be biased [49][50]. In other words, the use of free recall tasks to assess the memory of real-life episodes may not be appropriate, thus making self-report questionnaires more suitable to explore autobiographical memory and its phenomenological characteristics [51].

In sum, while the available studies support the hypothesis that different strategies may influence mnemonic processes, the role of ER in the recall of real-life negative events is still unclear. However, understanding this relationship would be of paramount importance. Autobiographical memories represent the core of an individual's affective architecture to build a coherent Self and a sense of purpose in life [52], and reminiscing about the past is considered an effective strategy to regulate emotions in the present. If it is true that ER affects the encoding of a stimulus and the subsequent recall of the associated memory, the use of adaptive strategies as opposed to maladaptive ones in face of adverse life events could facilitate the reframing of such episodes, promote the construction of more coherent life stories and encourage the use of past memories to regulate emotions in the present.

2. Current Analysis of Emotion Regulation in Autobiographical Memories

The present study aimed to explore the role of ER in the recall of negative autobiographical memories through an ecological approach. Unlike the previous literature, we attempted to assess daily negative events in daily life through an electronic diary and to assess the momentary use of ER strategies to deal with the ongoing negative emotions.

First, we attempted to replicate the findings of the previous research regarding the association between emotions and autobiographical memory [16][17][18]. Our results showed that emotional intensity was associated with the qualities of the recalled autobiographical memories both in the short and long term. More specifically, episodes with higher emotional intensity were associated with enhanced clarity and increased emotional involvement, thus confirming the importance of the emotional experience on the quality of the associated autobiographical memory.

Second, we explored the association between ER and autobiographical memory characteristics. Overall, our results suggest that ER is associated with and moderates the association between emotional intensity and autobiographical memory and that the use of different strategies entails different outcomes on memory. In the following paragraphs, we will separately discuss the findings of the present investigation in more detail.

2.1. Rumination

Rumination refers to the process of persistently thinking about one's feelings, causes, and consequences. This strategy can be considered maladaptive as it maintains and prolongs negative emotions over time [30][53] and hinders the adoption of problem-solving skills when facing a negative event [28]. Unlike cognitive reappraisal, ruminative reasoning does not promote a constructive change in the meaning of a situation, and it fails to encourage active efforts to cope with it [54], thus leading to negative and passive interpretations of the experience [31]. Moreover, the tendency to ruminate is associated with the selective and enhanced recall of negative stimuli [55]. Hence, it seems plausible that the intense use of rumination in response to a negative event may entail maladaptive outcomes on the subsequent memory.

In the present study, high rumination correlated with enhanced memory of thoughts and feelings at one-month assessment, and with higher emotional involvement at both post-assessments. This increased self-reported memory for cognitive and emotional details could be due to the continuous mental re-creation of the negative situation, which is typical of ruminative thinking [31]. Adding up to the existing literature, rumination was found to moderate the association between the emotional intensity of the event and the associated autobiographical memory.

First, increased emotional intensity was associated with higher memory of sensory details in participants who adopted low rates of rumination (i.e., the higher the emotional intensity, the higher the subjective feeling of remembering details). This was not the case for those who frequently used this strategy. Similar results were observed in relation to clarity (i.e., spatial and visual details) one month after the occurrence of the event, showing a stronger positive association between the two variables only in participants who adopted low rates of rumination. In other words, although the greater emotional intensity is likely to make an event more salient and improve memory performance [11][16], this mechanism seems to be disrupted when using intense rumination. We suggest that the intense use of rumination in response to a negative event may involve a considerable cognitive cost due to an increased focus on the negatively valenced cognitive and emotional components of the experience, which in turn could decrease the attentional resources available to encode and subsequently remember secondary information, such as sensory, visual and spatial details. In this direction, a previous study suggested that rumination may lead to an overloading of the working memory because of a deficit in shutting down negative material, which in turn might result in decreased specific memories [40]. This would explain why, for intense ruminators, memory retrieval was better when the emotional intensity of the event was low. This hypothesis seems to be coherent with an array of studies showing the presence of 'overgeneral memories' in depressed individuals (i.e., memories that lack details) [41][42][43], who happen to be characterized by an intense and habitual use of ruminative thinking [31][56].

Besides, rumination also significantly moderated the association between the emotional intensity of the reported event and the emotional involvement with the recalled memory both at one week and month follow-ups. According to the results, the more emotionally intense the event was, the higher the emotional involvement with the associated memory became. However, this association was less strong in participants adopting medium-to-high levels of rumination, who showed enhanced emotional involvement also in relation to events with low emotional intensity. These findings suggest that intense ruminators experienced similar levels of emotional vividness, regardless of the emotional intensity of the event, which might be the result of the repetitive thoughts about the episode and the associated negative emotional states [57]. Therefore, our results support the idea that rumination may be considered a maladaptive strategy, as relatively irrelevant experiences seem to require similar processing to emotionally relevant situations. Although this study only assessed rumination in relation to a single negative event, it is possible to hypothesize that intense and regular use of this strategy may have disruptive consequences for memory.

2.2. Cognitive Reappraisal

Cognitive reappraisal refers to the attempt to change the interpretation of a stimulus to modify its emotional impact [21]. To date, reappraisal is generally considered an adaptive strategy, that makes it possible to positively re-frame an emotional stimulus [58] and to effectively reduce the intensity of the associated negative emotions [32][59]. Contrary to the typical passive interpretations of ruminative thinking, cognitive reappraisal implies an active role of the individual, who explicitly tries to modify an emotional state by changing the meaning of a situation [26]. As a result of this process, reappraisal may affect the memory associated with a specific negative event, especially from a cognitive point of view.

As hypothesized, cognitive reappraisal was associated with more detailed memories at one-week assessment and, more specifically, with an enhanced recall of the associated sensory information. Even though the recall of details was assessed at a subjective level only, these findings seem to confirm the previous laboratory-based literature, where better memory performance was observed in individuals who adopted reappraisal [33][35]. As Richards et al. (2003) suggested, the attempt to reappraise a stimulus requires a deep conceptual analysis of the situation and an increased focus of one's attentional resources on its details, which in turn might boost memory performance. Adding up to these previous laboratory findings, our results suggest that the effects of cognitive reappraisal on memory performance may not last over time, thus being only limited to the short term (i.e., one week after the event). Indeed, it is possible that the pass of time, which presumably reduces the emotional impact of an event, makes cognitive reappraisal (and, in turn, remembering the details of the event) no longer necessary.

In our study, cognitive reappraisal was not significantly associated with event appraisal (overestimation or underestimation of the negativity of the event). Interestingly, though, the moderation analyses revealed a significant moderation effect of this strategy in the association between emotional intensity and event appraisal at one-month follow-up. Higher retrospective overestimation of the negativity of the event was observed as the emotional intensity of the episode increased in participants who scarcely adopted reappraisal. This is in line with the evidence showing that people typically tend to retrospectively overestimate negative emotional experiences [60]. This association, however, changed its direction in the case of high rates of appraisal, thus showing a greater tendency to underestimate the negativity of the event when the emotional intensity of the episode was greater. In other words, extensive use of reappraisal seems to be beneficial to reappraise emotionally intense episodes rather than less intense ones, which makes cognitive reappraisal a sensible strategy [61]. Cognitive reappraisal implies a reconstruction and re-elaboration of a stimulus [26], which in turn may lead to a change in one's subjective estimation of its negativity. Indeed, a less pessimistic representation of a personal negative event may promote an adaptive process of distancing from it, which in turn might reduce its emotional impact over time [21]. Thus, cognitive reappraisal appears to effectively serve its role in modifying the emotional impact of an eliciting stimulus, especially when this is highly intense. Interestingly, these results were only observed at the one-month follow-up, which suggests that the process of reappraising a negative personal event may be cognitively demanding and require time [26].

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