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ARTICLE

Emotion-dependent linguistic features of autobiographical memory of different specificity

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Abstract

Research has demonstrated that emotion modulates specificity in recollection of personally experienced events and the words individuals use during recollection reflect their psychological states. Here, we investigated the linguistic features of autobiographical memory (AM) of different specificity for different emotional events to address how emotion would modulate the psychological mechanisms underlying AM of different specificity. We analyzed 122 participants' narratives of AM categorized as specific and general under happy, sad, angry, fearful and neutral cues. The use of three groups (emotional process, cognitive process and thinking style) of words was, respectively, compared between specific and general AM in each emotion condition. In retrieval of sad, angry and fearful events, general relative to specific AM contained more affective process words, notably negative words. General AM featured more cognitive process words than specific AM, regardless of emotion type (except neutral). When recalling happy events, general AM featured more analytic thinking words than specific AM, while in recollection of fearful events, general AM featured fewer such words than specific AM. General relative to specific AM about happy experiences contained more narrative thinking words. These findings suggest that the psychological mechanisms underlying top-down and bottom-up retrieval differ between particular types of emotion engaged in AM.

Keywords: autobiographical memory; emotion; linguistic analysis; specificity

1. Introduction

Emotion enhances memory, particularly autobiographical memory (AM), which refers to a knowledge base of self-related and significant information that goes beyond the recall of personally experienced events to incorporate perspective,

interpretation and emotion to make up an individual's unique life story (Fivush, 2011; Williams et al., 2008). One major form of organization in the knowledge base is that autobiographical information is organized at varied levels of specificity, from vivid sensory, perceptual and emotional details of particular moments to high-level summaries of life periods (Barsalou, 1988; Conway & Bekerian, 1987; Conway & Pleydell-Pearce, 2000; Prebble et al., 2013). This means that AM, organized in a form of hierarchical structure with different levels of specificity, consists of specific AM and general AM from bottom to top (Conway & Pleydell-Pearce, 2000; Williams et al., 2007). Specific AM is a recollection of a past single event with episodic details that happened at a particular time and place and did not last longer than 1 day. In contrast, general AM refers to a general impression about past events without specific temporal and spatial details, including categorical memory (i.e., the memory refers to a class of generic events) or extended memory (i.e., the memory lasted longer than 1 day) (Sumner, 2012; Williams & Broadbent, 1986; Williams & Scott, 1988). Generally, humans are capable of retaining a wealth of AM details. Yet, the quantity and quality of the retrieval differ substantially across content, given that when retrieving personal past, not all memories come to mind with equal ease or with the same level of detail (Holland & Kensinger, 2010). Events imbued with emotion seem to be remembered more vividly and durably than events lacking an emotional component (Buchanan, 2007). Moreover, individuals may retrospect different emotional episodes with different levels of detail or specificity (Berntsen, 2002; Talarico et al., 2009). However, till now, little is known about the psychological mechanisms (i.e., emotional and cognitive processes as well as the thinking patterns) behind the construction of specific and general AM of different emotional events.

In the laboratory studies, one of the most common methods to measure AM is presenting participants with a list of cue words and asking them to recall a particular memory that corresponds to the cue words (see Holland & Kensinger, 2010, for a review). These cue words can be emotional in nature (Buchanan, 2007; Holland & Kensinger, 2010). Previous studies examining self-narratives of past experiences have found that the words individuals use reveal the psychological states of the narrators (Pennebaker et al., 2014; Tausczik & Pennebaker, 2010). For example, affective process words with both pleasant and unpleasant connotations (e.g., happy, sadness, hate, pride) are indicative of emotional processes in recalling past events, providing a global measurement of emotional reactions. Positively or negatively connoted words, as subcategories of affective process words, provide a window into individuals' subjective feelings and show how they cope with such events (Pennebaker et al., 2015; Pennebaker et al., 2003; Tausczik & Pennebaker, 2010). The use of positive words in recollection of positive events exhibits narrators' positive feelings, and that in recollection of negative events indicates a sound emotion regulation ability (Kahn et al., 2007; Robertson & Hopko, 2009). The use of negative words in narrating positive memories is reflective of an attenuated positive affect or distorted emotion perception, while that in narrating negative memories indicates immersion in negative events (Gamber et al., 2013; Himmelstein et al., 2018; Lee & Cohn, 2010). Cognitive process words include words that reveal thinking and causal reasoning (e.g., believe, think, reason, cause). They are indicative of the construction and rationalization processes during narration (Pennebaker, 2015; Pennebaker et al., 2003). An increasing use of cognitive process words reflects an effort to elaborate on what happened and to integrate it with subjective feelings to recognize a coherent story about past events (Boals & Klein, 2005; Crespo & Fernandez-Lansac, 2016).

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For example, the use of cognitive process words in recalling negative events has been shown to positively associate with psychological well-being since systematically analyzing the causes and perception of these events might facilitate the adaptive processes for unpleasant experiences (D'Andrea et al., 2012; Patwardhan & Kulkarni, 2023). Thinking styles, which are embodied using a series of function words (e.g., I, all, even, never, but), indicate how people are thinking (Pennebaker et al., 2014). Generally, frequent use of articles and prepositions reflects analytic thinking such that individuals are thinking in a logical, hierarchical and formal way. In contrast, a low proportion of articles and prepositions and a concurrent high rate of pronouns, auxiliary verbs, conjunctions, adverbs and negations reflect a narrative style in which people tell stories and speak in the here and now (Pennebaker, 2015; Pennebaker et al., 2014). Previous studies have shown that overgeneral memory is responsive to the manipulation of the extent of analytic thinking, with analytical thinking contributing to the maintenance of overgeneral memory (Watkins & Teasdale, 2001). The use of analytical thinking words after traumatic events suggests that individuals try to make sense of the negative information through a formal and logical way, posing a huge impact on the meanings, causations and consequences of these events (Monzani et al., 2021).

Taken together, the linguistic analysis provides an effective way to measure the content of memory and indicate the psychology behind it. Therefore, the present study analyzed the texts of AM narratives to address how the psychological mechanisms of memory would differ between specific and general AM and how the differences would vary across different emotions. Based on the literature, we focused on emotional and cognitive processes and thinking styles underpinning emotion-dependent psychological mechanisms of specific and general AM. We analyzed narratives of AM categorized as specific and general under cues of discrete emotions, instead of valence, given that different influences of emotion on cognition may go beyond valence and occur between distinct emotion types within the same valence (DeSteno et al., 2000; Zhang et al., 2021). While extensive evidence has suggested six basic emotion categories (happiness, sadness, disgust, anger, fear and surprise), these emotions are not discrete categories fully independent of each other. Happiness and sadness feature their own uniqueness, while disgust and anger, as well as fear and surprise, share substantial overlaps (Wang et al., 2019). Therefore, some studies have proposed that basic emotions may include four categories (happiness, sadness, surprise/fear and disgust/anger) rather than six (Jack et al., 2014; Jack et al., 2016). Considering that previous studies on autobiographical memory often recruit happiness, sadness, fear and anger (Mills & D'Mello, 2014; Wang et al., 2006), we chose them as emotional cues, with the neutral cue as the baseline.

To the best of our knowledge, no previous research has compared the linguistic markers of AM of different specificity across different emotional events. Therefore, the hypotheses in our study remained relatively general. Given that specific AM are often recalled with great feelings of vividness but general AM are often recalled without rich sensory and perceptual details (Holland & Kensinger, 2010), we expected higher use of affective process words in specific AM as compared to general AM. We also expected higher use of analytical thinking words in general AM relative to specific AM due to the important role of analytical thinking in the maintenance of overgeneral memory (Watkins & Teasdale, 2001). Moreover, we anticipated that specific versus general memory differences in using emotionally valenced words, cognitive process words and thinking style words would vary across AM of different emotional events since previous findings have suggested that the use of such words in

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narrations of different emotional experiences has different psychological implications (D'Andrea et al., 2012; Gamber et al., 2013; Monzani et al., 2021; Robertson & Hopko, 2009).

2. Methods

2.1. Participants

The present study aimed to obtain 210 AM reports of each emotion (105 in either of the specificity conditions). The target sample was determined using G*Power 3.1 (Faul et al., 2007) based on a minimum power of 0.95 at an α level of 0.05 as well as a medium effect size (0.25) reported in previous studies examining word use of emotional autobiographical narratives (Tani et al., 2016). Considering that every participant was asked to report six memories following each emotional cue, the required number of data could be collected in 35 participants. However, participants would report overgeneral or very specific AM under a particular emotion, given previous evidence showing that individuals may retrospect different emotional episodes with different levels of specificity (Berntsen, 2002; Talarico et al., 2009). Therefore, we enlarged the sample size to ensure that we could collect at least 210 general and specific AM of each emotion. Finally, the study included 122 healthy participants (60 males; age: 22.3 ± 2.09) recruited by local advertisement. To control for the potential confounding effects of handedness on AM recall (Parker et al., 2017), only right-handers were included. Given that there is a strong positive association between depression and overgeneral memory (Sumner et al., 2010), participants with a score of the second version of the Beck Depression Inventory (BDI-II) (Beck et al., 1996) greater than 13 were precluded from participation. The mean BDI-II score in participants was 4.47 ± 3.71. All participants gave written informed consent in accordance with the latest version of the Declaration of Helsinki and the study was approved by the Ethics Committee of the University of Electronic Science and Technology of China.

2.2. Task and procedure

The autobiographical memory task (Williams & Broadbent, 1986) was computerized and administered using Eprime 2.0. Before the task, participants were provided both written and verbal instructions explaining that they were to be shown on a computer screen five emotion-label words (i.e., happy, sad, angry, fearful and neutral) and then verbally recall an event that happened to them in the past in accordance with the given emotion. The instructions emphasized that the event should be personally experienced and the report should be given in detail (e.g., where and when the event occurred, what happened, who was present). In each of the five emotional contexts, participants elaborated six self-relevant memories, which constituted five (emotional) blocks of six (memory) trials. The permutation of the emotional blocks was randomized across participants. Each memory trial lasted 30 s, a time limit widely used in previous studies assessing the retrieval specificity of autobiographical memory under different cues (Hermans et al., 2004; Kleim & Ehlers, 2008). When time was up, a fixation was shown on the screen indicating the end of the report. Upon the presentation of the next cue, participants started to recall another corresponding memory. Speech was recorded by a computer with a Lenovo UM10C microphone.

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Data preprocessing

The speech recording files collected from each participant under each of the five emotional contexts were transcribed into texts using Xunfei's speech recognition platform (https://www.iflyrec.com). After transcribed texts were manually checked word by word, AM was classified into two categories (specific and general) by two trained reviewers who were unaware of the experiment design. The reviewers were instructed to code memories of an event that happened at a particular time and place within a time span less than 1 day as specific AM but summaries or classifications of repeated events (i.e., categorical memory), or recollection of an event that lasted longer than 1 day (i.e., extended memory) as general AM (Prebble et al., 2013; Sumner, 2012; Williams & Broadbent, 1986; Williams & Scott, 1988). When participants provided a verbal response derived from general knowledge rather than a memory (i.e., semantic associates), the response was coded as general AM given that semantic associates represent a type of overgeneral memory positioned at a level even higher than categorical memory in the hierarchy structure of memory system (Conway & Pleydell-Pearce, 2000; Debeer et al., 2009; Raes et al., 2007). The reviewers independently classified all transcripts, and Cohen's kappa coefficient was calculated ($k = 0.937$, $p < 0.001$), showing perfect agreement between their classifications (Conger, 2017). Disagreements were discussed and coded until a consensus was reached between them (Glachet & El Haj, 2019). Also, all the reported memories (3660 trials in total) were judged by the two reviewers on whether or not the memories were self-relevant and whether or not the emotion of the memories conformed to the emotion category required in the task. All the memory trials were evaluated as self-relevant except for one happy trial, one sad trial, six angry trials (from 5 participants) and 17 neutral trials (from 15 participants). All the emotional memories retrieved met the requirement of the emotion category, whereas one happy narration, one angry narration, three fearful narrations (from 3 participants) and 10 neutral narrations (from 10 participants) were not consistent with the required emotion category and thus excluded from the statistical analysis. Finally, a total of 3620 trials (happy: specific 510, general 220; sad: specific 464, general 267; angry: specific 426, general 299; fearful: specific 480, general 249; neutral: specific 198, general 507) were included in the following analysis.

Regarding linguistic features, the Simplified Chinese version of Linguistic Inquire and Word Count (SCLIWC) dictionary, an exclusive Simplified Chinese text analysis dictionary established according to the English LIWC dictionary and the Traditional Chinese version of LIWC dictionary to bridge the gap between LIWC software and Simplified Chinese (Gao et al., 2013), was imported into the Natural Language Processing and Information Retrieval (NLPIR) Chinese lexical analysis system (http://ictclas.nlpir.org) for the segmentation of transcribed texts. Afterward, TextMind, a Chinese language psychological analysis program optimized for processing Simplified Chinese and developed based on the SCLIWC to analyze preferences of different word categories in text, was used to generate word frequencies (Gao et al., 2013). Most of the input words were recognized by TextMind (general AM texts: M = 90.13%; specific AM texts: M = 90%) and the dictionary cover rate did not show significant differences between AM categories ($Z = -0.117$, $p = 0.907$, Mann–Whitney U test, two-tailed).

TextMind could map texts in 80 word categories, reflecting different aspects of the psychology and each category is computed as a ratio with respect to the total word

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count (Gao et al., 2013). Given that we focused on emotional and cognitive processes and thinking styles reflected by AM texts, 14 LIWC word categories were used and classified into three groups (emotional process, cognitive process and thinking style). The emotional process group (e.g., love, cry, worry) consisted of affective process words (Pennebaker, 2015). Considering that previous research has shown that the content of memory and the associated psychology behind it differ in words with differently valenced connotations (Gamber et al., 2013; Himmelstein et al., 2018; Kahn et al., 2007; Robertson & Hopko, 2009), we further compared the use of positive and negative emotion words, respectively, between specific and general AM following the analysis of the overall emotional word use. The cognitive process group (e.g., because, should, maybe) consisted of insight, causation, discrepancy, tentativeness and certainty words (Moore et al., 2021). Previous research has suggested that thinking styles are embodied using a series of function words, in which a high proportion of articles and prepositions signal analytic thinking, a relatively logical and precise thinking style and a high proportion of pronouns, auxiliary verbs, conjunctions, adverbs and negations indicate narrative thinking, a relatively dynamic and flexible thinking style (Pennebaker, 2015; Pennebaker et al., 2014). Therefore, the thinking style group (e.g., until, usually, very) here was divided into two subgroups representing analytic and narrative thinking styles. It is notable that due to the unique feature of Chinese, there is no article category; the analytic thinking group only included prepositions. The narrative thinking group included pronouns, auxiliary verbs, conjunctions, adverbs and negations.

2.3. Data analysis

Before performing the analysis in IBM SPSS version 22, the ratios of all word categories in each word group were added up to a total ratio within each emotion and specificity condition (see Supplementary Table S1 for the details). Therefore, six variables, namely the ratios of affective process, positive emotion, negative emotion, cognitive process, analytical thinking and narrative thinking words, were obtained for either specific or general AM in each of the five emotions. Then, the data of all the conditions were tested for normality and homogeneity of variance assumptions using the Kolmogorov–Smirnov test and the Levene test, respectively, which showed that the data did not follow the normal distribution (ps <0.001) and did not verify the assumption for equal variances (ps < 0.05). Thus, we turned to a nonparametric test to compare linguistic features between specific and general AM under each emotion condition. We used the Mann–Whitney U test, which does not rely on distributional assumptions and allows for unequal variances, and it has been shown to have a robust statistical power with disproportioned sample sizes (Karch, 2021; Treister et al., 2015; Zimmerman, 1987). False discovery rate (FDR) was used for multiple comparison correction to control for the type I error. The threshold of $p < 0.05$ (FDR corrected) was considered to be significant.

3. Results

Mann–Whitney U test results revealed that significantly fewer affective process words were used in specific AM than in general AM of sad ($Z = -2.93$, $p = 0.01$), angry ($Z = -4.74$, $p < 0.001$) and fearful ($Z = -3.85$, $p < 0.001$) events (Figure 1).

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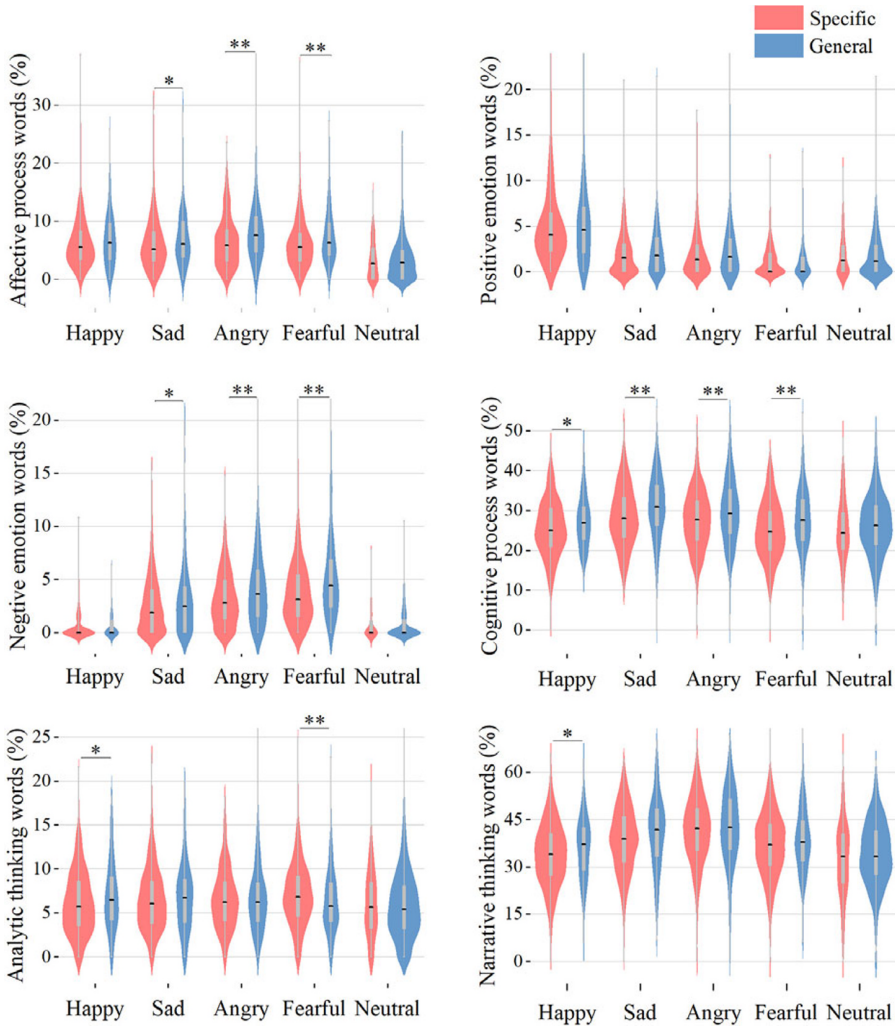

Figure 1. Emotion-dependent differences in word use between specific and general autobiographical memory. Black horizontal bars represent the median and the first and third quartiles are identified by the bottom and top of the bold vertical bars, respectively. The bottom and top of the thin vertical lines represent the lower and upper adjacent values, respectively. * $p < 0.05$, ** $p < 0.01$.

However, the differences in using such words were not significant between AM of different specificity when retrieving happy ($Z = -1.3$, $p = 0.26$) and neutral ($Z = -0.76$, $p = 0.54$) events. Furthermore, specific AM was provided with fewer negative words than general AM in sad ($Z = -2.82$, $p = 0.02$), angry ($Z = -3.46$, $p < 0.001$) and fearful ($Z = -4.67$, $p < 0.001$) narrations. In terms of the use of positive emotion words, however, no significant differences were identified between the two categories of AM under any emotional conditions (all ps > 0.1).

Regarding cognitive process words, general AM relative to specific AM featured a higher proportion of such words when happy ($Z = -2.66$, $p = 0.02$), sad ($Z = -4.55$,

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$p < 0.001$), angry ($Z = -3.27$, $p < 0.001$) and fearful ($Z = -4.48$, $p < 0.001$) experiences were recalled. There were no significant differences in using cognitive words for describing past neutral events ($Z = -1.65$, $p = 0.44$).

Regarding the use of words reflecting formal thinking styles, specific AM was reported with fewer such words than general AM under happy cues ($Z = -2.33$, $p = 0.03$), while in recollection of fearful events, specific AM was reported with more such words than general AM ($Z = -3.28$, $p < 0.001$). Retrievals under sad ($Z = -1.68$, $p = 0.29$), angry ($Z = -0.24$, $p = 0.96$) and neutral ($Z = -0.69$, $p = 0.36$) cues did not show any significant differences between AM categories in using formal thinking words. Regarding the use of informal thinking words, general relative to specific AM under happy cues featured more such words ($Z = -2.58$, $p = 0.02$). However, the use of informal thinking words did not show any significant differences under any other types of emotion (all ps > 0.1).

4. Discussion

To reveal the emotion-dependent psychological mechanisms of specific and general AM, we conducted a linguistic analysis of the recordings collected from an autobiographical memory task in happy, sad, angry, fearful and neutral contexts.

In the retrieval of events imbued with sadness, anger and fear, a higher proportion of emotional process words were used in general AM than in specific AM. Emotional words are cues reflecting emotional responses to experienced events (Tausczik & Pennebaker, 2010), and more frequent use of emotional words indicates enhanced emotional reactivity, which has been shown to associate with decreased emotion regulation efficiency (Robertson & Hopko, 2009, 2013). Therefore, our results suggest that recalling negative experiences at a general level may lead to decreased emotion regulation abilities and increased emotional reactions. This interpretation is supported by the finding in Philippot et al. (2003) that priming a general (versus specific) mode of negative AM reconstruction results in more intense emotion in a subsequent task in which participants mentally re-lived an associated emotional experience.

Given that the emotional process word category includes words with both pleasant and unpleasant connotations (Tausczik & Pennebaker, 2010) and the valence of an experience influences how likely AM is to be remembered (Williams et al., 2007), the findings of emotional words in narratives were further clarified regarding the use of positive and negative emotion words.

Negative words were used more often in general AM than in specific AM when events imbued with sadness, anger and fear were retrieved. Previous research has shown that negatively emotion-laden words are used frequently in describing negative experiences and the increased use of these words is associated with the enhancement of perceived negative emotions (Tausczik & Pennebaker, 2010). High frequencies of negative words indicate an immersion in negative events, leading to an impaired adaptive ability to cope with such events (Gamber et al., 2013; Lee & Cohn, 2010). Our findings on the use of negative words therefore suggest that maladaptive adjustment to experiences imbued with sadness, anger and fear results in recalling negative events in a general way, confirming our previous interpretation on the use of emotional word use. Indeed, previous studies have suggested that people troubled by their negative experiences are likely to develop a general retrieval style to

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avoid short-term distress, whereas this avoidance strategy comes at a long-term cost with maladaptive emotion regulation (Sumner, 2012; Williams et al., 2007).

Regarding the use of positive words, there were no differences between AM of different specificity under any emotional conditions. Positive words are often reported in positive narratives and are cues of perceived positive emotions (Tausczik & Pennebaker, 2010). Positive emotions broaden the scope of attention and cognition (Fredrickson, 2001). Happiness has been shown to activate a global information processing strategy, such that when happy, people attend to a broad range of information in the environment (Gasper & Clore, 2002). This information processing strategy, as it turns out, affects memory as well, such that people recall a wide variety of memory details and use less effortful heuristics to reconstruct experiences in narrating happy events (Levine & Pizarro, 2004). In the current study, the absence of general and specific AM differences in positive word use in the happy context indicates that the global information processing strategy makes no differences in the perceived positive emotion when retrieving happy events of different specificity. In recollection of aversive events (i.e., sad, angry and fearful), specific and general AM also did not show any significant differences in using positive emotion words. Finding positive meaning in memory of negative events is considered as mood incongruent recall, which is associated with a mood repair effect, lessening negative mood states (Brockmeyer et al., 2015). Such recall provides an adaptive way to reframe negative events, leading to the re-emergence of positivity at future recollections, in turn alleviating the experienced negative emotions (Speer et al., 2021). Our findings suggest that reinterpreting negative experiences in a positive way bears no impact on the perceived positive emotion between recollections of different specificity.

Taken together, the general AM advantages in overall use of emotional process words in the sad, angry and fearful contexts seem to be contributed by the greater use of negative words. Avoidance strategy triggered by aversive events exerts an adverse effect on the adaptive ability to cope with negative emotion, leading to diminished negative emotion regulation efficiency.

Cognitive process words were used more frequently in general AM than in specific AM in all emotional (but not neutral) narrations. Cognitive words reflect the ruminative processes of assimilating what happened to recognize a coherent story (Crespo & Fernandez-Lansac, 2016; D'Andrea et al., 2012; Patwardhan & Kulkarni, 2023). Previous evidence has shown that the construction of specific episodic memory features minimal inter-episode interference, while generalized episodic memory features overlapping information across multiple episodes (Kumaran & McClelland, 2012). Therefore, the higher frequency of cognitive words reported in happy general AM indicates that integrating happy event-specific details into a holistic impression, as compared to recalling a single happy event, involves increased cognitive processes. On the other hand, higher frequencies of cognitive words reported in sad, angry and fearful general AM suggest an adaptive integration of negative memory under avoidance strategy comes at a cognitive cost since general AM with negative valence depends on integrating both threatening and unpleasant feelings, typically difficult to accept (Weinstein et al., 2011). However, when retrieving neutral events, the use of cognitive words did not between AM categories, possibly because most of the neutral memories in the present study were general conceptual knowledge divested of personal experience involvement (e.g., *I had two cups. One was put in the lab and the other one was put in the dormitory. I used to carry the one in the dormitory*). Given that emotion increases self-focused attention during recalling

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(Mukadam et al., 2021), our finding suggests that although low emotion load decreases personal involvement, it makes no difference in cognitive complexity between AM categories.

We found general and specific AM differences in discrete emotional contexts regarding the use of both analytic and narrative thinking words. When past events imbued with fear were recalled, specific AM featured a higher proportion of analytic thinking words than general AM. Fear has been shown to motivate people to selectively encode and retrieve information associated with threats and means of avoiding them since such emotion alerts them to potential dangers that are similar to previously experienced circumstances (Lench & Levine, 2005; Levine & Pizarro, 2004). Our finding suggests that the potential threat posed by a single fearful event relative to that in a general fearful impression contributes to promoting a more precise and rigorous thinking style. However, in recollection of happy events, specific AM contained a lower proportion of both analytic and narrative thinking words than general AM. As previously discussed, when people are happy, they are likely to attend to global and heuristic characteristics of information rather than its local details (Gasper & Clore, 2002). On the other hand, healthy individuals generally experience positive events often, and thus, there may be a number of related events activated, interfering with the accurate retention details of any single positive experience and increasing the occurrence of false retrieval details (Holland & Kensinger, 2010; Storbeck & Clore, 2005). Therefore, our results suggest that when people retrieve happy events in a general way, their recollections may be less interfered with by concurrent activation of retention details of the same valence, as general retrieval implicates a more dynamic and flexible thinking style.

5. Conclusion

Manipulating the type of emotion engaged in AM, the present study elucidates the emotion-dependent psychological mechanisms underlying top-down and bottom-up retrieval processes. In sum, top-down retrieval of emotion-laden events incurs a cognitive cost. This retrieval style for sad, angry and fearful experiences involves an additional cost of reduced negative emotion regulation efficiency, while it contributes to avoiding re-experiencing painful feelings. For recollections imbued with happiness, although top-down retrieval demands more cognitive resources, it offers the benefits of a rigorous and flexible thinking style in return. On the other hand, bottom-up retrieval of accurate details for fearful experiences is driven by the alert for potential risks. However, to better understand the nature of the findings here, future research should measure participants' mood states to rule out potential influences of mood on emotional memory recall (Greenberg & Meiran, 2014). Also, future research should have more control over individual differences in traits, given their potential effects on emotional AM recall. For example, previous studies have shown that people with high levels of alexithymia experience decreased intensity of emotion during emotional memory retrieval (Mantani et al., 2005) and those with high trait anxiety exhibit increased arousal of negative emotion during narration, particularly when recalling negative events (Herrera et al., 2017). In addition, the current study ensured a gender balance among participants without primarily aiming to examine gender effects, since many studies have not found gender differences in emotional AM. However, there is evidence for such differences (see Grysman & Hudson, 2013,

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for a review). Therefore, exploring potential interactions between emotion and gender in future AM research would be valuable.

Supplementary material. The supplementary material for this article can be found at http://doi.org/10.1017/langcog.2025.10039.

Data availability statement. Raw data used for analysis in this study are available at OSF, https://osf.io/sguze/overview.

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Competing interests. The authors report there are no competing interests to declare.

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