This manuscript has been published in final form at https://doi.org/10.1016/j.lingua.2021.103083

# Emotional Intelligence, Working Memory, and Emotional Vocabulary in L1 and L2: Interactions and Dissociations

## Abstract

Cognition and emotion are interrelated concepts. However, very little is known about the relation between working memory capacity (WMC) and emotional intelligence (EI) and their effect on the retrieval and generation of emotional vocabulary. This study aimed to explore correlation patterns between WMC and four factors of trait EI (well-being, self-control, emotionality, sociability). It also sought to determine whether WMC and trait EI are significant determinants of the number and perceived pleasantness of emotion words freely retrieved and produced in a non-emotionally charged context and the extent to which language of retrieval had an effect on this association. The results showed negative correlations between WMC and two factors of trait EI (well-being and emotionality). Trait EI was the sole predictor variable of the perceived pleasantness of the words retrieved, whereas trait EI, language of retrieval, and gender explained a statistically significant amount of the variance in the number of emotion words generated. Qualitative analysis of the emotional vocabulary revealed a slight predominance of positive words and common patterns in the most highly activated words in both first and second languages.

*Keywords*: working memory, trait emotional intelligence, emotional vocabulary, perceived pleasantness, retrieval processes, positivity bias

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## 1. Introduction

Emotion and cognition are two sides of the same coin, influencing each other in multiple ways (Pessoa, 2008). As Swain (2013: 195) pointed out, “Emotions … have a significant impact on what has happened in the past, what is happening now, and what will happen in the future. In fact, emotions are an integral part of cognition”. However, very little is known about the interplay between two widely studied constructs, emotional intelligence (EI) – a concept that connects emotion and cognition (Salovey and Pizarro, 2003) – and working memory (WM) – traditionally seen as a cognitive mechanism par excellence. Moreover, EI and WM are multifaceted constructs, and one of the most challenging questions is *whether* and *how* different facets of EI and WM are linked to each other and, by extension, to emotional language processing and production. The current study aimed to expand this line of research by exploring correlation patterns between four factors of *trait* EI (well-being, self-control, emotionality, sociability) and WM capacity (WMC). In addition, this study sought to determine whether trait EI and WMC are significant determinants of the number and perceived pleasantness of emotion concepts freely retrieved and produced in the absence of an emotionally charged context.

Productive emotional vocabulary was the focus of the study for several reasons. The ability to use emotion concepts constitutes an essential part of human communication and is an indispensable ingredient of sociocultural and pragmatic competence (Dewaele, 2008; Ekman, 1999; Pavlenko, 2013). As Ekman (1999: 317) pointed out, “Without being able to name feelings, it is harder to distinguish them, think about them, plan regarding them, etc.”. Therefore, the ability to use a precise and rich vocabulary is an important step towards recognition, acceptance and regulation of emotions. It also promotes the development of effective interpersonal skills, conflict resolution strategies, and negotiation skills (Fisher and Shapiro, 2005). This does not only apply to first language (L1) but also to second language (L2) contexts, as we live in a globalised world where interaction, negotiation, and decision making in an L2 is an unavoidable reality. However, our knowledge regarding productive emotional vocabulary derives mainly from cross-linguistic studies (e.g.

Panayiotou, 2006; Pavlenko, 2008b; Semin et al., 2002), and psychological or personality factors underpinning its retrieval and use have received much less attention (Meara, 2002). It is believed that high EI individuals are better equipped to use a wide range of emotion concepts (Barrett, 2017). Some scholars further argued that emotional granularity[1] and WMC go hand in hand (Lee et al., 2017). Therefore, a plausible hypothesis is that EI and WMC would have an additive effect on the ability to retrieve and use emotion words.

There is also an extensive body of literature that investigates how emotions – and emotionality – foster memory capacity (Christianson, 1989; Christianson et al., 1991; Kensinger, 2009; LeDoux, 2003; Zimmerman and Kelley, 2010). Specifically, this work documents that emotional cues and contexts enhance certain aspects of WMC, as well as the subjective vividness and confidence related to retrieval processes. Indeed, emotion prompts and emotionally charged contexts may trigger and induce faster emotional or memory responses. However, being able to retrieve and produce emotion concepts in a neutral (non-cued) condition might require extra cognitive effort. This is particularly true when retrieval processes take place in an L2 because of the cognitive load imposed by L2 processing and the lack of automaticity when L2 users try to access and activate L2 vocabulary that has not been fully consolidated.

Empirical evidence further suggests that L2 vocabulary learning and use require complex underlying mechanisms that depend on individual differences in WMC (Ellis, 1996; Martin and Ellis, 2012; see Gathercole, 2006, for a review) and trait EI (Skourdi and Rahimi, 2014; but see Alavi and Rahimi, 2011). However, it is unclear whether this is a general effect or whether it also applies to specific types of words. Pavlenko (2008a) argued that emotion words should be treated as a unique word class in the mental lexicon because they are represented, encoded, and retrieved differently compared to concrete and abstract terms. Therefore, in order to elucidate the full spectrum of the *why* and *how* of emotional expression in general and of the retrieval and production of emotional vocabulary in particular, some

[1] Emotional granularity – also known as emotional differentiation – refers to the ability to describe emotional experiences in a specific and precise manner and depends on the emotional complexity of an individual's conceptual knowledge (Lee et al., 2017; Lindquist and Barrett, 2008).

minimal consideration of the role of individual differences in both cognitive and affective functions is of paramount importance.

Moreover, the current study qualitatively compared the emotional vocabulary retrieved and produced by English L1, Spanish L1, and Spanish L2 users. Previous research mainly focused on the emotional vocabulary of Spanish L1 (Alba-Juez and Pérez-González, 2019; Bisquerra and Filella, 2018), English L1 (Schrauf and Sanchez, 2004), and bilingual users (Ferré et al., 2010; Ferré et al., 2013). The aim of including Spanish L2 users was to provide data that would contribute to the study of emotion and bilingualism – which has been the norm in the scientific literature – and, eventually, allow for a more comprehensive account of the role of language on memory retrieval processes for emotion words. This analysis focused on the most highly activated words and their valence. The *positivity bias theory*, also known as the *Pollyanna hypothesis* (Boucher and Osgood, 1969), posits a higher prevalence of positive words in human communication. It suggests that people's lexicon includes more positive terms, which are used more frequently, appear in the early stages of language development, are learnt faster, and are recalled easier. Therefore, it was hypothesised that participants would mainly retrieve positive words regardless of language of retrieval.

## 2. Emotional intelligence and working memory: Conceptualisation

EI refers to an individual's ability to identify, comprehend, label, and manage their own and other people's emotions and use this knowledge to achieve a better quality of life (Mayer and Salovey, 1993, 1997; Petrides and Furnham, 2003; Salovey and Mayer, 1990). It has been suggested that the ability to regulate emotional experiences, especially negative ones, is an important characteristic of those high in EI (Barrett et al., 2001). On the other hand, specific cognitive or language impairments – such as alexithymia[2] – may result in low emotional granularity (Barrett, 2017; see Goerlich, 2018, and Hobson et al., 2019, for reviews).

EI has been conceptualised both as a *trait* and as an *ability* based on either the

[2] Alexithymia is characterised by a lack of ability to identify, distinguish, and appropriately describe inner feelings and emotions (Sifneos, 1973).

theoretical approach or the type of measurement used to assess the construct (Fiori, 2009; Gutiérrez-Cobo et al., 2016; Petrides and Furnham, 2001). According to Petrides (2011: 657), "*Trait EI* (or trait emotional self-efficacy) concerns emotion-related self-perceptions measured via self-report, whilst ability EI (or cognitive-emotional ability) concerns emotion-related cognitive abilities that ought to be measured via maximum-performance tests". Petrides (2011) argued that trait EI and ability EI are different constructs, and hence their empirical referents should be addressed independently. Taking a stand on this issue is beyond the scope of this paper, and both trait and ability EI are discussed in relation to WMC. However, it is important to clarify that the current study focuses on trait EI as assessed with the Trait Emotional Intelligence Questionnaire - Short Form (TEIQue-SF; Petrides, 2009a, 2009b)

The TEIQue-SF includes two items from each of the 15 facets of the full form (TEIQue) and yields a global trait EI score, as well as scores on four trait EI factors: well-being, self-control, emotionality, and sociability (Petrides and Furnham, 2003). Well-being comprises self-esteem (high scores indicate that people perceive themselves as successful and self-confident), trait happiness (cheerful and satisfied with their lives), and trait optimism (confident and likely to look on the bright side of life); self-control includes emotion control (high scores indicate that people perceive themselves as capable of controlling their emotions), stress management (capable of withstanding pressure and regulating stress), and impulse control (reflective and less likely to give into their urges); emotionality concerns emotion perception (high scores indicate that people perceive themselves as clear about their own and other people's feelings), emotion expression (capable of communicating their feelings to others), relationships (capable of having fulfilling personal relationships), and trait empathy (capable of taking someone else's perspective); sociability refers to social awareness (high scores indicate that people perceive themselves as accomplished networkers with excellent social skills), emotion management (capable of influencing other people's feelings), and assertiveness (forthright, frank, and willing to stand up for their rights) (Petrides, 2009a, 2009b; Petrides et al., 2016). The remaining two facets are adaptability and self-motivation and do not load on any factor, but rather contribute to the global trait EI score (Petrides, 2009a, 2009b; Petrides et al., 2016).

WM is comprised of a set of mechanisms that allow individuals to activate, rehearse, and update mental representations and action plans while performing complex and demanding (e.g. time-pressured) tasks, resisting cognitive interference by suppressing irrelevant or competing stimuli, engaging in controlled strategic processing, and retrieving domain- and task-relevant information from long-term memory (Baddeley and Logie, 1999; D'Esposito, 2007, 2008; Jonides et al., 2005; Kane et al., 2007). If WM provides a form of cognitive control, individual differences in WMC would likely account for individual differences in the ability to control – and eventually express – thoughts, feelings, and actions (Barrett et al., 2004). Recent evidence suggests that highly granular individuals are better able to search for and inhibit conceptual knowledge related to emotions because of their higher WMC (Lee et al., 2017). It is thus reasonable to assume that individual differences in both EI and WMC would have an effect on (emotional) language processing and, eventually, certain implications for language teaching and pedagogy.

## 3. Cognitive abilities, emotional intelligence, and processing of emotional stimuli

Interest has grown recently in how emotional aptitudes interact with cognitive mechanisms, such as WM, and other emotional states or stimuli (see Fernández-Berrocal and Extremera, 2016, and Gutiérrez-Cobo et al., 2016, for reviews). Matthews et al. (2007) argued that moderate associations should exist between EI and cognitive abilities, which seems to be the case when performance-based – rather than self-reported – measures of EI are employed (Gutiérrez-Cobo et al., 2016). Gutiérrez-Cobo et al.'s (2016) meta-analysis further revealed that ability EI is related to performance in hot (i.e. emotionally laden) cognitive tasks; on the other hand, very few studies have included cool cognitive tasks, suggesting an absence of – or negative – correlations with EI.[3] For instance, Checa and Fernández-Berrocal

[3] Hot cognition is defined as "cognition colored by feeling" (Brand, 1985/1986: 5). In other words, it refers to how emotions, feelings, and affect influence cognitive processes related to memory, attention, decision making, etc. Cold cognition is "emotion-independent" cognition, that is, "information processing in absence of any emotional influence" (Roiser and Sahakian, 2013: 2). Therefore, hot cognitive tasks are those comprising emotionally valenced stimuli, whereas cool cognitive tasks usually comprise neutral stimuli (numbers, letters, words without emotional connotations, etc.) (Roiser and Sahakian, 2013).

(2015) found a negative association between impulsivity as measured with the numerical Stroop task – a widely used task for the assessment of specific executive functions such as the ability to inhibit interference – and the ability to manage emotions as measured with a performance-based ability test. Two recent studies by Gutiérrez-Cobo et al. (2017a, 2017b) showed that individuals with high ability EI scored higher in hot (but not in cool) 2-Back tasks – a widely used task to measure WM processes (see Jaeggi et al., 2010) – and were more accurate in tasks measuring cognitive control ability. However, the same pattern of results was not replicated when using self-reports of EI.

Regarding trait EI, the available evidence is less clear. For instance, Coffey et al. (2003) observed that individuals who reported paying attention to their emotions had better performance on the emotional Stroop task. On the other hand, Furnham and Petrides (2003) did not find an association between global trait EI (TEIQue-SF) and cognitive ability (i.e. general, fluid and verbal intelligence, and verbal and spatial ability). The above findings suggest that the link between WMC and EI is subject to the emotional content of the WM tasks and the type of assessment measures used (performance-based vs. self-report).

Another body of research addressed the relation between EI and attention to emotional stimuli. Using the TEIQue, Mikolajczak et al. (2009) found that high trait self-control individuals allocated more attentional resources to emotional stimuli under a stressful condition based on a failure experience, whereas in a neutral condition the same individuals recalled more positive memories. In a similar vein, Davis (2018) observed that individuals who scored high in emotion management and trait well-being appeared to avoid negative stimuli, especially under stressful conditions, whereas those with high trait sociability and trait emotionality showed a preference for negative stimuli. Davis' (2018) study assessed emotion management with an ability EI test, whereas the TEIQue-SF was employed to assess trait EI factors. Lea et al. (2018), who also used the TEIQue-SF, found that high trait EI individuals fixated longer on positive stimuli regardless of the modality of presentation (pictures vs. scenes). The authors claimed that a preference for positive stimuli promotes well-being, which in turn draws an individual's attention to positive material. On the other hand, Matthews et al. (2015) found that cognitive ability, rather

than trait EI, predicted emotional processing. According to the authors, these results imply that perception of and attention to emotional stimuli might be modulated by attentional resource allocation. Although not directly comparable, the results of the aforementioned studies point to a complex pattern of interactions between cognitive ability, different factors of trait EI, and emotional processing.

## 4. Memory and emotional vocabulary

Some interesting findings on the interplay between emotion and memory come from studies that examined granularity and memory for emotion words in bilinguals. Lee et al. (2017) conducted an electroencephalography study to investigate how individual differences in emotional granularity influenced brain activity during affective stimulus processing (i.e. images that induced awe, excitement, fear, disgust, and images comprising neutral stimuli). Granularity was assessed based on participants' experience of 20 emotion categories during daily episodes that occurred two days before the experiment. Lee et al. (2017) found that participants high in emotional granularity were more likely to efficiently access, retrieve, and inhibit – when necessary – concrete conceptual knowledge related to emotion concepts in order to describe their affective states. According to the authors, this ability stemmed from their higher WMC. Moreover, the same participants tended to recruit more attentional resources for the categorization of the meaning of their affective states and were more likely to use these resources to anticipate and regulate their emotions.

Ferré et al. (2010) explored memory for emotion words in early and late bilinguals. All participants showed better memory for emotion words regardless of language dominance, age, type and context of L2 acquisition, and similarity between their languages. The authors also found that emotional intensity was similar in L1 and L2, at least in the case of proficient bilinguals. In a subsequent study, Ferré et al. (2013) examined memory for emotion words of highly proficient bilinguals using encoding tasks that directed participants' attention either to emotionality features or to words' features (i.e. concreteness and number of vowels contained in each word).

Their results showed that recall was higher for positive compared to neutral words across languages and tasks. Nevertheless, both studies used cued tasks; therefore, it is difficult to draw conclusions about the affective properties of the words that would predominate if L1 and L2 users *freely* retrieved and produced emotional vocabulary.

Based on different research questions and methodological paradigms, three studies that explicitly addressed this issue were those of Semin et al. (2002), Schrauf and Sanchez (2004), and Alba-Juez and Pérez-González (2019). Semin et al. (2002) did not find significant differences in the number of emotion words retrieved by Hindustani-Surinamese L1 and Dutch L1 users. However, Hindustani-Surinamese speakers retrieved and produced a greater number of state verbs and a lower number of state referent nouns; this pattern of results was consistent when critical and emotional events were analysed. Schrauf and Sanchez (2004) examined the working emotional vocabulary of monolingual Spanish speakers in Mexico and monolingual English speakers in the United States using a free emotion term generation task. They observed a predominance of negative emotion words, a greater diversity of words retrieved by older participants, and a similar distribution of positive and negative emotion concepts in Spanish and English.

The third study, conducted by Alba-Juez and Pérez-González (2019), explored the relation between affective competences related to EI and pragmalinguistic competences in emotionally challenging situations in the workplace. They administered an online questionnaire that included, among other tasks, the TEIQue-SF and a free emotion term generation task. According to the authors, the rationale behind the use of the latter task was to obtain a brief proxy for both emotional granularity and emotion-related linguistic competence. They identified 1515 emotion tokens and 454 emotion types, only 2 of which – *alegría* (joy) and *tristeza* (sadness) – were used by more than 50% of their participants. These results are identical to the ones obtained by Bisquerra and Filella (2018), indicating a high consistency in the retrieval of emotion concepts by Spanish L1 users in a 3-minute time interval (Alba-Juez and Pérez-González, 2019). On the other hand, no associations were found between emotional vocabulary and trait EI global scores. This finding is somewhat surprising because, as the authors mention in their literature review, high EI

individuals are expected to have a more detailed emotional lexicon (see also Barrett, 2017). It is possible that shortcomings of the study (e.g. emotion words were not lemmatised and only global trait EI scores were used) hindered the strength of observed correlations between trait EI and emotional lexicon.

## 5. The current study

The current study set out to explore correlation patterns between WMC and trait EI (global trait EI scores, well-being, self-control, emotionality, and sociability). It also aimed to establish whether WMC and trait EI were significant determinants of the number and perceived pleasantness of emotion words freely retrieved and produced by English L1, Spanish L1, and Spanish L2 users and the extent to which language of retrieval modulated retrieval processes. Additionally, a qualitative analysis of the emotional vocabulary was conducted to identify whether there was a predominant pattern in the most highly activated emotion words in L1 and L2. Specifically, the study sought to answer the following research questions:

RQ1: Is there a relation between WMC and trait EI (global trait EI scores, well-being, self-control, emotionality, sociability)?

RQ2: What is the contribution of WMC and trait EI to the number and perceived pleasantness of emotion concepts freely retrieved and produced in the absence of an emotionally charged context, and how does language of retrieval modulate this link?

RQ3: Is there a common pattern in the most highly activated emotion words retrieved by L1 and L2 users?

### 5.1 Participants

A total of 174 students, 59 males and 115 females, aged between 18 and 27 ($M$ = 20.07, $SD$ = 1.68) took part in the study. Eighty-one participants were Spanish L1 users, 56 were from the United States and 28 from China, whereas the remaining 9 participants had the following nationalities: Korean, British, Dutch, Italian, and Norwegian.

## 5.2 Tasks

### *5.2.1 Operation Span Task*

WMC was assessed with a computerised version of the Operation Span Task (OSPAN; Unsworth et al., 2005), which measures WMC through both storage and processing abilities and is also believed to tap into specific executive functions such as updating (Miyake et al., 2000; Wilhelm et al., 2013). The task requires participants to solve sets of mathematical problems presented visually and followed by a proposed solution. In addition, participants must remember and accurately recall in order sets of three to seven letters that appear after each mathematical problem and pick these letters from a provided letter matrix. WM span was obtained by summing all perfectly recalled sets; for example, if a participant correctly recalled two letters in a set size of two mathematical problems, three letters in a set size of three mathematical problems, but only three letters in a set size of four mathematical problems, the WM span would be a score of 5 (2+3+0). An 85% level of accuracy was established for the secondary processing task (Unsworth et al., 2005).

### *5.2.2 Trait Emotional Intelligence Questionnaire*

Trait EI was measured with the 30-item short form of the TEIQue-SF (Petrides, 2009a, 2009b). Participants indicated their agreement with each item using a Likert scale ranging from 1 (*completely disagree*) to 7 (*completely agree*). As mentioned previously, the TEIQue-SF includes two items from each of the 15 facets of the full form (Petrides and Furnham, 2003) and yields scores on four self-perception factors of EI (i.e. well-being, self-control, emotionality, and sociability). Responses for each factors were averaged to create overall composites.

Bayesian reliability analyses were conducted using McDonald's omega coefficient, the Guttman λ2 coefficient, and the mean inter-item correlations (MIC), but not Cronbach's alpha coefficient[4] since several authors argue against its use for

[4] The popularity of Cronbach's alpha coefficient is attributed by Cho (2016: 654) to "the awareness of the name alpha" which "outdistances that of any other reliability coefficients" even when superior alternatives for reliability estimates exist. A more cutting critique is expressed by Sijtsma (2009: 118), who argued that "The only reason to report alpha is that top journals tend to accept articles that use statistical methods that have been around for a long time such as alpha".

estimating internal consistency (Sijtsma, 2009; Widaman et al., 2011). Cronbach's alpha is based on the tau-equivalent assumption, which – if violated – can produce large estimation errors (Cho, 2016). As Widaman et al. (2011: 54) pointed out, "if coefficients omega and alpha diverge in magnitude, coefficient alpha is likely a biased underestimate of scale reliability", whilst Sijtsma (2009) contended that Cronbach's alpha is *not* a measure of internal consistency (see also Cortina, 1993). Moreover, Cronbach's alpha values are largely dependent on the number of test items (Cortina, 1993; Graham, 2006; Schmitt, 1996; Streiner, 2003). On the other hand, McDonald's omega is a good alternative when short versions of original scales are used (Widaman et al., 2011; see also Hayes and Pritchard, 2013), whilst Woodruff and Wu (2012) recommend the use of Guttman's λ2 when there are negative inter-item covariances, data are normally distributed, and polytomous items are included in the scale (see also Callender and Osburn, 1979, and Hayes and Pritchard, 2013). Therefore, before conducting the reliability analyses, the assumption of normality was checked and data were screened for outliers, revealing one univariate outlier which was removed from the analyses.

For trait EI global scores, the reliability coefficients were McDonald's ω = .825 [.787, .859], Guttman's λ2 = .843 [.811, .875], while the MIC reached a value of .15 (see Clark and Watson, 1995); for well-being, McDonald's ω = .809 [.763, .852], Guttman's λ2 = .816 [.774, .858], MIC = .431; for self-control, McDonald's ω = .511 [.411, .614], Guttman's λ2 = .525 [.423, .623], MIC = .13; for emotionality, McDonald's ω = .594 [.505, .682], Guttman's λ2 = .612 [.526, .694], MIC = .15; and for sociability, McDonald's ω = .601 [.505, .692], Guttman's λ2 = .621 [.538, .700], MIC = .20. The lower reliability values obtained for the four factors compared to the trait EI global scores are not surprising and do not pose a problem. Although it could be argued that reliability coefficients lower than .70 or .80 are not acceptable, it should be kept in mind that these are mere conventions, which have been characterised as "unsystematic", "chaotic", "haphazard", and "undisciplined" (Cho, 2016; Cortina, 1993). Reliability estimates should be assessed in conjunction with other factors (e.g. the number of items in the (sub)scale, the correlations of the scale with other relevant constructs, etc.). The good psychometric properties of the TEIQue have been demonstrated in several studies that used both classical test

theory and item response theory (Cooper and Petrides, 2010; Mikolajczak et al., 2007; Petrides, 2009). Moreover, the present study only employed the 30-item short form of the TEIQue, not the 153-item full form. The full form would be expected to yield higher values of internal consistency for the four factors (see, for instance, Mikolajczak et al., 2009), contrary to the short form which tends to produce relatively lower reliability coefficients (Petrides, 2011), as it occurred in the present study.

*5.2.3 Working Emotional Vocabulary Task*

Working emotional vocabulary refers to "those emotion labels immediately available to individuals as they think through their experience" (Schrauf and Sanchez, 2004: 269). Participants were asked to write down a list of as many emotion words (adjectives and nouns that referred to an emotion, feeling, or mood) as they could within 10 minutes. The instructions were taken from Alba-Juez and Pérez-González's (2019) study. Qualitative analysis revealed that participants generated nouns and adjectives. The few instances of verbs were found almost exclusively in Spanish L2 and were the following: *llorar* (*f* = 2; also in Spanish L1: *f* = 1), *gustar* (*f* = 7), *encantar* (*f* = 3), *disculpar* (*f* = 1), *sentir* (*f* = 1), *esperar* (*f* = 1), *amar* (*f* = 1). Given the extremely low percentage of these verbs, as well as their emotional meaning, they were maintained in the analysis. Moreover, although Schrauf and Sanchez (2004) opted for a 2-minute interval for the emotion term generation task and Alba-Juez and Pérez-González (2019) and Bisquerra and Filella (2018) opted for a 3-minute interval, their participants carried out the task in their L1. In the present study, participants retrieved emotion words in their L1 or L2. Therefore, a longer time period was allowed for the completion of the task to compensate for the additional cognitive costs of processing and producing words in an L2.

Participants were also instructed to indicate on a 7-point Likert scale the degree of pleasantness of each word. Ratings were made within the task time interval (10 minutes), and participants were instructed to provide ratings in the way most convenient to them (i.e. either after producing each word or after producing all words). The rationale behind using a pleasantness scale was that participants had already been asked to *generate* emotion words, not just retrieve previously seen words or rate a list of given words – a common procedure in studies that develop

sets of normative emotional ratings. Therefore, asking participants to then assess these words in terms of emotionality may have been confusing and redundant, given the confounding boundaries between an *emotion* concept and its *emotion(ality)*, as well as the overlapping boundaries between emotionality and pleasantness.[5]

Regarding coding, repeated words produced by the same participant and emotion-laden words (e.g. amputee, stupid, home, dead, blind, etc.) were excluded from the analysis, whereas words with similar but not identical meanings (e.g. happy – content, delighted – charmed, exhausted – tired, etc.), as well as antonyms (e.g. happy – unhappy, content – discontent, bothered – unbothered, etc.), were retained (Schrauf and Sanchez, 2004). The identification of emotional vocabulary was based on Pavlenko's (2008a) definitions of emotion words and emotion-related words.

For each participant, two values were calculated: (1) the total number of emotion words[6] retrieved (EMW), and (2) a pleasantness index (PLIN), which was obtained by summing the scores given to each word on the 7-point scale and dividing the sum by the total number of words. This adjustment was deemed necessary because approximately one third of participants carried out the task in L2, which may very likely have increased the cognitive complexity of task performance. Moreover, in order to explore whether there was a predominance of specific emotion words in English L1, Spanish L1, and Spanish L2, the number of emotion types and tokens was calculated using the programme V_Words v2.0 (Meara and Miralpeix, 2016).

### 5.3 Procedure

All participants were informed about the general purpose of the study and asked to sign a consent form. Thirty-nine participants (26 females and 13 males) performed the emotional vocabulary task in English L1, 81 (49 females and 32 males) in

[5] There is evidence suggesting that words that are very positive or very negative tend to be more arousing than neutral words (Warriner et al., 2013). The mean valence of the 100 most common emotion types in English L1, Spanish L1, and Spanish L2 was obtained using different sets of norms (Bradley and Lang, 1999; Hinojosa et al., 2016; Redondo et al., 2007; Stadthagen-Gonzalez et al., 2017; Warriner et al., 2013). This analysis revealed that only 16 of 300 emotion types had a mean valence between 4 and 6 (i.e. they were neutral words).

[6] For the purpose of the analysis, the term *emotion words* is used to refer to both emotion words and emotion-related words.

Spanish L1, and 54 (40 females and 14 males) in Spanish L2. Among the 54 participants who completed the emotional vocabulary task in their L2, 18 were Americans, 28 Chinese, 5 Korean, and the remaining 3 participants were from the Netherlands, Italy, and Norway. Their dominant language was their L1, and they had an intermediate level in Spanish as established by both a placement exam and self-ratings that participants provided regarding their speaking, understanding, reading, and writing skills in Spanish using a 5-point scale (mean cumulative score: 10.96, *SD* = 2.86, *n* = 51). The mean age of onset of Spanish acquisition was 16.46 years (*SD* = 4.73, *n* = 47) and, all but 8 participants started learning Spanish after the age of 12 in instructional settings. However, at the time of data collection all were taking Spanish language courses in Spain; therefore, they were immersed in the Spanish culture and society and had continuous exposure to the L2 both inside and outside the classroom.

First, participants completed the emotional vocabulary task and subsequently the TEIQue-SF. Fifty-one participants also completed the OSPAN during individual sessions outside class hours that took place between one and three weeks after the other two tasks. For the emotional vocabulary task and the TEIQue-SF, instructions and paper versions were provided in both Spanish and English as all participants whose L1 was not English or Spanish indicated that they had at least an intermediate proficiency level in English. Participants were instructed to complete the TEIQue-SF in the language they preferred. A preliminary analysis showed that there were no statistically significant differences between female and male participants in trait EI ($t(172) = -1.325$, $p = .187$) and WMC ($t(49) = 0.334$, $p = .740$).

The study was carried out in accordance with the Declaration of Helsinki and ethical guidelines of the American Psychological Association. Approval was obtained from the Research Ethics Committee at the author's institution [Reference no. <Details omitted for double-blind reviewing>].

## 6. Results

Data were initially screened for univariate and multivariate outliers using Mahalanobis distance. No such outliers were found except for one univariate outlier

This manuscript has been published in final form at https://doi.org/10.1016/j.lingua.2021.103083

(case 48, female originally from China, who obtained a trait EI score of 3.17), and her data were removed from the remaining analyses. A summary of descriptive statistics is provided in Table 1. For most variables, values of skewness and kurtosis were acceptable (i.e. lower than 1). Age presented slightly higher values of both skewness and kurtosis because a few participants ($n$ = 11) were older than 23 years.

Table 1

Descriptive statistics for age, EMW, PLIN, WMC, and trait EI.

| | | N | M | SD | Skewness | Kurtosis |
|---|---|---|---|---|---|---|
| Age | English/L1 | 39 | 20.280 | 1.109 | 0.403 | 0.404 |
| | Spanish/L2 | 53 | 21.080 | 1.719 | 1.460 | 3.046 |
| | Spanish/L1 | 81 | 19.310 | 1.533 | 1.553 | 2.649 |
| | Total | 173 | 20.069 | 1.683 | 1.119 | 2.103 |
| EMW | English/L1 | 39 | 25.640 | 7.154 | 0.388 | -0.423 |
| | Spanish/L2 | 53 | 16.170 | 5.656 | 0.222 | -0.342 |
| | Spanish/L1 | 81 | 22.440 | 7.223 | 0.658 | 0.046 |
| | Total | 173 | 21.243 | 7.632 | 0.539 | -0.096 |
| PLIN | English/L1 | 39 | 3.849 | 0.420 | 0.339 | -0.077 |
| | Spanish/L2 | 53 | 3.961 | 0.529 | 0.198 | -0.384 |
| | Spanish/L1 | 81 | 3.829 | 0.507 | -0.098 | 0.101 |
| | Total | 173 | 3.874 | 0.496 | 0.203 | 0.107 |
| WMC | English/L1 | 25 | 44.720 | 15.252 | -0.341 | -0.706 |
| | Spanish/L2 | 25 | 54.240 | 15.026 | -1.202 | 1.817 |
| | Spanish/L1 | - | - | - | - | - |
| | Total | 50 | 49.480 | 15.737 | -0.650 | -0.170 |
| Trait EI | English/L1 | 39 | 5.428 | 0.593 | -0.451 | 0.728 |
| | Spanish/L2 | 53 | 4.994 | 0.623 | 0.243 | -0.742 |
| | Spanish/L1 | 81 | 4.834 | 0.537 | -0.249 | 0.581 |
| | Total | 173 | 5.017 | 0.619 | -0.082 | -0.145 |
| Well-being | English/L1 | 39 | 6.013 | 0.828 | -0.849 | -0.112 |
| | Spanish/L2 | 53 | 5.531 | 0.916 | -0.116 | -1.043 |
| | Spanish/L1 | 81 | 5.179 | 1.014 | -0.712 | 0.555 |
| | Total | 173 | 5.475 | 0.995 | -0.668 | 0.286 |
| Self-control | English/L1 | 39 | 4.748 | 0.961 | -1.401 | 2.223 |
| | Spanish/L2 | 53 | 4.469 | 0.549 | -0.629 | 0.850 |
| | Spanish/L1 | 81 | 4.105 | 0.849 | -0.488 | 0.279 |
| | Total | 173 | 4.361 | 0.836 | -0.679 | 0.724 |
| Emotionality | English/L1 | 39 | 5.391 | 0.726 | 0.148 | -0.536 |
| | Spanish/L2 | 53 | 5.035 | 0.920 | 0.052 | -0.672 |
| | Spanish/L1 | 81 | 5.109 | 0.715 | -0.014 | -0.042 |
| | Total | 173 | 5.150 | 0.793 | -0.131 | -0.172 |

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| | | | | | | |
|---|---|---|---|---|---|---|
| Sociability | English/L1 | 39 | 5.303 | 0.757 | -0.334 | 0.205 |
| | Spanish/L2 | 53 | 4.711 | 0.958 | -0.324 | -0.876 |
| | Spanish/L1 | 81 | 4.768 | 0.828 | -0.009 | 0.313 |
| | Total | 173 | 4.871 | 0.882 | -0.216 | -0.252 |

*Note.* L1 and L2 refer to language of retrieval.

Pearson product-moment correlations were used to explore the relation between the variables (Table 2). EMW was positively and significantly correlated with trait EI global scores, emotionality, and sociability. A similar pattern of results was obtained with respect to PLIN, although correlations were statistically significant for trait EI global scores, well-being, and self-control. According to Cohen (1988, 1992), the magnitude of the correlation coefficients obtained represent low to medium effect sizes. After removing variability associated with age, correlations between EMW, PLIN, and trait EI scores were maintained at similar levels. Moreover, the results of a partial correlation analysis with both age and WMC as control variables showed that EMW was still significantly correlated with sociability, as was PLIN with self-control ($r$ = .354, $p$ = .013, and $r$ = .349, $p$ = .015, respectively). On the other hand, WMC was negatively associated with trait EI global scores, well-being, and emotionality.

Table 2

Correlations between EMW, PLIN, WMC, and trait EI.

| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|---|
| 1. EMW | Pearson's *r* | — | | | | | | |
| | *p*-value | — | | | | | | |
| 2. PLIN | Pearson's *r* | -.093 | — | | | | | |
| | *p*-value | .222 | — | | | | | |
| 3. WMC | Pearson's *r* | -.232 | -.137 | — | | | | |
| | *p*-value | .105 | .341 | — | | | | |
| 4. Trait EI | Pearson's *r* | .174* | .176* | -.321* | — | | | |
| | *p*-value | .022 | .020 | .023 | — | | | |
| 5. Well-being | Pearson's *r* | .120 | .196** | -.402** | .793*** | — | | |
| | *p*-value | .114 | .010 | .004 | < .001 | — | | |
| 6. Self-control | Pearson's *r* | -.049 | .171* | -.252 | .619*** | .442*** | — | |
| | *p*-value | .525 | .024 | .077 | < .001 | < .001 | — | |
| 7. Emotionality | Pearson's *r* | .196** | -.018 | -.301* | .649*** | .300*** | .193* | — |
| | *p*-value | .010 | .810 | .033 | < .001 | < .001 | .011 | — |
| 8. Sociability | Pearson's *r* | .159* | .134 | -.256 | .678*** | .427*** | .214** | .279*** |
| | *p*-value | .036 | .079 | .072 | < .001 | < .001 | .005 | < .001 |

*$p$ < .05, **$p$ < .01, ***$p$ < .001

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In order to shed more light on the correlation patterns described above, two hierarchical multiple regression analyses were carried out with EMW (Table 3) and PLIN (Table 4) as the outcome variables, and age (Step 1), gender (Step 2), language of retrieval (Step 3), and trait EI (Step 4) as the independent variables. WMC was excluded from these analyses as correlation coefficients with EMW and PLIN were low and not statistically significant. In addition, power analysis was conducted using G*Power 3 Software (Faul et al., 2009; Faul et al., 2007). Input parameters were set in the following way: two-tailed test, effect size = .15, α = .05, β = .20. For two (L1, trait EI) tested predictor variables and age and gender as control variables, the required sample size was estimated to be $n$ = 68. The total sample size of the study was 174, therefore, it was deemed appropriate for the intended analyses.

Table 3

Summary of hierarchical regression analysis for variables predicting the number of emotion words

| | $R^2$ | Adj. $R^2$ | $\Delta R^2$ | $F$ | $B$ | $SE\ B$ | β | $t$ | $p$ |
|---|---|---|---|---|---|---|---|---|---|
| Model 1 | .033 | .027 | .033* | 5.854* | | | | | |
| (Constant) | | | | | 37.800 | 6.867 | | 5.504 | < .001 |
| Age | | | | | -0.825 | 0.341 | -.182 | -2.419 | .017 |
| Model 2 | .046 | .034 | .013 | 4.063* | | | | | |
| (Constant) | | | | | 39.163 | 6.903 | | 5.673 | < .001 |
| Age | | | | | -0.862 | 0.341 | -.190 | -2.531 | .012 |
| Female | | | | | -1.801 | 1.205 | -.112 | -1.494 | .137 |
| Model 3 | .218 | .204 | .172*** | 15.702*** | | | | | |
| (Constant) | | | | | 25.422 | 6.660 | | 3.817 | < .001 |
| Age | | | | | -0.053 | 0.337 | -.012 | -0.159 | .874 |
| Female | | | | | -2.377 | 1.099 | -.148 | -2.163 | .032 |
| L1 | | | | | -7.500 | 1.229 | -.454 | -6.103 | < .001 |
| Model 4 | .250 | .232 | .032** | 14.025*** | | | | | |
| (Constant) | | | | | 16.277 | 7.369 | | 2.209 | .029 |
| Age | | | | | -0.156 | 0.333 | -.034 | -0.470 | .639 |
| Female | | | | | -2.649 | 1.084 | -.165 | -2.444 | .016 |
| L1 | | | | | -7.307 | 1.209 | -.443 | -6.045 | < .001 |
| Trait EI | | | | | 2.242 | 0.832 | .182 | 2.693 | .008 |

*Note.* *$p$ < .05, **$p$ < .01, ***$p$ < .001. Reference category for gender is female and reference category

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for language of retrieval is L1. Unstandardised beta coefficients are reported.

Regarding EMW, Model 4 yielded the best fit ($F(4,168) = 14.025$, $p < .001$) explaining 23.2% of the variability in EMW, and the standardised beta coefficients for gender (ß = -.165, $t = -2.444$, $p = .016$), language of retrieval (ß = -.443, $t = -6.045$, $p < .001$), and trait EI (ß = .182, $t = 2.693$, $p = .008$) were statistically significant. Moreover, trait EI was the only significant predictor of PLIN. Specifically, age, gender, and language of retrieval did not contribute to the regression models, whilst trait EI accounted for 2.4% of the variability in PLIN. Although this is a very small percentage, the change in $R^2$ was significant at the .05 level. A simple linear regression model was run with trait EI as the only predictor variable and it yielded a better fit ($F(1,171) = 5.474$, $p = .020$), suggesting that the remaining variables were redundant.

Table 4

Summary of hierarchical regression analysis for variables predicting the degree of perceived pleasantness

| | $R^2$ | Adj. $R^2$ | $\Delta R^2$ | $F$ | $B$ | $SE\ B$ | β | $t$ | $p$ |
|---|---|---|---|---|---|---|---|---|---|
| Step 1 | .008 | .003 | .008 | 1.433 | | | | | |
| (Constant) | | | | | 3.334 | 0.452 | | 7.370 | < .001 |
| Age | | | | | 0.027 | 0.022 | .091 | 1.197 | .233 |
| Step 2 | .009 | -.003 | .000 | 0.734 | | | | | |
| (Constant) | | | | | 3.322 | 0.458 | | 7.233 | < .001 |
| Age | | | | | 0.027 | 0.023 | .092 | 1.206 | .230 |
| Female | | | | | 0.017 | 0.080 | .016 | 0.207 | .836 |
| Step 3 | .017 | -.001 | .008 | 0.947 | | | | | |
| (Constant) | | | | | 3.514 | 0.486 | | 7.233 | < .001 |
| Age | | | | | 0.016 | 0.025 | .054 | 0.649 | .518 |
| Female | | | | | 0.025 | 0.080 | .024 | 0.307 | .759 |
| L1 | | | | | 0.105 | 0.090 | .098 | 1.170 | .244 |
| Step 4 | .047 | .024 | .030* | 2.050 | | | | | |
| (Constant) | | | | | 2.941 | 0.541 | | 5.441 | < .001 |
| Age | | | | | 0.009 | 0.024 | .032 | 0.388 | .699 |
| Female | | | | | 0.008 | 0.080 | .007 | 0.096 | .924 |
| L1 | | | | | 0.117 | 0.089 | .109 | 1.319 | .189 |
| Trait EI | | | | | 0.140 | 0.061 | .175 | 2.299 | .023 |

*Note.* $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$. Reference category for gender is female and reference category

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for language of retrieval is L1. Unstandardised beta coefficients are reported.

The emotion words retrieved by English L1, Spanish L1, and Spanish L2 users were also analysed qualitatively focusing on the first three, five, and ten most highly activated words (Table 5). The most highly activated words common in all groups were happy/happiness (*feliz*/*felicidad*) and sad/sadness (*triste*/*tristeza*); also, joyful/joy (*alegre*/*alegría*) in Spanish L1 and L2. In addition, angry/anger (*enfadado/enfado*) appeared among the first five most highly activated words. Regarding the distribution of positive and negative words with higher activation, and based exclusively on absolute frequency values, positive words were slightly more prevalent in all groups for the first three most highly activated words. The same pattern of results was observed in English L1 and Spanish L2 for the first five and ten words, whereas Spanish L1 users produced a slightly higher number of negative emotion words.

Table 5

Qualitative analysis of the emotion words retrieved by English L1, Spanish L1 and Spanish L2 users.

| | English/L1 | Spanish/L1 | Spanish/L2 |
|---|---|---|---|
| Tokens (total) | 1000 | 1806 | 831 |
| Types (total) | 342 | 503 | 250 |
| First 3 words | | | |
| Tokens | 119 | 243 | 155 |
| Types | 40 | 73 | 48 |
| Most highly activated words (*f* tokens; > 10 tokens) | Happy (29)<br>Sad / Sadness (22) | Triste / Tristeza (42)<br>Alegre / Alegría (33)<br>Feliz / Felicidad (25)<br>Enamorado / Amor (17)<br>Miedo (12)<br>Enfado (10) | Feliz / Felicidad (43)<br>Triste / Tristeza (27)<br>Alegre / Alegría (10) |
| First 5 words | | | |
| Tokens | 193 | 405 | 261 |
| Types | 71 | 124 | 78 |
| Most highly activated words (*f* tokens; > 10 tokens) | Happy / Happiness (30)<br>Sad / Sadness (28)<br>Angry / Anger (15)<br>Excited / Excitement (14) | Triste / Tristeza (52)<br>Alegre / Alegría (42)<br>Feliz / Felicidad (33)<br>Miedo (23) | Feliz / Felicidad (46)<br>Triste / Tristeza (38)<br>Alegre / Alegría (18)<br>Enojado (11) |

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| | Content (10) | Enamorado / Amor (22)<br>Enfadado / Enfado (16)<br>Frustrado / Frustración (13) | Enfadado (10) |
|---|---|---|---|
| First 10 words | | | |
| Tokens | 390 | 810 | 509 |
| Types | 145 | 234 | 155 |
| Most highly activated words (*f* tokens) | Happy / Happiness (30)<br>Sad / Sadness (28)<br>Angry / Anger (15)<br>Excited / Excitement (14)<br>Content (16)<br>Depressed (13)<br>Anxious / Anxiety (13)<br>Joyful / Joy / Joyous (12) | Triste / Tristeza (64)<br>Alegre / Alegría (48)<br>Feliz / Felicidad (44)<br>Miedo (36)<br>Enamorado / Amor (35)<br>Enfadado / Enfado (25)<br>Sorpresa (17)<br>Euforia (16)<br>Frustrado / Frustración (16)<br>Ira (16)<br>Angustia (15)<br>Ansiedad (13)<br>Asco (13)<br>Soledad (10) | Feliz / Felicidad (50)<br>Triste / Tristeza (45)<br>Alegre / Alegría (24)<br>Enfadado / Enfado (19)<br>Contento (18)<br>Enojado (14)<br>Nervioso (13)<br>Cansando (12)<br>Bueno (11)<br>Miedo (10)<br>Tranquilo (10)<br>Agradable (10)<br>Enamorado / Amor (12)<br>Malo (10)<br>Odio (10)<br>Sensible (9) |

*Note*. *f* = frequency

## 7. Discussion

The current study intended to add to a growing body of literature exploring the relation between WMC and trait EI, but it also goes a step further by examining the effect of WMC and trait EI on the number and perceived pleasantness of emotion words freely retrieved and produced by English L1, Spanish L1, and Spanish L2 users. Moreover, the study aimed to identify whether there was a predominant pattern in the most highly activated emotion words generated in L1 and L2. Overall, the results showed negative and statistically significant correlations between WMC and trait EI (well-being and emotionality). Trait EI was the sole predictor variable of the perceived pleasantness of the words retrieved by the participants, whereas trait EI, language of retrieval, and gender explained a statistically significant amount of the variance in the number of emotion words generated. Qualitative analysis of the emotional vocabulary revealed common patterns in the most highly activated words in L1 and L2, as well as a slight prevalence of positive words.

Before discussing the results in detail, it is important to elucidate some statistical issues. The magnitude of the statistically significant correlations obtained ranged between |.159| and |.402| with an average of |.23| (see Table 2). These correlation coefficients represent medium effect sizes according to Cohen (1988, 1992) and tend to be *the norm* – rather than the exception – in individual differences research.[7] This is not surprising, as psychological constructs – and, obviously, linguistic variables – are influenced by many factors and, as Fraley and Marks (2007: 165) argued, "To the extent to which multiple factors play a role in shaping individual differences in a domain, the association between any one factor and that outcome will necessarily be limited". Recently, Gignac and Szodorai (2016) offered new guidelines for the interpretation of effect sizes in personality and individual differences research. They established that correlations of .10, .20, and .30 should be assessed as small, typical, and relatively large, respectively (see also Richard et al., 2003). Funder and Ozer (2019: 166) added that "A *very large* effect size ($r$ = .40 or greater) in the context of psychological research is… likely to be a gross overestimate that will rarely be found in a large sample or in a replication", whereas smaller effect sizes "are not merely worth taking seriously. They are also more believable". Considering the above remarks, as well as the exploratory nature of the present study, not only are the correlation patterns reported here worth mentioning, but they also deserve a thorough discussion.

Regarding the first research question, WMC was negatively correlated with global trait EI scores, well-being, and emotionality. A plausible explanation for these findings is that being able to retain and process a large amount of information in real time is not necessarily advantageous, the same way EI might be more or less adaptive in specific contexts (Petrides et al., 2016). As Barrett et al. (2004: 566) pointed out, "higher WMC is [not] always associated with the more functionally effective emotional response. Individuals low in WMC may fare better in situations that call for quick actions in negative situations, whereas those higher in WMC may engage in unnecessary deliberation". Put differently, high WMC individuals would be

[7] Several systematic reviews and meta-analyses found that the average value of $r$ in social psychology and personality literature is around .21 (Fraley and Marks, 2007; Richard et al., 2003; see also Hemphill, 2003, and Funder and Ozer, 2019).

expected to focus and maintain their attention on specific internal or external stimuli in a more efficient way. However, if these stimuli are emotional in nature and cannot be differentiated, repaired, or regulated, they could have a negative impact on the individual. Existing evidence supports this, as excessive attention to emotions has been found to lead to rumination, which – if not controlled or mitigated – may worsen individuals' mood state (Extremera and Fernández-Berrocal, 2006; Fernández-Berrocal et al., 2006; Fernández-Berrocal et al., 2004), and, ultimately, their well-being and quality of life. Therefore, sometimes *less* WMC might be better (DeCaro et al., 2008; Levy and Anderson, 2002); in other words, having a good WMC does not necessarily confer an advantage in all situations and in certain cases might also lead to emotional vulnerability.

However, the above interpretation does not deny the positive implication of WM in emotional control and is compatible with empirical work suggesting a positive link between EI and executive functions (see, for instance, Pe et al., 2013). Executive functions would help minimise, reorganise or suppress unpleasant thoughts, attend more positive feelings, and redirect attention from ongoing problems that could hamper emotional recovery to past or future (positive) experiences. As mentioned before, the WMC task employed in the present study assesses the dual functions of simultaneous processing and storage and probably to a lesser degree specific executive functions implicated in emotional control. Moreover, the assumption of a positive link between EI and WMC seems to be supported when the WM tasks comprise emotional content and when EI is measured by performance-based tests (Gutiérrez-Cobo et al., 2016, 2017a, 2017b; Pe et al., 2013). The negative correlation between self-reported EI and performance in a cool WM task deserves further exploration in future studies, preferably within experimental-based paradigms. These studies should also take into account the developmental stage and the educational cycle of the participants, as the available evidence suggests that variation in both emotional awareness – which is a key aspect of trait EI – and WMC are subject to age and general cognitive development (Agnoli et al., 2019; Craik and Salthouse, 2008; Mankus et al., 2016). In the current study, participants' age ranged between 18 and 27 years. However, the vast majority of them (93.6%) were between 18 and 22, and all were university students. Thus, it is quite unlikely that participants'

developmental stage influenced the results obtained.

The second research question addressed the effect of WMC and trait EI on the number and perceived pleasantness of emotion concepts freely retrieved and produced in the absence of an emotionally charged context and the extent to which language of retrieval had an effect on this link. The results showed that the contribution of WMC to the variability observed in the number and perceived pleasantness of emotion words was quite negligible. Kensinger (2004) argued that the memorability of emotionally arousing stimuli is usually explained by the fact that these stimuli recruit more attention, whereas valenced items may boost memory through the use of elaborative processing (e.g. autobiographical and semantic elaboration). Drawing on this argument, it can be hypothesised that memory processes are more involved when individuals access and retrieve specific vocabulary related to emotionally evocative events – whether they are induced or belong to their own repertoire of emotional experiences –, because these events are more relevant for individuals and, hence, would recruit more attentional resources. Also, individuals who generate autobiographical memories in response to an emotional cue might be more prone to produce vocabulary of a specific valence. However, when they are asked to produce emotional vocabulary *spontaneously* and without any emotional cue, this vocabulary might be more diverse in terms of valence, arousal, or both. The task employed in the present study required participants to write down as many emotion words as they could within a specific time interval, which in many cases led them to employ semantic processing strategies (e.g. use of antonyms like *happy* and *unhappy* in the same word-listing exercise). The processes described above are related to memory mechanisms (e.g. episodic memory for autobiographical events, semantic memory for semantic mapping and elaboration strategies) but perhaps related to a lesser degree to more *typical* WM processes (e.g. rehearsal, updating, and active maintenance of information).

Unlike WMC, trait EI significantly contributed to the retrieval of emotional vocabulary, as high trait EI participants retrieved and produced more emotion words, which they also tended to perceive as more positive. These findings are in line with previous experimental studies showing a greater recall and attentional bias towards

emotional stimuli, particularly positive stimuli, among high trait EI individuals (Coffey et al., 2003; Lea et al., 2018; Mikolajczak et al., 2009). They also indicate that the linguistic positivity bias might be related not only to extraversion or gender as previous studies have shown (Augustine et al., 2011) but also, to some extent, to trait EI. On the other hand, the results contradict evidence from Alba-Juez and Pérez-González (2019), who did not find any association between emotional vocabulary and trait EI as assessed with the TEIQue-SF in a sample of Spanish L1 users. In the present study, high trait EI participants retrieved and produced more emotion concepts, which might indicate that these participants are equipped with the ability to label a wide range of emotions, while also being able to use different and varied terms to refer to the same or similar concepts.[8] More interestingly, the results obtained suggest that this tendency is not situation-specific, but can also emerge *in isolation*, that is, in a non-emotionally induced context.

Some interesting patterns regarding the relation between different factors of trait EI and emotional vocabulary were also revealed and are worth mentioning. Specifically, the number of emotion words retrieved correlated with sociability and emotionality, as did their perceived pleasantness with well-being and self-control (see Davis, 2018, and Mikolajczak et al., 2009, for similar results). A plausible explanation for the first finding is that individuals who perceive themselves as more capable of communicating their own emotions and influencing other people's feelings in social situations are also more able to use an ample and rich vocabulary, especially emotional vocabulary. The second finding could be explained by the fact that perceiving life events as positive or focusing on the positive aspects of negative experiences are good strategies for combatting stress and enjoying a better quality of life. However, the mere fact of perceiving a specific concept as more positive could also be intrinsically rewarding (see Zimmerman and Kelley, 2010) and serve as an effective way to start managing negative or stressful situations. Recently, Kotabe and Hofmann (2015) proposed the *integrative self-control theory*, which posits that self-control is comprised of seven major components: desire, higher order

[8] Although the TEIQue-SF is a self-reported measure, it should be kept in mind that *by definition* high EI is linked to the ability to use more varied emotion terms. Follow-up studies should try to confirm this link by using maximum-performance EI measures.

goals, desire-goal conflict, control motivation, control capacity, control effort, and enactment constraints. Drawing on some of these components, the results obtained in the present study might indicate the intentional desire and motivation of high trait self-control individuals to direct their attention to the positive aspects of emotion concepts, as positive stimuli are more compatible with one's personal goals and can lead to long-term benefits.

Strong language specificity effects were also observed, such that L1 users retrieved more emotion words compared to L2 users. This result provides support for the assumption that memorability is higher when the language of encoding matches the language of retrieval (Marian and Neisser, 2000; Schrauf, 2000; see also Kazanas et al., 2019).[9] As Baumeister et al. (2017: 9) stated, "reading emotional words in a native language provides a deep and embodied emotional experience, which may subsequently also support their salient encoding and retrieval". Interestingly, however, language of retrieval was not a determining factor for the perceived pleasantness of the words retrieved by L1 and L2 users. This result seems to suggest that valence effects are less *language*-dependent and more *psychologically*-dependent, related to at least some affective or personality traits such as trait EI.

Gender also emerged as a significant predictor of the number of emotion words retrieved; specifically, female participants tended to retrieve and produce more emotion concepts. This is in line with a wide range of evidence indicating that women use more affective terms and emotion explanations in a variety of contexts (Brody, 2000; Brody et al., 2016; Goldshmidt and Weller, 2000). Chaplin's (2015) review of several meta-analytic findings also revealed gender differences in emotion expression, which tended to increase with age and depend on the context of social interactions, cultural differences and values, and ethnicity. Although the findings of the present study do not suggest that female participants were more emotional or had more emotional experiences than men, gender differences derived from biological factors and socialisation processes that influence emotional

[9] Obviously, this assumption can extend to other word categories; that is, L1 users would likely retrieve more concepts belonging to any word class because of the higher proficiency level in their L1 compared to L2 users. However, the discussion will be limited to emotion words, which was the focus of the current study.

712 expressiveness (Brody, 2000; Brody et al., 2016; Kring and Gordon, 1998) could be
713 a potential explanatory factor for the higher number of emotion words retrieved by
714 women.

715 The third goal of the present study was to examine common patterns in the
716 most highly activated emotion words retrieved by L1 and L2 users. Qualitative
717 analysis of the emotional vocabulary revealed psychologically salient words (i.e.
718 common words retrieved in first position regardless of language of retrieval). In
719 accordance with previous studies in bilingualism (Ferré et al., 2010; Ferré et al.,
720 2013) and based exclusively on descriptive data (i.e. absolute frequency values), a
721 slightly higher prevalence of positive words was observed. Positive words might be
722 more salient because of the simple reason that people would like their lives to be
723 positive and pleasant, and they tend to forget negative experiences, which in turn will
724 allow them "to cope with tragedies, celebrate joyful moments, and look forward to
725 tomorrow" (Walker et al., 2003: 209). It seems that this tendency can also be
726 manifested in a simple non-cued task that requires the mere retrieval of emotion
727 concepts beyond an emotionally charged context. The above interpretation is
728 consistent with the positivity bias theory (Boucher and Osgood, 1969) and supports
729 the view that the higher everyday usage of words associated with positive emotions
730 might be due to their higher impact on the formation and strengthening of human
731 social links (Garcia et al., 2012). It also fits well with corpus-based studies focused
732 on both written and naturalistic corpora, which have consistently reported a positivity
733 bias (Augustine et al., 2011; Kloumann et al., 2012).

734 In the case of L2 users, the tendency to retrieve more positive words could
735 further be attributable to either motivational goals related to L2 acquisition in an
736 immersion context or positive attitudes towards the L2 culture, as these two
737 conditions are considered to be "emotionally highly stimulating and enriching"
738 (Conrad et al., 2011: 14). Culture-related factors might have also played a role in
739 these results. For instance, Conrad et al. (2011) observed a pronounced negativity
740 bias in their German participants' L2 processing of emotion words, contrary to their
741 Spanish participants, and they speculated that this might reflect a more general trend
742 related to culture. Follow-up studies are definitely needed to address the effect of
743 cultural background on productive emotional vocabulary in a more systematic way.

The results of the qualitative analysis also revealed that basic emotions, such as happiness (*felicidad*), sadness (*tristeza*), anger (*enfado*), and joy (*alegría*), were considered to be emotionally charged words whether they were evoked in L1 or L2. These findings are almost identical to the ones obtained by Alba-Juez and Pérez-González (2019) and Bisquerra and Filella (2018) in Spanish L1, but they were also replicated among Spanish L2 users. This emotionality effect for L2 productive emotional vocabulary could be attributed to direct translation strategies (i.e. the recall of an emotion concept in L1 and its mental translation into the L2, at least in the case of L2 learners with low or intermediate proficiency level in the target language) or, alternatively, to the more conscious processing these concepts undergo when they are freely retrieved by L2 users. Future studies should explore whether this effect extends to more varied L2 production contexts.

Nevertheless, the study has several limitations that need to be acknowledged and addressed in future research. To begin with, the sample size was moderate, and the number of tasks used to assess WMC and EI was limited. Future studies should include larger groups of L1 and L2 users, preferably of the same languages (i.e. L1 and L2 users of both English and Spanish), and more balanced groups in terms of gender, whilst a closer examination of participants' developmental stage would help shed light on the way emotion words are acquired over time. Future replication studies would also benefit from the inclusion of more varied WMC and EI measures; for instance, performance-based EI measures such as the Mayer-Salovey-Caruso Emotional Intelligence Test (Mayer et al., 2003) and both hot and cool WM or cognitive ability tasks, since the use of different measures is likely to have an important influence on the results. When short versions of original self-reports of EI are used, reliability issues constitute another concern. In the present study, for example, internal consistency of the trait self-control factor was low. It is also important to note that particularly salient events which occurred recently in participants' lives and individual differences variables not investigated in the current study (e.g. general language ability and alexithymia) might have exerted some influence on the retrieval of emotional vocabulary. It is worth mentioning that a study conducted by Irwin and Melbin-Helberg (1997) showed no link between alexithymia and the number of positive and negative words retrieved orally by adults. The

776 authors concluded that "people with dissociative tendencies have a 'normal' affective
777 vocabulary but have difficulty in utilizing this vocabulary to depict their own affective
778 states" (Irwin and Melbin-Helberg, 1997: 164). However, other studies found low
779 verbal abilities and reduced vocabulary for abstract words among alexithymic
780 individuals (Hobson et al., 2019). Although it seems quite unlikely that different levels
781 of alexithymia affected the emotional vocabulary retrieved by the participants of the
782 current study, it is still a possibility that cannot be discarded completely and must be
783 tested empirically in future studies. Additionally, the results showed only negligible
784 associations between WMC and emotional vocabulary, and this might be due to the
785 nature of the emotion term generation task. Given that previous studies have
786 demonstrated a substantial role of WMC in a wide range of language-related tasks, it
787 would be interesting to systematically investigate the conjoint effect of WMC and EI
788 on the emotional vocabulary that appears as part of complete oral and written
789 discourses. Furthermore, the present study only focused on emotional nouns and
790 adjectives. Future studies should analyse more linguistic categories (e.g. emotional
791 response verbs) as previous research suggests that linguistic properties vary across
792 different languages (Pavlenko, 2008a). This work should further examine how
793 emotion terms from these linguistic categories are distributed across different
794 emotional dimensions (e.g. valence and arousal).
795
796 ## 8. Conclusions
797
798 The present study highlights the complex interaction between memory,
799 emotion, and language processes related to productive emotional vocabulary.
800 Although much has been said and written about the potential benefits of WMC in a
801 wide range of complex tasks, the negative link found between WMC and trait EI
802 indicate that the aforementioned benefits might be accompanied by costs. Regarding
803 EI, as Gutiérrez-Cobo et al. (2016) argued, the construct demands further
804 examination and specification. For instance, certain factors of trait EI seem to
805 overlap with other conceptually related constructs (see Matthews et al., 2007, for a
806 discussion), and this overlap makes it difficult to clarify EI's precise relation with
807 cognitive abilities such as WMC. Nevertheless, the results also revealed a robust

808 contribution of trait EI to the retrieval of emotion words, suggesting that trait EI is
809 linked, at least to some degree, to the explicit knowledge of emotion concepts,
810 especially positive ones. These findings can be particularly informative for rethinking
811 and adapting the ways of approaching language learning and teaching. In particular,
812 they highlight the need to design and implement specific pedagogical interventions to
813 enhance students' affective competencies, such as EI, and eventually help them
814 expand their emotional vocabularies. This seems to be a viable goal, as there is
815 evidence to indicate that trait EI is amenable to change (Petrides et al., 2016).
816 More specifically, participants in the current study retrieved an average of 20
817 emotion words (*M* = 24.44 for L1 users, *M* = 16.17 for L2 learners). Bisquerra and
818 Filella (2018) also found that the active emotional vocabulary of third-year
819 undergraduate students and Spanish language teachers ranged between 15 and 25
820 words. They attributed these findings to the younger age and less work and vital
821 experiences of the students and concluded that teachers should be the primary
822 receivers of emotional education so that they are able to transmit this knowledge to
823 their students (see also Márquez-Cervantes and Gaeta-González, 2017). Guidelines
824 for teachers and training programmes and software to improve adolescents' EI and
825 emotional competences in general already exist (Bisquerra, 2007; Filella et al., 2016;
826 Ruiz-Aranda et al., 2013; Salguero et al., 2012; Soldevila et al., 2007; see Pérez-
827 González, 2008, for a review). It would, therefore, be interesting to investigate
828 whether the effects of such programmes are transferable to specific language
829 domains and whether acquiring an ample emotional vocabulary early in life might
830 serve as a form of scaffolding for learning emotion words in an L2 during adulthood.
831 The findings of the current study also suggest that both L1 and L2 students
832 might benefit from classroom-based activities and other techniques and resources
833 aiming at helping them acquire more sophisticated and flexible repertoires which, in
834 turn, will allow them to share and negotiate their feelings and thoughts and to face
835 emotionally challenging situations in the target language. Expressive or persuasive
836 writing, reasons to + (emotion) exercises, role-playing, and storytelling about
837 emotional or social matters are only some examples. Weare (2000: 126) highlights
838 the advantages of the latter two techniques: "Through stories, the young can
839 experience some of the challenges of growing up, coping with fear, uncertainty,

ambiguity, facing the future, coping with change, loss and disappointments in a safe context", whereas role-playing helps them learn not only words but also "the appropriate tone, body language and facial expressions to become more socially effective" (Weare, 2000: 128).

The findings of the study also lend support to the positivity bias theory and revealed that trait EI might play some role in people's tendency to focus on positive information. This positivity bias appears to be a fundamental prerequisite for building positive social interactions in both L1 and L2 and probably for developing effective emotion regulation strategies when dealing with linguistic conflicts or demotivation. Future research should further explore these possibilities.

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