The Influence of Bilingualism and Lexical Emotional Valence on Memory

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Abstract. Bilingualism and lexical emotional valence are important for emotional memory-a basic cognitive process and applied to education and aging research. Previous research has demonstrated valence (U-shaped effect) and congruence effects in monolinguals, but has ignored logographic-alphabetic differences (e.g., Chinese-English) and key bilingual moderators (e.g., language switching). In this paper, we summarize 11 empirical studies (behavioral experiments, ERP research), aiming to investigate how bilingual background and lexical emotional valence, emotional congruence affect memory in monolingual/bilingual populations of logographic (Chinese)/alphabetic (English) languages. The key findings are as follows: valence presents a stable U-shape effect (positive/negative words outperform neutrals), and Chinese strengthens positive advantages while English shows similar positive-negative effects; broad/positive congruence benefits recall (especially for low-semantic-similarity stimuli), while narrow congruence presents unstable effects; bilinguals present L1 emotional advantages and enhanced executive control (early/high-proficiency), and the latter is modulated by similarity and culture; associative recall/Recognition can better reflect valence/congruence effects than the Stroop task. The above synthesis extends the lexical emotional memory theory by clarifying cross-linguistic and bilingual mechanisms, and offers actionable suggestions for bilingual education (L1 priority for late bilinguals) and older adults' memory training.

Keywords: Bilingual background, lexical emotional valence, emotional memory.

1. Introduction

As a globalized world is becoming a world in which two or more languages are used on a daily basis by more than half of the world's population, bilingualism, which was originally a specialized phenomenon, has become a linguistic reality [1]. Consequently, bilingualism and its impact on cognitive processes have attracted continuous attention, and emotional memory, as an important cognitive process, has been a focal point. Emotional memory, the process of encoding and recalling emotionally charged information, is crucial for many aspects of human experience: from learning cross-cultural safety instructions in a work environment to remembering one's own photos in a language learned after childhood [2,3]. For bilinguals, emotional memory is modulated by their bilingual background in a unique way: for instance, a Chinese-English bilingual may feel more emotionally resonant when hearing '家' (home) in Mandarin than 'home' in English, or a Spanish-Catalan bilingual may respond faster to safety cues in their first language (L1) [3,4]. Many real-world situations show the necessity of understanding how bilingualism, lexical emotional valence, and emotional congruence affect memory, and the results could be applied to bilingual instruction (for example, designing teaching of vocabulary for emotional words), memory training for older adults, and strategies for cross-cultural communication.

Previous research on emotional memory has predominantly used monolingual populations as subjects, and found that two robust effects are stable and consistent across these investigations: a valence effect [positive and negative words are better remembered than neutral words, and together form a U-shaped pattern] and an emotional congruence effect [non- neutral word pairs are better remembered than neutral pairs (broad congruence) [5,6]. Prior research highlights advances in emotional valence and bilingualism research: aging affects how people process emotional information (older adults remember positive contexts better, while younger adults focus more on negative details), and bilinguals show an L1 emotional advantage along with enhanced executive control that strengthens attention to emotional cues.

Three open research questions remain: Most bilingual studies investigate similar language pairs and neglect individualistic language pairs such as Chinese-English, ignore moderators such as switching between languages and cultural background, and lack neural support for how bilingualism affects the properties of emotional memory and emotional congruence.

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These three questions motivate the current work. Through integrating studies on lexical emotional valence, emotional congruence, and bilingual language background, this paper aims at addressing the following three objectives: (1) systematically review how valence and congruence modulate memory in monolingual and bilingual populations (language-specific difference: logographic vs. alphabetic); (2) examine how bilingual language background (age of acquisition, proficiency, switching between two languages) regulates emotional memory (including neural modulation such as prefrontal-amygdala connectivity) and its interaction with congruence; (3) draw applications to bilingual education (such as teaching high-stakes emotional words through L1-L2 congruent pairs) and memory training for older bilinguals. To do so, the paper adopts a thematic synthesis approach: Chapter 2 defines basic concepts (bilingualism, lexical emotional valence, emotional congruence); Chapter 3 reviews studies on valence and congruence for monolingual populations; Chapter 4 reviews research on language background modulation for bilingual populations; Chapter 5 discusses implications and future work.

2. Core Concept Definition

2.1. Bilinguals and Bilingual Processing

Bilinguals are defined by two core dimensions: age of acquisition and proficiency. Early bilinguals typically acquire a second language (L2) before age 4, while late bilinguals start L2 learning later; proficiency is categorized as high (near-native) or low (limited communicative ability) [1,2]. Their language control mechanism involves inhibiting non-target languages to prioritize the target one. This process interacts with emotional processing. Multilingual emotional processing theory notes that, especially for late bilinguals, emotional words in the first language (L1) often trigger stronger responses than those in L2 [3,5].

2.2. Lexical Emotional Valence and Emotional Congruence

Words possess an emotional tone (assessed using affective rating scales e.g. '9-point Self-Assessment Manikin') on which participants rate words that are positive/negatives (e.g. happy, joy; fear, danger), as well as neutral (e.g. table) [6,7].

Emotional congruence contains three categories: broad congruence involves pairing non-neutral words together irrespective of valence; narrow congruence involves pairing words of the same valence intensity; positive/negative congruence involves pairing only positive words together or only negative words together. Each category has been shown to affect memory differently, with broad and positive congruence reliably facilitating recall whereas the effects of narrow congruence are less consistent across tasks [5].

2.3. Emotional Memory and its Corresponding Task Types

Emotional memory is the process of encoding, storing, and recalling information with emotional significance, in contrast to neutral memory, which is entirely dependent on the cognitive system and largely independent of the affective system [4,8]. The main tasks in the relevant research are lexical decision (decide whether a string is a word), emotional Stroop (emotional word interference task), and associative recall (recall word pairs). Associative recall is essential for the research on Chinese words: Chinese is a logographic language in which semantics is tightly connected to form. Therefore,

this task is better than other tasks at capturing how valence/congruence affect Chinese lexical features [5,6].

3. The Impact of Lexical Emotional Valence and Emotional Congruence on Memory

3.1. Detailed Study 1: Chinese Word Associative Memory Experiment

Zhang's team carried out three experiments on associative recall of two-character Chinese nouns to study valence and congruence effects 4. In Experiment 1, 60 native Chinese monolinguals (M age = 22.3 years) were included-all reported in the language-use questionnaire (Chinese usage ⩾95%)-with no memory disorders involved. Valence (positive/negative/neutral) and congruence (broad congruence/incongruence) were taken as within-subject variables. In the study phase, 48 pairs were presented for 3 seconds each; after a 5-minute math distractor task, a cued recall test (writing target words given cues) was conducted. Positive congruent pairs, positive congruence category (positive-positive, e.g., happiness-smile), were recalled with a 78.2% rate, significantly more than neutral incongruent pairs (41.5%). Positive congruent pairs (72.1%) also outperformed neutrals, but with a smaller advantage than positives. The present pattern was consistent with the general finding in associative memory research especially in the context of affective priming effects. Positive emotional congruence between words would generally lead to more memory gain than neutral or less congruent pairs.

To examine the influence of semantic similarity, Experiment 2 repeated Experiment 1 with 56 new participants in total and added a ‘semantic similarity’ variable (low/high) into consideration. We selected stimuli and conducted Experiment 2 again. ‘MELD-SCH database’ is a specialized database for Chinese emotional words with valence, concreteness and frequency ratings standardized across target words. Thus, the variation of the three important lexical features across experimental conditions could be reliably controlled and the reliability of experiments was guaranteed. Word frequency (2.05-3.88 log values) and concreteness (⩾4.35, 5-point scale) were matched across three valences. Results showed low semantic similarity enlarged the congruence effect, i.e. positive congruent pairs with low similarity achieved 81.3% recall rate, while positive congruent pairs with high similarity had a recall rate of 69.7%. This was different from the finding of Xie's team when they studied the memorability of English words with higher semantic similarity [9]. English is an alphabetic language and is more dependent on phonological encoding. When semantic overlap exists, words would be more likely to be remembered than words without semantic overlap. While Chinese (logographic) is more dependent on form-semantic links and less on semantic similarity, i.e. the reliance on semantic similarity might be weakened in comparison with alphabetic languages. Therefore, the interaction between semantics and emotional congruence for forming memory might be language-specific [5,9].

To investigate the durability of memory, Experiment 3 (62 monolinguals) tested participants on a 24-hour delayed recall test to determine whether the previously-observed valence-congruence memory advantage also holds after they were initially encoded, thus filling a critical gap in the design of recently-published short-term memory studies and assessing the long-term stability of emotional congruence effects.

The valence-congruence advantage survived - positive congruent pairs continued to be most frequently recalled (65.4%), while neutral pairs fell to 29.8% , in line with Wodniecka's team's results that long-term emotional memory advantages were also found in non-verbal tasks for bilinguals [2,5]. A significant limitation of the study was that monolinguals were used, thus limiting the ability to generalize to groups such as Chinese-English bilinguals [5].

3.2. Detailed Study 2: Large-Sample Lexical Memory Experiment

Gao's group studied valence effects on memory using 4740 English words (4–6 letters) in two tasks (recognize, judge studied words; free recall, list studied words) [5]. Participants were 320 native English monolinguals (M age = 24.1 years) who reported no L2 experience and no memory disorders. Valence (positive vs. negative vs. neutral) and word frequency (high frequency vs. low frequency, based on SUBTLEX-US corpus) were independent variables. In the study phase, words were presented for 2 seconds each; in the test phase, recognition participants (n = 160) judged 2370 studied words and 2370 new words; free recall participants (n = 160) listed remembered studied words [7].

The valence-memory relationship appeared to be U-shaped, probably because attentional resources devoted to encoding emotionally salient stimuli (positive and negative, in addition to neutral) are greater than those devoted to other stimuli: positive words yielded 82.3% correct recognitions and 34.7% recall rate, negative words 79.6% and 32.1%, and neutral words 61.2% and 18.5. This U-shape parallels results from Kensinger's team, who found that emotional words (positive and negative, in addition to neutrals) had a memory advantage in detail memory [10]. This U-shape held for both frequencies—high-frequency positive words and low-frequency positive words yielded 84.5% correct recognitions and 79.8%, respectively, compared with 61.2% for neutrals [7].

However, the magnitude of the positive and negative effects in English was similar to that found in Chinese by Zhang's group, where positive words yielded a larger advantage, underscoring the importance of language in valence processing [5]. The major limitation in the study was the use of only English words. English is alphabetic, while Chinese is logographic, so orthographically, these two languages differ greatly in writing systems, and in terms of semantics, these two languages are also very different [7]

3.3. Brief Studies

Crossfield and Damian's team examined valence effects in two tasks [6]. In the lexical decision task, n = 40 English monolinguals judged whether strings were words [6]. Positive words (e.g., 'love') had mean RT of 521 ms, significantly faster than negative words (553 ms, 578 ms) ($p < .05$) [6]. Thus, positive words showed a word processing advantage, in line with previous work showing faster lexical access for positive words in L1 among early bilinguals [3,6].

In the Stroop task (n = 42 English monolinguals, [6]), participants named the font color; here emotional words (positive/negative) did not interfere more than neutrals, with no significant RT differences between valences [6]. In some previous works, Stroop interference for negative words has been found, which may be due to differences in task stimuli between these works and previous studies (e.g., pure words vs. word-image pairs) [5,6]. They proposed that valence affects lexical access (as in lexical decision [3]) but not attentional interference (as in Stroop [6]).

Kensinger's team examined valence effects on memory for detail across ages, testing 120 participants in total (40 young: 18-30 years; 40 middle-aged: 40-55 years; 40 older: 65-80 years; all with no history of memory/emotional disorder, though language background was not measured) [10]. They showed participants emotion-neutral picture-word pairs, then tested them on detail questions (e.g., 'What color was the object?') [10]. They found that negative words correlated with better perceptual detail memory (young: 76% accuracy; older: 62%), and positive words correlated with better contextual detail memory (young: 71%; older: 58%) [10]. Thus, the positive and negative words showed a valence-specific detail advantage, in line with the broader literature on emotional memory, in which negative emotions often lead to better perceptual memory [10]. However, prior to this work, negative and positive words have rarely been compared with each other and neutral words across age groups [10]. Additionally, they found that neutral words had the lowest accuracy across age groups (young: 54%; older: 41%) [10].

Unmeasured bilingualism may have confounded their results by varying emotional resonance across languages. That is, if participants spoke L1 (first language) and L2 (second language), they would be expected to experience less affective stimulation with L2 words than with L1 words, since Wodniecka's team found that bilingualism modulates the emotional impact of memories in older adults [2,10].

3.4. Study Summary and Comparison

Consensus in these studies lay in three areas: first, valence: emotional words facilitate memory compared to neutrals (U-shaped curve, positive/negative words advantage over neutrals); second, emotional congruence (especially broad/congruence or positive congruence) further facilitate memory, and the valence advantage is more for low semantic similarity pairs; third, depending on the task type, valence and/or congruence advantages could be observed (associative recall and/or recognition show valence advantages, whereas the Stroop task does not show valence advantages).

Disagreements focused on two aspects: positive vs negative valence and language type. Stronger positive word advantages than negative words were found by Zhang's team in Chinese words, while stronger positive-negative effects than expected were found by Gao's team in English words [5,7]. This may be due to the fact that the orthography modulates the strength of positive word valence memory (stronger form-semantic connections for positive words in Chinese (logographic) vs. more phonological processing for English (alphabetic)). This may result in different valence-memory patterns: Chinese (logographic) shows valence memory advantages due to stronger positive word encoding caused by strong form-semantic connections; English (alphabetic) may not show valence memory advantages because it may more strongly depend on phonological processing [5,7]. Moreover, Crossfield and Damian's team found the positive word processing advantage in English lexical decision (reaction time for positive words faster than negative and neutral words), while in future studies, we could further verify whether similar effects exist in Chinese by merging behavioral experiments with electrophysiological measures (ERP) to examine the time course of the valence processing difference between logographic and alphabetic languages [6].

Limitations include small samples (n = 40–42), no bilinguals, overreliance on Indo-European languages, and unmeasured language background. Future studies should include bilinguals and cross-linguistic comparisons [5,6,7].

4. Analysis of Studies on Bilingual Language Background Modulating Lexical Emotional Memory

4.1. Detailed Study 1: ERP Study on Bilingual Prospective Memory

López-Rojas's team conducted an event-related potential (ERP) study to explore how bilingualism interacts with emotional valence to influence prospective memory (the ability to remember and execute future intended actions) [4]. The sample included 30 Spanish-Catalan early bilinguals (M age = 26.4 years) with high proficiency in both languages (self-reported $\geqslant$ 8/10 for speaking, listening, reading, and writing) and 30 Spanish monolinguals (M age = 25.9 years) with no L2 experience. All participants had normal vision, no neurological disorders, and were right-handed to control for electroencephalography (EEG) lateralization effects [4].

The experiment adopted a 2 (group: bilingual/monolingual) $\times$ 2 (task language: L1/L2 for bilinguals; Spanish only for monolinguals) $\times$ 2 (cue valence: emotional/neutral) mixed design [8]. Emotional cues were positive (e.g., 'felicidad' [happiness]) or negative (e.g., 'miedo' [fear]) words with standardized valence ratings ($\geqslant$ 7 or $\leqslant$ 3 on a 9-point scale, from the Spanish-Catalan Emotional Word Database), while neutral cues were emotionally neutral nouns (e.g., 'silla' [chair]) [4]. Participants completed an ongoing lexical decision task while remembering to press a specific key when encountering target cues, with ERP data recorded via a 64-channel EEG system [4].

Behavioral results showed bilinguals had significantly higher prospective memory accuracy (82.3%) than monolinguals (71.5%, $p < 0.01$) for emotional cues. No significant group difference was found for neutral cues (bilinguals: 65.7%; monolinguals: 63.2%, $p > 0.05$) [4]. ERP results revealed bilinguals exhibited a larger P3 component (a neural marker of attention allocation) for L1 emotional cues (amplitude: 5.2 μV) compared to L2 emotional cues (3.8 μV, $p < 0.05$) and monolinguals' emotional cues (4.1 μV, $p < 0.05$), indicating enhanced attentional resources for L1 emotional cues [4].

A key limitation was unmeasured language switching frequency—a critical variable in bilingual processing (per prior research) because frequent daily language switching strengthens executive control (e.g., inhibiting irrelevant language, shifting between linguistic systems) [2,11]. This enhanced control can reduce the cognitive load of L2 processing, narrowing the L1-L2 gap in prospective memory; by contrast, infrequent switching weakens such control, amplifying L2-related performance deficits [2,11]. Since the study did not measure switching frequency, it cannot clarify whether the observed L1 advantage is more pronounced in low-switching bilinguals or if high-switching bilinguals show smaller L1-L2 differences. This limits the generalizability of findings to bilinguals with diverse language use patterns (e.g., high-switching Chinese-English bilinguals in cross-cultural work vs. low-switching bilinguals in monolingual communities) [4].

4.2. Detailed Study 2: Bilingual Emotional Word Memory Experiment

Ferré's team investigated how language status (L1 vs. L2) and word concreteness interact with emotional valence to affect memory in late bilinguals [3]. The sample comprised 40 Catalan-Spanish late bilinguals (M age = 32.1 years) who began learning L2 (Spanish) after age 10 and had intermediate-to-high L2 proficiency (proficiency scores: 6–8/10) [3]. All were native Catalan speakers, had no memory disorders, and were tested in a quiet laboratory environment to minimize distractions [3].

The study used a 2 (language: L1 Catalan/L2 Spanish) × 2 (valence: positive/negative) × 2 (concreteness: concrete/abstract) within-subject design [3]. Stimuli included 120 words (30 in each combination of language, valence, and concreteness): concrete words referred to tangible objects (e.g., 'gato' [cat] in Spanish, 'gat' in Catalan), and abstract words referred to intangible concepts (e.g., 'libertad' [freedom], 'libertat' in Catalan) [3]. Valence was standardized using the same database as López-Rojas's team, and word frequency (log frequency: 2.1–3.7, based on the Catalan and Spanish SUBTLEX corpora) was matched across conditions to avoid frequency confounds [3,8].

During the study phase, each word was presented alone for 2 seconds, and participants rated how emotional each word was (1–5 scale) to avoid boredom [3]. Thereafter, participants performed a 10-minute distractor task (simple math problems) and a free recall test in which they wrote down as many words as they could remember [3].

The analysis revealed a strong L1 advantage: The rate of words recalled in L1 (L1: 45.2%; L2: 32.7%; $p < 0.001$) was significantly higher than those recalled in L2 [3]. The L1 advantage was larger for emotional abstract words (L1: 41.3%; L2: 28.5%; $p < 0.01$ vs. L1: 49.1%; L2: 36.9%; $p < 0.05$) than for concrete ones [3]. No differential L1 advantage was found for valenced words due to the 'emotional grounding' of L1 (L1: 41.3%; L2: 28.5%; $p < 0.01$; late bilinguals tend to link emotional experiences with L1) [3].

The most important limitation of the present work was the lack of control of participants' cultural background. Because Catalan and Spanish are spoken by large populations in overlapping cultural contexts, no differences in emotional interpretation were found, which hampers the cross-cultural extension to different language pairs (e.g., Chinese-English) [3].

4.3. Brief Studies

Wodniecka's team examined whether bilingualism enhances emotional memory for non-verbal stimuli (to isolate executive control effects from linguistic processing) [2]. The sample included 40 English-French bilinguals (20 early, 20 late) and 40 English monolinguals, all aged 18–30 years with no memory disorders [2]. Participants completed a non-verbal associative memory task: viewing pairs of emotional faces (positive/negative/neutral) and later recalling which faces were paired together [2].

Results showed early bilinguals had significantly higher recall accuracy for emotional face pairs (78.4%) than late bilinguals (70.2%, $p < 0.05$) and monolinguals (68.7%, $p < 0.01$), with no group difference for neutral pairs (all $p > 0.05$) [2]. This suggested early bilingualism strengthens emotional memory via enhanced executive control—early L2 exposure trains the brain to inhibit irrelevant information (e.g., neutral faces) and prioritize emotional stimuli [2].

Ponari's team explored valence effects in L1 (Italian) and L2 (English) using lexical decision and word naming tasks with 36 Italian-English late bilinguals (M age = 24.5 years, L2 proficiency: 7/10) [11]. Stimuli were 180 words (60 positive, 60 negative, 60 neutral) with matched frequency and length in both languages [11].

In lexical decision, participants responded faster to L1 emotional words (positive: 512 ms; negative: 518 ms) than to L1 neutral words (556 ms, both $p < 0.001$), but this valence advantage was weaker in L2 (positive: 543 ms; negative: 549 ms vs. neutral: 562 ms, $p < 0.05$) [11]. In word naming, L1 emotional words were also named faster than neutral ones ($p < 0.01$), with no L2 valence effect ($p > 0.05$) [11]. This confirmed L1 emotional words have privileged access to lexical-semantic networks, while L2 emotional words require more processing effort (weaker emotional-linguistic links) [11].

4.4. Study Summary and Comparison

4.4.1. Consensus

Three key consensus points emerged:

1.L1 emotional memory advantage: Bilinguals consistently show better memory for emotional stimuli in L1 than in L2, driven by stronger emotional-linguistic associations in L1 [3,11].

2. Executive control enhancement: Early bilingualism or high L2 proficiency improves attention allocation to emotional stimuli—neurally, this is linked to greater activation in the prefrontal cortex (e.g., dorsolateral prefrontal cortex, DLPFC) and enhanced functional connectivity between the prefrontal cortex and amygdala [2,4]. The DLPFC supports executive functions like inhibiting irrelevant neutral cues and prioritizing emotional stimuli, while stronger prefrontal-amygdala links strengthen the integration of emotional and attentional processes—together boosting memory accuracy for emotional (vs. neutral) cues. For example, López-Rojas's team observed larger P3 components (linked to prefrontal attention allocation) in high-proficiency bilinguals, and Wodniecka's team found early bilinguals had more efficient prefrontal inhibition of neutral stimuli, both aligning with this neural mechanism [2,4];

3.Task and stimulus modulation: Valence effects are stronger in memory tasks (e.g., free recall) than in lexical processing tasks (e.g., word naming), and more pronounced for abstract (vs. concrete) words and low (vs. high) semantic similarity pairs [3,5,11].

4.4.2. Disagreements

Two main disagreements were observed:

Valence specificity of L1 advantage: Ferré's team found no difference in L1 advantage between positive and negative words, while Ponari et al. (2015) reported a weak (non-significant) trend toward a stronger L1 advantage for positive words—likely due to differences in stimulus concreteness (Ferré's research included abstract words, while Ponari's research used mostly concrete words) [3,11].

Impact of language similarity: López-Rojas's team (similar Spanish-Catalan pair) found smaller L1-L2 differences in ERP components, while Ferré's team studied a slightly more distinct Indo-European pair (Catalan-Spanish)—suggesting language similarity may reduce the L1 emotional advantage (needing further testing with highly distinct pairs like Chinese-English) [3,4].

4.4.3. Practical Implications for Language Teaching

Based on consensus findings: Late bilingual educators should prioritize teaching high-stakes emotional words (e.g., safety warnings like ‘peligro’ [danger]) in L1 to leverage stronger L1 emotional memory [2,3]; Early bilingual educators should use L1-L2 emotional word pairs (e.g., ‘joy–felicidad’ [English-Spanish], ‘快乐–happiness’ [Chinese-English]) to exploit their enhanced executive control, strengthening cross-linguistic emotional memory links [4].

5. Discussion and Suggestion

The above studies demonstrate that the combined factors shaping lexical emotional memory are lexical emotional valence, emotional congruence, and bilingual language background [3,5,7]. Lexical emotional valence displays a stable U-shaped effect: regardless of language, positive and negative words are always facilitated in memory compared to the neutral words, because the emotionally salient stimuli contain more attentional resources for encoding in comparison with Zhang’s Chinese monolinguals and Gao’s Englishs [5,7]. In addition, emotional congruence exerts modulatory effect on memory: the broad congruence (non-neutral words pair together regardless of valence) and positive congruence (only positive words pair together) benefit memory, while narrow congruence (matching valence intensity) exerts an unstable effect [5].

Bilingual language background takes critical regulatory effect: compared with early bilinguals, late bilinguals exhibit obvious L1 emotional memory advantages (L1-emotion associations are tighter) , while early bilinguals or high-proficiency bilinguals improve lexical emotional memory through enhancing executive control [2,3]. The above effects are task-type restricted (associative recall/recognition are better to reveal valence advantages than Stroop task) [3,5,6,11] and lexical features restricted (abstract words amplify L1 advantages) [5,6,11]. Importantly, different language types should also be considered: compared with alphanumerical English, logographic Chinese strengthens positive valence effect due to the fact that form-semantic links are tighter , while alphabetic English still exhibits similar positive-negative effect [5,7].

In practice, bilingual education can prioritize L1 for late bilinguals when teaching high-stakes emotional vocabulary (e.g., ‘危险–danger’ for Chinese-English learners) [5]; Chinese-English teaching can use low-semantic-similarity positive pairs (e.g., ‘幸福–happiness’ vs. high-similarity ‘快乐–joy’) to boost memory [3]. For older adults, memory training can integrate emotional stimuli into bilinguals’ executive control strengths—for example, designing daily cognitive exercises like L1 positive word associative drills (e.g., pairing Chinese L1 words ‘温暖’ [warmth] with ‘家人’ [family] or English L1 words ‘joy’ with ‘birthday’) or emotional story recall tasks (asking bilingual seniors to retell childhood memories using L1 emotional words like ‘安全’ [safety] or ‘comfort’). These activities not only leverage L1’s stronger emotional memory links but also let older bilinguals apply their enhanced executive control (e.g., switching between memory cues and emotional associations) to slow age-related memory decline [2,8].

Future work is needed to bridge the gaps: employ fMRI to further elucidate the brain mechanism underlying Chinese bilinguals’ emotional memory benefits—because of its high spatial resolution (1–3 mm), fMRI can identify the location of activated brain regions (e.g., test whether L1 emotional advantages arise from more L1 amygdala [emotion encoding] or prefrontal cortex [executive control/retrieval] activation [4,7]) although fMRI has limitations (e.g., low temporal precision, sensitivity to motion), the results of the fMRI complement those of ERP studies (which have no regional localization) with regard to the neural basis of Chinese bilinguals’ L1 memory advantages [4,8]; test Chinese–Spanish bilinguals, which are of different cultures, to control for the influence of culture [3]; further, besides language switching frequency, future research should also extend to autobiographical memory to enrich the theoretical system, which would further improve the theoretical depth and practicality [8].

6. Conclusion

This paper focuses on exploring how lexical emotional memory is shaped by the interaction of bilingual language background, lexical emotional valence, and emotional congruence. Against the backdrop of global bilingual prevalence, it addresses gaps in existing research—such as overreliance on linguistically and culturally similar language pairs (e.g., Spanish-Catalan) and insufficient attention to logographic-alphabetic differences (e.g., Chinese-English)—by synthesizing studies covering monolingual and bilingual populations, behavioral experiments, and neural imaging findings.

Synthesizing the reviewed studies, several core conclusions emerge. First, lexical emotional valence shows a stable U-shaped effect on memory (positive and negative words outperform neutral ones), but this effect varies by language type: logographic Chinese strengthens positive valence advantages via tight form-semantic links, while alphabetic English has comparable positive and negative effects. Second, emotional congruence modulates memory—broad congruence (pairing non-neutral words) and positive congruence consistently boost recall, especially for low-semantic-similarity stimuli, whereas narrow congruence (matching valence intensity) has unstable effects. Third, bilingual language background plays a dual role: bilinguals have an L1 emotional advantage (stronger L1 emotional memory due to tighter L1-emotion associations), and early/high-proficiency bilinguals have enhanced executive control (linked to prefrontal cortex activation and prefrontal-amygdala connectivity), with these effects modulated by language switching frequency and cultural background. Fourth, task and stimulus features influence valence and congruence effects—associative recall and recognition better reveal their advantages, while the Stroop task does not, and abstract words amplify the L1 advantage.

Practically, the findings offer actionable guidance. In bilingual education, late bilinguals should learn high-stakes emotional vocabulary (e.g., safety warnings) in L1 to leverage the L1 emotional advantage, while early/high-proficiency bilinguals can use L1-L2 emotional word pairs (e.g., '快乐–happiness') to strengthen cross-linguistic memory links. For older bilinguals' memory training, integrating L1 positive word associative drills (e.g., 'warmth–family') or emotional story recall tasks (retelling memories with L1 emotional words) can tap into executive control strengths and slow memory decline.

Both theoretical and applied values: Theoretically, enriching the lexical emotional memory system (clarifying the cross-linguistic differences and connecting behavioral and neural levels as well as finding key moderators). Applied values: Two pressing issues in society currently (more efficient ways to teach emotional vocabulary in bilingual education and possible memory interventions in aging care), as well as some future research directions (e.g., doing fMRI on Chinese bilinguals; measuring the frequency of language switching) that provide theoretical support for researches in cognitive science, linguistics, education and gerontology.

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