Journal of Cognitive Psychology

ISSN: 2044-5911 (Print) 2044-592X (Online) Journal homepage: https://www.tandfonline.com/loi/pecp21

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JOURNAL OF COGNITIVE PSYCHOLOGY
https://doi.org/10.1080/20445911.2020.1745816

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Affective picture processing is modulated by emotion word type in masked priming paradigm: an event-related potential study

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ABSTRACT

Although a large body of research demonstrates the role of language in emotion processing (e.g. emotional facial expressions), how emotion-laden words (e.g. poison, reward) and emotion-label words (e.g. fear, satisfaction) differently impact affective picture processing is not clear. Emotion-label words label affective states straightforwardly, whereas emotion-laden words engender emotion via reflection. The current study adopted the masked priming paradigm to examine how Chinese emotion-laden words and emotion-label words distinctively influence affective picture processing. Twenty Chinese speakers decided the valence of the pictures with their cortical responses recorded. Emotion-label words facilitated affective picture evaluation behaviourally. Moreover, pictures that were preceded by emotion-laden words generated larger electrophysiological activation than those preceded by emotion-label words. Combined behavioural and ERP evidence revealed that emotion word type modulated affective picture processing, suggesting different roles of emotion-laden and emotion-label words in how emotion is shaped by language.

ARTICLE HISTORY
Received 1 May 2019
Accepted 18 March 2020

KEYWORDS
Emotion word; emotion word type; emotion-label words; emotion-laden words; affective picture

Emotions contribute directly to mental functions at various levels, such as perception, cognition, personality, and social competence (Izard, 2001). Therefore, emotion research has always been a crux of behavioural science for centuries (Altarriba, 2012; Gendron & Barrett, 2009). However, there is still no agreement on the definition of emotions and how emotions work (Barrett, 2019). Basic emotion theory assumes that emotions are originated from consistent adaption to cope with substantial life risks (Ekman, 1992; Panksepp, 2007). In contrast with basic emotion theory (Ekman & Cordaro, 2011), psychological constructionist account claims that emotions are constructed (Barrett, 2006). Recent work with a constructionist perspective highlighted an influential role of language in emotion processing (Lindquist, 2017).

Language and emotion processing

A number of behavioural and neuroimaging studies supported the powerful role of language in emotion (Brooks et al., 2017; Brooks et al., 2019; Brooks & Freeman, 2018; Doyle & Lindquist, 2018; Fugate et al., 2018; Gendron et al., 2012; Lindquist, 2017; Lindquist et al., 2006, 2014; Lindquist & Barrett, 2008; Lindquist, Satpute, et al., 2015; Macoir, Hudon et al., 2019; Macoir, Laforce et al., 2019; Nook & Somerville, 2019; Nook, Lindquist et al., 2015; Nook, Sasse et al., 2017; Satpute et al., 2016). For example, Gendron and her colleagues (2012) found that after the semantic satiation of the emotion words (i.e. presenting the emotion words 30 times makes participants unfamiliar with those words), repetitive priming effect (i.e. people are faster at processing the stimuli following the same stimuli against following unrelated stimuli) of emotional facial expression was remarkably reduced. Gendron et al. (2012) also observed that repetitive priming was decreased even when participants judged the non-emotionally perceptual characteristics of the emotional facial expressions (e.g. deciding the eye distance is far or close). The notion that language impacts emotional facial expressions has been further validated in many other explorations (Brooks & Freeman, 2018; Doyle & Lindquist, 2018; Nook et al., 2015).

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Supplemental data for this article can be accessed https://doi.org/10.1080/20445911.2020.1745816

Besides vast evidence that suggests hindering access to language, especially emotion words, leads to impairment of emotion perception, some data also demonstrate that providing verbal labelling facilitate emotion perception (Fugate, Gouzoules et al., 2010). In specific, Fugate and her colleagues (2010) investigated how categorical perception was influenced by conceptual knowledge that included expertise and verbal labels (words). Categorical perception occurs when people are faster at differentiating stimuli of categories than stimuli within the same category. The findings showed that verbal labelling learning enhanced categorical perception when recognising emotional facial expressions of Chimpanzees. One recent meta-analysis of brain-imaging studies further revealed that the presence of the emotion words encouraged retrieval of emotion concepts while the absence of emotion words led to ambiguous affective meanings (Brooks et al., 2017). Additional correlation study revealed that semantic dementia was positively related to the deficit in emotion perception (Lindquist et al., 2014).

Apart from the close connection between language and emotion perception, language has been found to be able to influence personal emotional experiences (Lindquist & Barrett, 2008; Satpute et al., 2016). For example, Lindquist and Barrett (2008) found that participants who were primed by conceptual knowledge of fear showed decreased risk taking than those who were exposed to conceptual knowledge of anger that was explained in emotion words. The results underscored the importance of conception that is supported by language in forming people's emotional experiences. In addition to studies of normal people, a large body of literatures of alexithymia indicated that individual with alexithymia (i.e. difficulty in labelling and describing one's emotional experiences) also exhibited reduced emotional awareness (Aaron et al., 2018; Hobson et al., 2018; Hobson et al., 2019). Hobson et al. (2018) observed that damage in brain areas (e.g. inferior frontal gyrus) that were responsible for language functions was also connected with the presence of alexithymia, suggesting the tight connection between language and emotional awareness and experiences.

Two critiques: no pictures and neglected role of emotion word type

Despite the above findings supporting the essential part of language in emotion, the majority of the previous studies adopted emotional facial expressions rather than affective pictures as the experimental materials. It has been long believed that facial expressions are useful and reliable cues to understand one's emotional state (Ekman et al., 1987; Izard, 1994; Mandal & Awasthi, 2014). In contrast with this position, Aviezer and his colleagues (2017) recently proposed that emotional facial expressions that were presented independently provide very vague clues. To currently recognise others' emotional state, people need contextual information, such as gestures, body language (Aviezer et al., 2017; Barrett et al., 2007; Barrett et al., 2011). Unlike emotional faces, colourful affective pictures provide a wide range of situations and objects that contain emotion content and can elicit people's emotions. One prominent example is the International Affective Picture System (IAPS) that was extensively used in countless experiments (Lang et al., 1997). Although there is much support for the notion that language drastically shapes emotion perception, the evidence is mostly obtained from the studies that deployed emotional facial expressions. Therefore, it remains unclear whether language plays a role in affective picture processing that includes extensive contextual information and various situations and objects.

Another critique for previous studies (Fugate et al., 2018; Lindquist et al., 2006) which investigated the relations between language and emotion is that they examined emotion-label words rather than emotion-laden words. Emotion words include two sorts of words that are emotion-laden words and -label words (Wang et al., 2019; Wu & Zhang, 2019a, 2019b; Zhang et al., 2017; Zhang, Teo, et al., 2018; Zhang, Wu, Yuan, et al., 2018). The words that illustrate affective states directly (e.g. worry, delight) are termed as emotion-label words, whereas emotion-laden words contain emotional information with connotations (e.g. war, peace). It has been consistently shown that the two kinds of emotion words are distinctive, and the distinction is termed as emotion word type effect (Altarriba, 2006; Altarriba & Basnight-Brown, 2011; Kazanas & Altarriba, 2015, 2016a, 2016b; Knickerbocker & Altarriba, 2013; Wang et al., 2019; Wu & Zhang, 2019a, 2019b; Zhang et al., 2017; Zhang, Teo, et al., 2018; Zhang, Wu, Yuan, et al., 2018). For example, Zhang et al. (2017) reported that emotion-laden words provoked decreased early brain responses during lexical decision task than emotion-label words, and this result has also been further obtained in second language (Zhang, Wu, Yuan et al., 2018). These studies convergingly demonstrated that larger emotion activation was generated by emotion-label words than emotion-laden words (Zhang et al., 2019), because when emotion-label words, such as *shame and pride*, are presented to people, emotion will automatically and directly be activated. In contrast, emotion-laden words, such as *partner and breakup*, activate emotions via reflection and elaboration.

Up to now, emotion word type effect has not attracted much attention from affective science researchers. If language influences emotion processing, emotion word type effect is rationally supposed to modulate emotion processing as a consequence. Specifically, larger emotion activation provoked by emotion-label words than emotion-laden words is predicted to facilitate emotion processing (e.g. affective picture judgment).

Event-related potentiasl (ERPs) technique has been broadly utilised in affective picture processing (Fan et al., 2013; Horan et al., 2010; MacNamara et al., 2010; Olofsson et al., 2008; Olofsson & Polich, 2007; Schupp, Junghöfer, et al., 2003, 2004; Schupp, Markus, et al., 2003). Early Posterior Negativity (EPN) has been reported in a large number of ERP studies on affective pictures (Olofsson et al., 2008) and also on emotion words (Citron, 2012). Unlike the emotion words that elicit EPN with an occipital-temporal distribution (Citron, 2012; Hinojosa et al., 2019), affective pictures often generate EPN that occurs at central sites (Schupp et al., 2004). For example, Schupp et al. (2004) found that larger EPN was elicited by both pleasant and unpleasant pictures than by neutral pictures. Because EPN usually peaks during 200–300 ms, a relatively early processing stage, it is theorised that EPN is associated with early and automatic emotion activation and natural selective attention (Schupp et al., 2004). Therefore, electrophysiological responses (EPN) and behavioural performance were recorded during affective picture processing preceded by the presentation of emotion words in the present study, thereby providing combined evidence of how emotion word type automatically impacted affective picture judgment.

The present study

In contrast with previous investigations that used semantic satiation technique that decreased the semantic retrieval of the participants by repeatedly presenting them the same words (Gendron et al., 2012; Lindquist et al., 2006), the present study adopted a masked priming paradigm that was a prominent research tool in psycholinguistics (Forster, 1998). In this paradigm, a prime was presented shortly (e.g. 50 ms) and preceded by a 500 ms mask so that the participants were usually unaware of the prime. Despite being unconscious of the primes, the participants still responded faster to the targets that were related to the primes as compared to those which were unrelated to the primes, and the priming effect was somewhat of the same amplitude with the visible primes (Forster, 1998). One advantage of using masked priming is that we can preclude the influence of strategic processing of the primes. In the current study, we presented the primes (i.e. emotion-label words and emotion-laden words) briefly and masked them to the participants in order to investigate how masked emotion words impacted affective picture judgment.

Founded on previous explorations and the affective picture processing related ERP component (EPN), it is hypothesised that affective pictures are evaluated faster when they are preceded by emotion-label words than emotion-laden words, along with decreased EPN elicited by the pictures that are preceded by emotion-label words than by emotion-laden words. Since emotion elicitation is enhanced for emotion-label words than laden words, and this effect is at an early stage and unrelated to task demands (Wang et al., 2019; Wu & Zhang, 2019a, 2019b; Zhang et al., 2017; Zhang et al., 2019; Zhang, Teo, et al., 2018; Zhang, Wu, Yuan et al., 2018), it is further hypothesised that this enhancement effect on affective picture processing is to be found equally for both negative and positive ones.

Method

Participants

Twenty Chinese speakers (mean age: 26.5 ± 3.93 years, five males, right-handedness) from the University of Macau participated in the present experiment. None of them had psychiatric disorders or brain impairments. All of the participants had a normal or corrected-to-normal vision. Prior to the experiment, participants signed consent forms. The research protocol was approved by the Institutional Review Board at the University of Macau (SSHRE17-APP017-FED).

Stimuli

The words as primes were from the study of Zhang et al. (2017). There were 160 Chinese emotion words in total, with 40 words in each category (i.e. positive emotion-laden words, positive emotion-label words, negative emotion-laden words, and negative emotion-label words). The four groups of primes were not different with respect to word frequency, strokes, and arousal, all $ps > .05$ (see Supplementary materials for the word list). For the emotional pictures as targets, a total of 320 emotional pictures retrieved from Chinese Affective Picture System (CAPS) were matched on arousal in eight conditions crossed by the three factors (i.e. word type, valence, and relatedness) with 40 pictures in each condition (Bai et al., 2005). The CAPS is constructed by following IAPS (Lang et al., 1997) and rated with a representative sample from China. The CAPS has been widely used in emotion processing research in the Chinese context (Bond, 1996; Yuan et al., 2007; Zhang et al., 2015). The selected 320 pictures cover a wide range of categories, such as people (e.g. baby), animals (e.g. spider), situations (e.g. accident). Negative pictures were more negative than positive pictures, F (7, 312) = 2082.179, $p < .001$. Moreover, within negative and positive pictures, emotion-label words and emotion-laden words were not different in both related and unrelated conditions, $ps > .05$ (see Table 1 for more details).

Procedure

After a short briefing of the experiment, the participants provided the written consent forms. Afterward, the participants were seated at a distance of 70cm from the monitor in a dim-light chamber. The participants were asked to pay attention when a fixation appeared on the screen. Sequentially, a mask (500 ms) that was made by several overlapping Chinese characters was displayed (Zhang, Wu, Zhou, et al., 2018). A prime (an emotion word, 50 ms) was shortly presented and masked by a backward mask (10ms). A target, an affective picture (dimensions: 360×240), was presented after the backward mask. A picture was exhibited on the monitor and disappeared as long as the participants made a response. The task was to decide the valence (i.e. negative or positive) of the affective pictures and the electrophysiological activations were recorded during responding (see Figure 1 for a trial scheme). After the judgment, the participants could blink their eyes for a second. The 320 affective pictures were equally distributed into eight blocks. Each Chinese emotion word was presented twice in different blocks. An emotion word could be the same valence with the picture (related condition) or be the different valence from the picture (unrelated condition). Each picture was allocated in the related condition in one list and unrelated in the other list. We counterbalanced the two lists among participants. The participants could have a rest during the intervals between the blocks. The order of blocks and trials in one block was random. None of the participants reported that they saw the primes during the experiment.

ERP recording and analysis

Ongoing electroencephalography (EEG) data were obtained from a 128-channel EEG Geodesic system (Electrical Geodesic Inc., USA). The sampling rate was 1000 Hz, and impedance was retained below 50kΩ, in line with the recommendation of the EGI Geodesic system. The offline data were processed with Net Station Waveform Tools by being filtered with a 0.1–30 Hz bandpass firstly and segmented into 850 ms epochs with a 100 ms baseline before stimulus trigger. Artifacts were identified if amplitude variances in any electrode exceeded ± 70 μV (eye blink) or ± 27.5μV (eye movement) and were discarded for further analyses. Amplitude changes that were larger than ± 200μV during the whole recording were labelled as bad channels and were replaced by averaging the adjacent channels, but trials with more than 10% bad channels were excluded. In this way, around 580 trials for each condition were kept for further analysis. Trials were averaged across subjects in each condition and were referenced by the average of all electrodes. The baseline was corrected by 100 ms epochs before the stimuli onset.

Table 1. Mean and Standard Deviation (SD) in brackets for affective picture characteristics.

	Negative				Positive			
	Emotion-label		Emotion-laden		Emotion-label		Emotion-laden	
	Related/Unrelated		Related/Unrelated		Related/Unrelated		Related/Unrelated	
Valence	2.74 (0.36)	2.73 (0.34)	2.72 (0.33)	2.74 (0.36)	7.12 (0.33)	7.14 (0.30)	7.06 (0.27)	7.04 (0.26)
Arousal	5.32 (0.87)	5.34 (0.76)	5.31 (0.83)	5.36 (0.69)	5.49 (0.81)	5.53 (0.61)	5.48 (0.61)	5.46 (0.74)

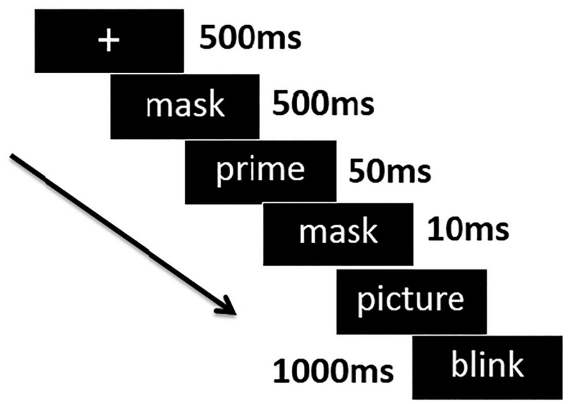

Figure 1. Trial scheme.

As for ERP analyses, Cz, C1, C2, C3, and C4, five central sites, were selected for EPN analysis within the time window of 140–360 ms according to visual inspection and prior investigations (Carretié et al., 1997; Schupp et al., 2004). The EPN was computed by averaging the five electrodes in each condition.

Results

Behavioural results

Trials that exceeded M ± 2.5SD were discarded for further analyses, thereby deleting 2.26% of the data. The remaining data were submitted into a 2 (word type: emotion-label words and emotion-laden words) × 2 (valence: negative and positive) × 2 (relatedness: related and unrelated) repeated-measure ANOVA in both accuracy rate and reaction time analyses.

For accuracy rates, the overall accuracy rate was high, over 0.90 for all conditions, implying that the participants were engaged in the task. A main effect of valence was identified, F (1, 19) = 12.731, p = .002, partial η^2 = .401. Positive pictures (0.97) were perceived with higher accuracy than negative pictures (0.92). No other main effects or interactions were found.

For reaction times, pictures that were preceded by emotion-label words (804.60ms) were perceived faster than those preceded by emotion-laden words (826.18ms), suggesting an advantage of facilitation of emotion-label words on affective picture judgment, F (1, 19) = 21.266, p < .001, partial η^2 = .528. In addition, positive pictures (756.12ms) had faster processing speed than negative pictures (874.66ms), F (1, 19) = 43.123, p < .001, partial η^2 = .694. No other main effect or interactions were identified, ps > .05 (see Table 2 for more details).

ERP results

Larger EPN was elicited by negative pictures (−2.494μV) than by positive pictures (−1.926μV), F (1, 19) = 29.197, p < .001, partial η^2 = .606. Moreover, there was an interaction between word type and relatedness, F (1, 19) = 4.763, p = .042, partial η^2 = .200. Post hoc comparisons showed that under the unrelated condition, emotional pictures preceded by emotion-label words (−2.072μV) provoked weaker EPN than those preceded by emotion-laden words (−2.330μV), t (19) = 2.272, p = .035, cohen's d = 0.483. whereas no difference was found in the related condition (−2.211μV for emotion-label words, −2.226μV for emotion-laden words), t < 1. Additionally, both emotion-label words and emotion-laden words as primes generated similar cortical activation in related and unrelated conditions, ps > .3. No other main effects or interactions were observed (see Figures 2 and 3).

Discussion

The present study investigated how Chinese emotion-label words and emotion-laden words influenced affective picture processing in masked priming paradigm. The results clearly demonstrated that the emotion word type modulated affective picture judgment, even when participants were unaware of the primes. The behavioural results firstly showed that affective pictures were processed faster when they were preceded by emotion-label words than by emotion-laden words. ERP data further revealed that under the unrelated condition, affective pictures primed by emotion-laden words evoked stronger brain activation than by emotion-label words, suggesting that emotion-label words facilitated affective pictures evaluation. The converging evidence underscored that subliminal language could shape emotion judgment by differential roles of emotion-label words and emotion-laden words.

It has been long proposed that language plays an essential part in emotion experience and construction (Barrett et al., 2007; Cowen & Keltner, 2017; Gendron & Barrett, 2018; Lindquist, 2017; Lindquist, MacCormack, et al., 2015; Lindquist, Satpute, et al., 2015; Nook et al., 2015, 2017). More recently, primary progressive aphasia (e.g. non-fluent and

Table 2. Mean reaction time (ms) and accuracy rate (%) in brackets of emotion-label words and emotion-laden words as a function of relatedness and valence on affective picture processing.

Negative				Positive			
Emotion-label		Emotion-laden		Emotion-label		Emotion-laden	
Related	Unrelated	Related	Unrelated	Related	Unrelated	Related	Unrelated
861.64 93.36	853.30 92.79	880.22 91.20	903.49 91.62	747.98 98.35	755.47 97.32	749.40 96.79	771.61 96.60

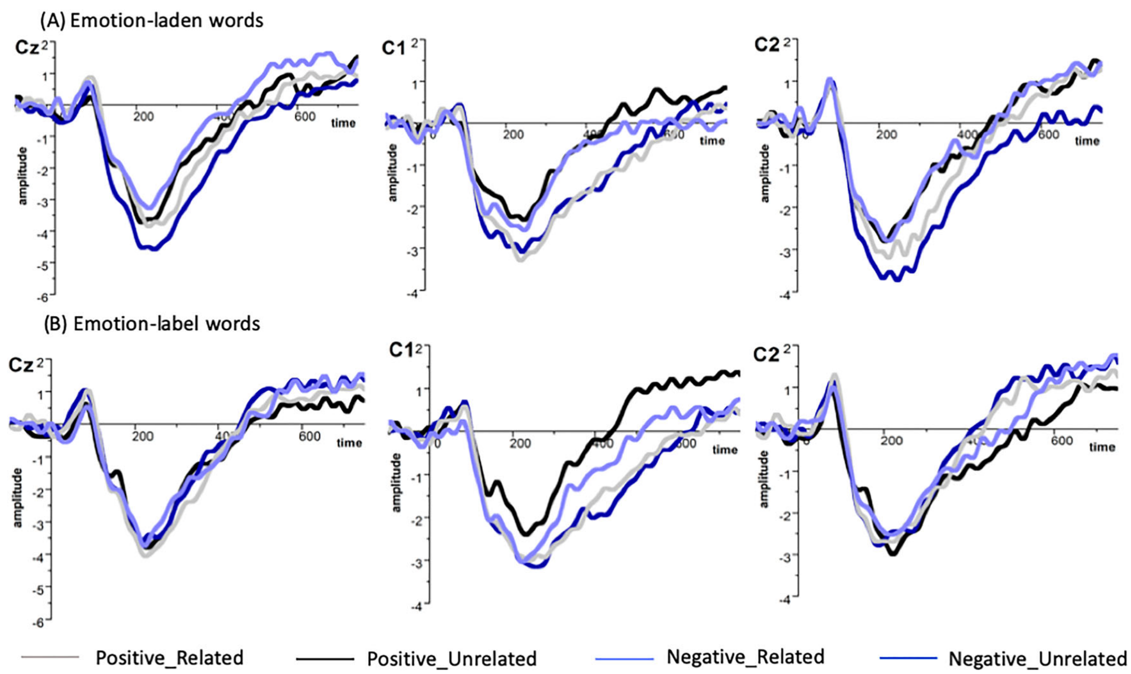

Figure 2. Grand average ERPs of EPN at selected electrodes, (A) emotion-label words, and (B) emotion-laden words as primes, amplitude (μV) and time (ms).

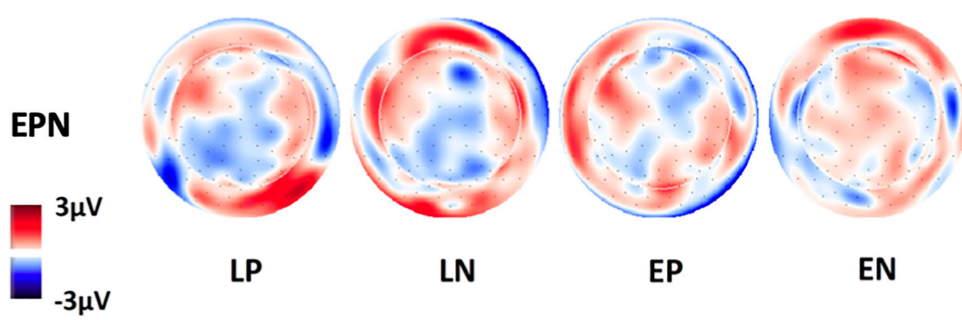

Figure 3. Topography of the EPN: Unrelated condition – related condition, L*P* = positive emotion-laden words, LN = negative emotion-laden words, E*P* = positive emotion-label words, EN: negative emotion-label words.

semantic variant disease) was found be associated with deficit in emotion perception, theory of mind, and empathy (Fittipaldi et al., 2019), suggesting that people suffering from language impairment also might have problems in emotion-related processing (Lindquist et al., 2014). Although the close association between language and emotion has been supported, none of the previous studies concentrated on the differential roles of emotion-label words and emotion-laden words in such associations. Emotion-label words are recognised differently from emotion-laden words in both behavioural performance and cortical responses (Kazanas & Altarriba, 2015; Zhang et al., 2017), and such differences were called as emotion word type effect (Wu & Zhang, 2019a, 2019b). Therefore, the current ERP study aimed to further explore how emotion word type influenced emotion judgment, namely affective picture processing that was scarcely investigated in the previous studies (Fugate et al., 2018; Gendron et al., 2012; Lindquist et al., 2006).

The behavioural results showed that affective pictures were evaluated faster preceded by emotion-label words than by emotion-laden words. The result not only underscored the differences between the two types of words (Zhang et al., 2017; Zhang, Teo, et al., 2018; Zhang, Wu, Yuan, et al., 2018) but also revealed that the automatic activations of emotion-label words facilitate the affective picture processing over emotion-laden words. Similar to previous findings (Kazanas & Altarriba, 2015, 2016a; Zhang et al., 2017; Zhang et al., 2019; Zhang, Teo, et al., 2018; Zhang, Wu, Yuan, et al., 2018), the facilitation effect of emotion-label words on emotional valence judgment suggested that this process benefited from the early emotion activation triggered by emotion-label words. After emotion-label words were processed, the emotion was thus elicited. As a result, participants were more readily to judge affective pictures and show better valence judgment than when they were presented with emotion-laden words that were hard to produce early emotion elicitation.

ERP results provided further revealed that under the unrelated condition, affective pictures generated larger electrophysiological responses primed by emotion-laden word than by emotion-label words. This result implied that after a short exposure to emotion-label words, affective picture processing was facilitated by emotion-label words with decreased early brain activation (EPN) that is related to initial emotional engagement and selective attention induced by emotion (Schupp et al., 2004). This is in consonance with previous studies showing the early impact of emotion-label words on cognitive (Zhang, Teo, et al., 2018) and emotion conflict processing (Zhang et al., 2019). Emotion-label words elicited pronounced emotion activation than emotion-laden words at early times, and this enhancement was found to influence conflict processing. The current findings extended previous work from conflict processing to emotion processing, suggesting a close relationship between emotion and language (Barrett et al., 2007).

These behavioural and ERP findings have implications for how language shapes emotion and constructs emotion by indicating differential roles of two types of emotion words in these processes. Gendron and Barrett (2018) recently proposed a theoretical framework to account for the complexity of emotion processing that involves multidimensional and dynamic sources (e.g. facial expressions, gestures, speech, physiological activation). The main point is that emotion processing is a conceptualisation that synchronised among individuals, and language shapes the process of the conceptualisation. Although this account captures the core of complexity of emotion processing in terms of the sources and variability, Gendron and Barrett (2018) did not notice the different roles of emotion-label words and emotion-laden words in emotion construction. The findings of emotion word type's modulation on affective picture processing can be incorporated into conceptual synchrony by separating the two kinds of words. The priming advantage for emotion-label words is a result of language constructing emotion that is initiated by emotion-laden words. For example, the word "knife" is a neutral word for a child who is unfamiliar with this object. When the child is hurt by the knife, and feels pain and sad about the injury, the child will connect "knife" (a neutral word at first) with many negative emotions. As a consequence, "knife" becomes an emotion-laden word (Altarriba, personal communication, 2016). However, without negative emotion-label words, the negative feelings are very ambiguous; they can be sad, angry, or fearful. The emotion-label words that indicate different affective states are learned, abstracted, and embodied by extensive emotional experiences, such as being hurt by a knife. After that, emotion-label words are able to activate related emotions more automatically than emotion-laden words, thereby priming affective pictures even in the masked priming condition. This developmental hypothesis is in agreement with the recent constructionist accounts of emotion development that emphasize the essence of language in contributing emotion development (Hoemann et al., 2019; Nook et al., 2019; Nook & Somerville, 2019; Shablack & Lindquist, 2019). The distinction of the current hypothesis from the previous constructionist accounts lies in the emotion word type perspective that localises the different roles of emotion-label words and emotion-laden words in emotion concept development.

It is also important to note that the factor relatedness was not significant. One possibility is that affective pictures, in contrast with emotional facial expressions, are full of contextual information. Therefore, it is easy to interpret the valence of affective pictures, leading to a null effect of valence priming. However, positive pictures were recognised faster and more accurately than negative pictures, along with enhanced brain response to negative pictures than positive ones. The processing advantage of positivity has been found in multiple studies including words (Kazanas & Altarriba, 2015, 2016b), faces (Calvo & Nummenmaa, 2016), and pictures (Olofsson et al., 2008). The traditional notion is that negative stimuli are processed more slowly than positive stimuli as a result of automatic vigilance that monitoring negative stimuli is prolonged and requires increased attention (Estes & Adelman, 2008). By contrast, a recent argument disagrees with this account by indicating that positive stimuli are processed faster due to their more intensive density than negative ones, because good things are more similar than bad things (Alves et al., 2017a, 2017b; Koch et al., 2016). The present study is more in line with this recent account, because negative pictures were not only evaluated more slowly but also had higher error rates, suggesting that deciding the valence of negative pictures is more effortful than positive pictures. This suggestion was further supported by the increased cortical activation induced by negative pictures than by positive pictures. The difficulty of valence evaluation of the negative pictures is because negative emotions are more discrete than positive emotions, making it hard to converge into a single factor (valence).

The results in the present study have implications for explaining the possible mechanism of affect labelling effect that when people label their emotional states or label the emotional aspect of certain emotion stimuli, emotional responses of the people will decrease accordingly (McRae et al., 2010; Torre & Lieberman, 2018). In one recent review, Torre and Lieberman (2018) argued several explanations for how affect labelling works: distraction, self-reflection, reduction of uncertainty, and symbolic conversion. Among the four candidates, reduction of uncertainty and symbolic conversion are related to the current study in that emotion stimuli (e.g. an affective picture) are converted into emotion-laden words (symbolic conversion), and then the emotion-laden words are abstracted into emotion categories that are represented by emotion-label words (reduction of uncertainty). Therefore, the two processes are achieved jointly by two kinds of emotion words. Future research of labelling affect might consider comparing emotion-laden words and emotion-label words and their influences on emotional responses, which might shed light on how affect labelling operates.

In conclusion, the current study found that emotion word type influenced affective picture processing. Specifically, as compared to emotion-laden words, emotion-label words as primes enhanced affective picture evaluation with accentuated processing speed and attenuated electrophysiological responses. These results emphasize that language has an impact on emotion by distinguishing emotion-label words from emotion-laden words, thereby extending the previous findings of emotional facial expressions to affective pictures with an emotion word type perspective.

Acknowledgement

This work has been submitted in partial fulfillment of the Ph.D. degree in Education by the first author.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

This work was supported by Universidade de Macau: [grant number MYRG2015-00221-FED,MYRG2016-00193-FED,MYRG2017-00217-FED].

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