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The establishment of the Chinese Emotion Regulation Word System (CERWS) and its pilot test

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Abstract

It is an important way to initiate a certain emotion regulation process using words with the meaning of emotion regulation. However, there is still a lack of a standardized emotion-regulation word system in the international field of emotion regulation, which may lead to the mismatch between the selected words and the target strategies or the incomparability of the results from different laboratories. Therefore, we select, classify, and evaluate many emotion-regulating words and establish a standardized emotion regulation word system, named "Chinese Emotion Regulation Word System (CERWS)". Firstly, the correlation degree between emotion- regulating words and various emotion-regulating strategies is evaluated, and the words are screened and classified into different strategical categories according to the results. Secondly, each word's six attributes, including pleasure/valence, arousal, motivational tendency, dominance, familiarity, and writing complexity, were determined for the system. Thirdly, using the sentence unscrambling paradigm, we test the moderating effect of the implicit emotion regulation strategy induced by the CERWS on the negative emotion. Results showed that: (1) 149 emotion-regulating words can reflect five emotion-regulating goals (acceptance, distraction, cognitive reappraisal, expression suppression, and venting) and neutral goals; the system has good reliability and internal consistency. (2) the implicit cognitive reappraisal and expression suppression adjust the valence and arousal of negative emotion, and the implicit attention distraction reduce the arousal of negative emotion. These findings suggest that the CERWS has satisfactory reliability, and the system's words can be used to initiate emotion regulation effectively.

Key words implicit emotion regulation, Chinese Emotion Regulation Word System (CERWS), emotion regulation strategies, cognitive reappraisal, sentence unscrambling task

1 Introduction

Emotion regulation refers to the process of changing cognitive or behavioral patterns to affect emotion production, experience, and expression during emotional arousal (Gross, 2013). Emotion regulation plays an important role in people's daily life and is an important way for individuals to maintain their mental health, which has attracted the attention of many researchers in recent years (Berking & Wupperman, 2012; Desteno et al., 2013; Gao et al., 2018; Gross & Muñoz, 1995; Wang & Li, 2017;). According to the process model of emotion regulation (Gross, 2013), the emotion regulation process includes five stages: Situation selection, Situation modification, Attentional deployment, Cognitive change, and Response modulation. Each emotion regulation stage has the corresponding emotion regulation strategy. Among them, situational selection/ modification, attentional deployment, and cognitive change belong to Antecedent-focused strategies, and response modification belongs to Response-focused strategies. On the other hand, both situation selection and situation modification are strategies to change emotion by changing the situation, so they do not belong to the category of cognitive strategies (that is, strategies to change their attention, cognitive pattern, and behavior to achieve emotion regulation). The representative attentional deployment methods are distraction and concentration, while cognitive reappraisal and expressive suppression are typical examples of cognitive change and response modification, respectively. In addition to the typical emotion regulation strategies mentioned in the model, there may be other emotion regulation strategies at each stage. For example, in the response modification phase, acceptance and venting are also effective emotion regulation strategies (Ding et al., 2015; Mauss et al., 2007).

Emotion regulation can be achieved both explicitly and implicitly (Gyurak et al., 2011). Explicit emotion regulation generally refers to intentional regulation of one's emotion, while implicit emotion regulation refers to spontaneous regulation of emotion without conscious awareness or regulatory intention. Among them, implicit emotion regulation has received increasing attention as it does not engender subjective effort (Gao et al., 2018). In recent years, implicit emotion regulation has been shown to be effective in modulating individuals' emotional responses without consuming additional cognitive resources (Williams et al., 2009; Yuan et al., 2015). Moreover, implicit emotion regulation has also been used to improve the emotional state of depressed individuals due to its advantage of little cognitive cost (Li & Yuan, 2018).

Unconscious goal pursuit is the basis of implicit emotion

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regulation (Bargh & Williams, 2007). It requires subjects to process linguistic information related to emotion regulation strategy to induce unconscious goal pursuit. When the primed goal uniquely reflects a regulatory strategy, implicit emotion regulation occurs in lab settings. For example, Mauss et al. (2007) used words of emotion control and those of emotional expression in a sentence unscrambling paradigm to activate the implicit emotion-regulation goals, which successfully reduced anger experiences. In addition, Yang et al. (2015) initiated implicit emotion regulation using an idiom matching task (selecting the idiom with the similar meaning as that of the target word), which successfully decreased the subjects' emotional experience in the follow-up task. Current research has consistently proved that the two paradigms, sentence unscrambling task and idiom matching task, can achieve the goal of emotion regulation. For example, implicit priming of cognitive reappraisal was as effective as intentional reappraisal in reducing anxiety, depression, and disgust (Williams et al., 2009; Yuan et al., 2015); implicit priming of emotional control and emotional expression can regulate anger and fear successfully (Mauss et al., 2007; Wang & Li, 2017) while implicit priming of acceptance and distraction had a significant moderating effect on depression induced by frustration (Ding et al., 2015; Li & Yuan, 2018).

In the above mentioned studies, critical words of emotion-regulatory meanings play a pivotal role in successful emotion regulation (Gao et al., 2018). However, prior researchers selected emotion regulation words based on random choice in the absence of a unified criteria, which leads to a couple of limitations: (1) the words tend to relate exclusively to a single strategy of reappraisal; (2) self-determined words may imply ambiguous strategic meanings, such as “switching” that can imply both attention (distraction) and cognitive (reappraisal) switching; (3) previous studies have shown that the pleasure, arousal, and other attributes of word materials may modulate mood, memory, and attention, which was, however, not considered in these studies (Aquino & Arnell, 2007; Kensinger & Schacter, 2006; Luo et al., 2004; Smith, 2012). In summary, there is still a lack of a standardized emotion-regulatory word system that takes care of these limitations.

Therefore, the present study tends to establish a standardized Chinese Emotion Regulation Word System (CERWS) and provides normative emotional ratings for the words in CERWS to overcome the limitations.

In study 1, according to the process model of emotion regulation (Gross, 2013), we selected the adaptive strategies in the three temporal stages of attention allocation, cognitive change, and response regulation (Gross, 1998), excluding maladaptive strategies such as rumination (Nolen-Hoeksema & Aldao, 2011; Rusting & Nolen-hoeksema, 1998). Finally, the CERWS includes five strategies: distraction, reappraisal, acceptance, venting, and suppression. Distraction refers to shifting attention away from negative emotions and towards positive or neutral stimuli (Van Dillen & Koole, 2007). Reappraisal means adjustment of emotional response by changing cognition and understanding of emotional events. It attempts to understand negative events in a more positive manner or to rationalize emotional events (Gross, 1998). The acceptance strategy advocates an open, accepting attitude towards the internal emotional experience without trying to change the frequency, the form, and the impact of emotional events (Hayes et al., 2006). Venting represents expressing emotion as much as possible in facial expression and behavior (Huang Miner, 2001). Expression suppression considers inhibiting the emotional expression and emotional behavior, and keeping the emotions from being revealed (Gross, 2002). These five strategies cover different temporal stages in the process model of emotion regulation (Gross, 1998; Gross, 2013) and have been shown to be effective in regulating different emotions (Ding et al., 2015; Yuan et al., 2015; Li & Yuan, 2018).

Moreover, there have been a couple of established emotional word systems. For instance, the National Institute of Mental Health (NIMH) developed the Affective Norms for English Words (EW) (Bradley & Lang, 1999), providing the self-rating data at three dimensions of emotional words -- pleasure, arousal, and dominance. In China, Wang et al. (2008) established the Chinese Affective Words System (CAWS) and Xu et al. (2008) established the Chinese Affective Words Categorization System (CAWCS) to facilitate studying emotional processing profiles of the healthy and clinical population. Inspired by the methods of these studies, the current study selected emotion-regulatory words corresponding to each of the five strategies, and then the selected word pool was screened and evaluated in multiple dimensions (pleasure, arousal, etc.).

To test the validity of the CERWS, study 2 used the words from CERWS as the materials of implicit emotion regulation. The emotion regulation effects of the chosen words were examined using the sentence-unscrambling paradigm.

2 Study 1: The establishment of Chinese Emotion Regulation Word System

2.1 Method

2.1.1 Participants

A total of 128 undergraduates and postgraduates (57 males, 71 females) from Neijiang Normal University and Southwest University participated in the study. The average ages of the participants (between 17 to 32 years) were 20.52 ± 2.43 years. To test the reliability, thirty participants were randomly selected from the sample to repeat the assessment one month later.

2.1.2 Materials

The authors selected two-character words and four-character idioms related to five emotion regulation strategies and neutral words unrelated to emotion regulation strategies, according to the previous studies, the Contemporary Chinese Dictionary (seventh edition) and Xinhua Idiom Dictionary. The neutral words were included: (1) to establish standardized neutral word materials which can be compared with emotion-regulating words; (2) and to act as buffers presented between emotion-regulating words so as to avoid participants' suspicion of the experiment purpose. The authors used three principles to select the materials: (1) comprehensibility -- choose the words easy to understand; (2) representativeness -- choose the words that represent the meaning of the emotion regulation strategy clearly; (3) familiarity -- choose common words as much as possible and avoid obscure words. Accordingly, the authors selected 34 words related to acceptance strategy (17 two-character words and 17 four-character idioms), 32 related to attentional distraction (16 two-character words and 16 four-character idioms), 37 related to emotional expressions (20 two-character words and 17 four-character idioms), 43 related to expression inhibition (26 two-character words and 17 four-character idioms), 38

oms), 38 related to cognitive reappraisal (19 two-character words and 19 four-character idioms), and 42 neutral words (28 are two-character words and 14 are four-character idioms). There were a total of 226 words.

The degree of correlation between each word and five emotion regulation strategies (attention deployment, cognitive reappraisal, acceptance, expression suppression, and venting) were then evaluated using questionnaire 1. Besides, the Affective Norms for English Words (ANEW) used three dimensions to characterize word attributes: pleasure, arousal, and dominance (Bradley & Lang, 1999), and the Chinese Affective Word System (CAWS) used five dimensions: pleasure, arousal, dominance, tendency, and familiarity (Wang et al., 2008). Therefore, the participants in this study rated the words on the six dimensions of pleasure/valence, arousal, dominance (degree of being controlled-dominance), the motivational tendency (degree of avoidance-approach), familiarity, and writing complexity using questionnaire 2. The dimension of writing complexity was added to control the stroke number of some Chinese four-character idioms.

2.1.3 Experimental procedure

The meaning of the five emotion regulation strategies was first explained to participants, and the participants were then asked to complete the questionnaire 1. Specifically, the correlation degree between words and five emotion regulation strategies was evaluated by the 9-points scale: 1 means no correlation at all, and 9 means high correction. After finishing questionnaire 1 and having a rest, the participants completed questionnaire 2. The six dimensions of word attributes were also rated using the 9-point scale: 1 means no correlation at all, and 9 means a high correlation.

2.1.4 Statistical processing

The data of questionnaire 1 were analyzed using repeated-measures ANOVA. Specifically, one word was included into the CERWS if the correlation between this word (e.g., "acceptance") and one strategy (e.g., acceptance strategy) was significantly higher than the correction between this word and the rest of the strategies (Figure 1a). If one word was related to two or more emotion regulation strategies at the same time, it was regarded as an ambiguous word and was excluded in this study (e.g., word "adjustment", Figure 1b). Neutral words were included only if the correlation between each word and all the strategies was lower than the median of the scale (i.e., 5).

The data of questionnaire 2 were analyzed using paired-sample t-tests to examine the attribute differences between the ratings of emotion-regulating words and the ratings of neutral words. All the analyses were completed using SPSS 21.0.

2.2 Results

2.2.1 Word classification and selection

Based on the results of repeated-measures ANOVA, 77 words were deleted. The remaining 149 words were divided into 5 kinds of emotion regulation strategies and neutral words: 19 words of acceptance strategy (8 two-character words and 11 four-character idioms), 13 words of attention distraction strategy (12 of two-character words and 1 of four-character idioms), 30 words of venting (13 two-character words and 17 four-character idioms), 30 words of expressive suppression (16 two-character words and 14 four-character idioms), 25 words of cognitive reappraisal (11 two-character words and 14 four-character idioms), and 32 neutral words (22 two-character words and 10 four-character idioms). See Supplementary Table 1-6 for more details.

2.2.2 Word attributes

We compared the attribute ratings of the emotion-regulating words with those of the neutral words (see Figure 2, Figure 3). In the pleasure dimension, the words of acceptance strategy were higher than neutral words; the words of attentional distraction, venting, and expressive expression were lower than neutral words; there was no significant difference between cognitive reappraisal and neutral words;

In the arousal dimension, words of acceptance were lower than neutral, while the other strategies were all higher than neutral.

In the writing complexity, there was no significant difference amongst acceptance, distraction, and neutral strategies, whereas the other strategies were higher than neutral.

In the familiarity dimension, there was no significant difference between acceptance and neutral strategies, whereas the familiarity ratings of other strategies were lower than neutral.

In the dominance dimension, the acceptance words were higher and expressive suppression words were lower than the neutral; there was no significant difference between the other strategies and the neutral.

In the dimension of motivational tendency, the acceptance words were significantly higher than the neutral, whereas the other strategies were lower than the neutral.

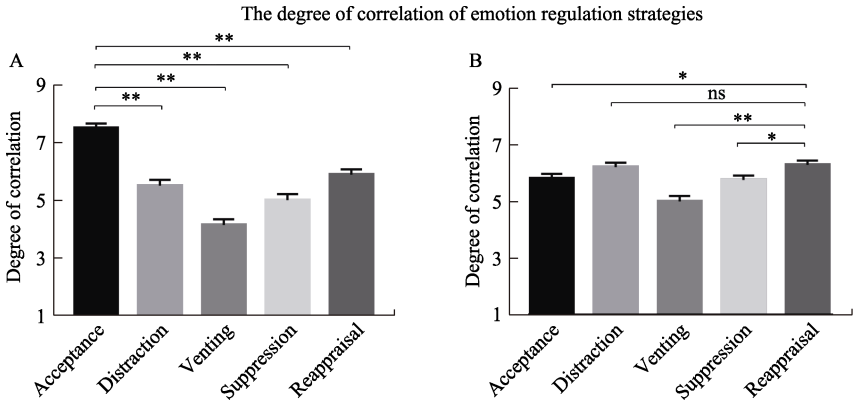

Figure 1. (a) The correlation degree of the word "acceptance" with various emotion regulation strategies. (b) The correlation degree of the word "adjustment" with various emotional adjustment strategies. Distraction means attention distraction strategy; suppression means expressive suppression strategy (the same hereinafer). The error line means *SE*. * means $p < 0.05$; ** means $p < 0.001$.

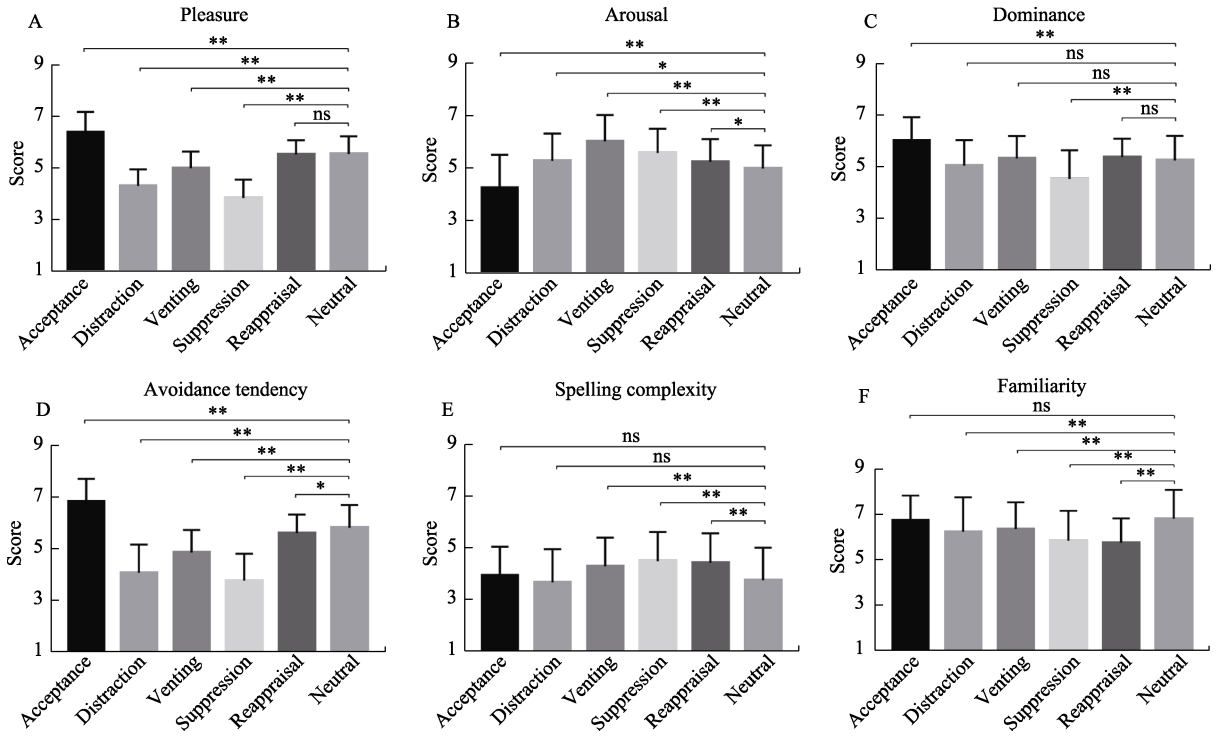

Figure 2. The comparison of the word attributes between five emotion-regulating words and neutral words. The error line means *SD*. * means $p < 0.05$; * * means $p < 0.001$.

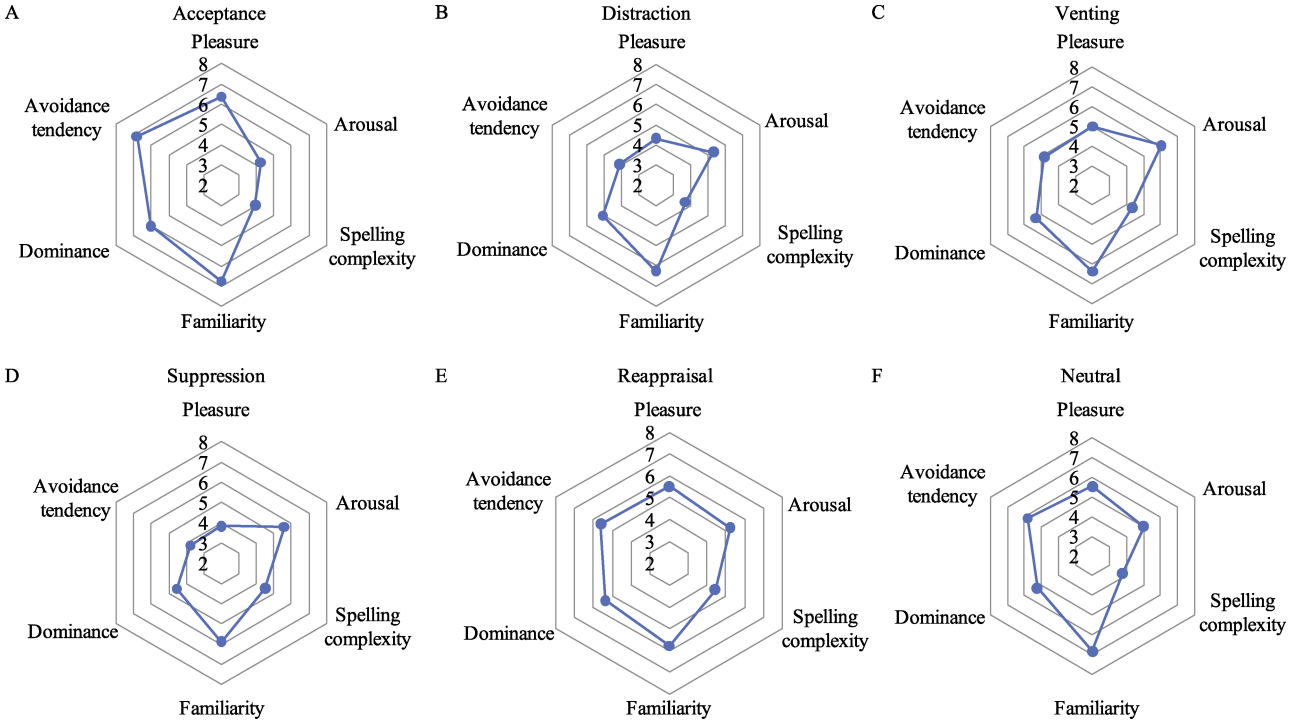

Figure 3. The linguistic properties of the five types of emotion regulation words and neutral words (radar map).

2.2.3 Gender difference analysis

The independent sample t-tests were conducted between males and females for the word attributes of each strategy. Results showed that there were only gender differences in the pleasure (t (126) = 2.09, p = 0.039, d = 0.37) and the familiarity (t (126) = −2.38, p = 0.019, d = 0.42). Males rated higher on the pleasure dimension than females for distraction words, and females were more familiar with the acceptance words than males.

2.2.4 Reliability test of the CERWS

The test-retest reliability was indexed by the correlation coefficient of the two tests. The test-retest reliability was r = 0.70, $p < 0.001$. The Clonbach α Coefficient of the CERWS was shown in Table 1. Kendall Coefficient of Concordance (w = 0.28, $p < 0.001$) was calculated by combining the two questionnaires.

Table 1
Clonbach's alpha coefficient of word attributes

Attribute	Strategy					
	Acceptance (19)	Distraction (13)	Venting (30)	Suppression (30)	Reappraisal (25)	Neutral (32)
Pleasure	0.850	0.671	0.797	0.872	0.742	0.878
Arousal	0.907	0.832	0.918	0.904	0.878	0.913
Writing complexity	0.927	0.932	0.944	0.947	0.94	0.972
Familiarity	0.905	0.928	0.943	0.945	0.898	0.967
Dominance	0.849	0.834	0.872	0.926	0.838	0.923
Motivational tendency	0.862	0.857	0.888	0.928	0.829	0.92

3 Study 2: Pilot test of the CERWS

3.1 Methods

3.1.1 Participants

A total of 196 female undergraduates between 18 and 22 years (M = 19.84, SD = 1.17) were recruited from Neijiang Normal University. The participants were randomly assigned to the control (34), cognitive reappraisal (32), venting (31), expressive suppression (33), reappraisal (33), and the attention distraction groups (33). Before the experiment, participants' emotional states and emotional regulation habits were measured. The emotional state was measured by STAI-state (Spielberger, 1970), STAI-trait (Spielberger, 1970), and Beck Depression Inventory (Beck & Bederamesfer, 1974). Emotion regulation habits of cognitive reappraisal and expressive suppression were measured using the emotion regulation scale (ERQ, Gross, 2003), and the habit of using acceptance was measured by the acceptance-action scale (AAQ, Hayes, et al., 2004). Results showed that there were no significant differences in state anxiety (F (5,190) = 1.56, p = 0.175), trait anxiety (F (5,190) = 1.83, p = 0.110), and depression (F (5,190) = 2.16, p = 0.061). There were no significant differences in the habitual use of cognitive reappraisal (F (5,190) = 0.60, p = 0.698), expression suppression (F (5,190) = 0.67, p = 0.650), and acceptance (F (5,190) = 0.59, p = 0.710).

3.1.2 Materials

(1) Emotional pictures. We used typical disgust pictures as emotion-inducing materials. We selected 120 disgust images and 30 neutral images from the International Affective Picture System (IAPS), the Chinese Affective Picture System (CAPS), and the internet. Because there is evidence that the emotion-regulatory effect is affected by emotional intensity (Shafir et al., 2016), 15 psychology graduate students were recruited to rate the emotional intensity of the 150 images using 9-point scale (pleasure: 1 = very unpleasant, 9 = very pleasant; arousal: 1 = very calm, 9 = very excited). According to the results, 15 images of moderate-intensity negative emotion (arousal 6.16 ± 0.61, pleasure 2.55 ± 0.38) were selected as the emotion-inducing materials, and fifteen neutral images (arousal 2.14 ± 0.21, pleasure 4.92 ± 0.42) were used as a neutral control. There were significant differences in the arousal (F (1,28) = 583.08, p < 0.001, η_p^2 = 0.95) and the pleasure (F (1,28) = 265.25, p < 0.001, η_p^2 = 0.90) between the negative and the neutral images.

(2) Material of implicit emotion regulation. We used the classic sentence-unscrambling task to prime implicit emotion regulation. For each emotion regulation strategy, 10 words were randomly selected from the CERWS. Using the selected words, we made 10 sentences for each emotion regulation strategy. Five words were randomly selected from the neutral words to form 5 neutral sentences. The 15 sentences together formed the priming material for each emotion regulation group. We randomly selected 15 neutral words from the CERWS to form 15 neutral sentences for the control group. All the sentences were divided into four parts (e.g., "1-help; 2-calmness; 3-resolve; 4-problem"), and one irrelevant word was also added to form a scrambled sentence (e.g., "1-help; 2-calmness; 3-resolve; 4-problem; 5-desk"). Participants need to choose 4 out of 5 elements to form a meaningful sentence (e.g., "2134; camness help resolve problem"). Two raters blind to the experimental aim were asked to rate the valence and arousal of the six types of sentences. Results showed that there was no significant difference in valence among the six types of sentences (F (5,84) = 2.25, p > 0.05), but there was a significant main effect of strategy type on arousal (F (5,84) = 6.11, p < 0.001, η_p^2 = 0.27). Further post-hoc comparisons showed there was no significant difference in arousal amongst the five emotion-regulatory sentences (p_{min} = 0.17). However, the five emotion-regulatory sentences were significantly higher than the neutral sentences in arousal rating (ps < 0.001).

3.1.3 Experimental design

This study used a mixed design, which included a between-participants factor (control, reappraisal, venting, suppression, distraction, and acceptance) and a within-participants factor (negative vs neutral pictures). The participants first completed the sentence-unscrambling task to implicitly activate emotion regulation goals (Figure 4). Each emotion-regulating group finished 10 emotion-regulatory sentences and 5 neutral sentences in a random order, whereas the control group finished 15 neutral sentences. After the sentence-unscrambling task, participants rated the task difficulty (1 = not at all difficult, 9 = very difficult) and the cognitive efforts required by the task (1 = very low, 9 = very high). After a short rest, the participants performed the emotional elicitation task, in which all groups of participants viewed negative and neutral pictures randomly and rated their emotional experience. The pictures were presented by a block-design, and each block included three negative or three neutral pictures. After viewing each block of pictures, participants were asked to rate their emotional valence (1 = very pleasant, 9 = very unpleasant) and arousal (1 = very calm, 9 = very excited).

3.1.4 Statistical analysis

One-way ANOVA was used to compare the emotional valence and arousal ratings of negative pictures between 6 experimental groups. The statistical analysis was conducted using SPSS 21.0.

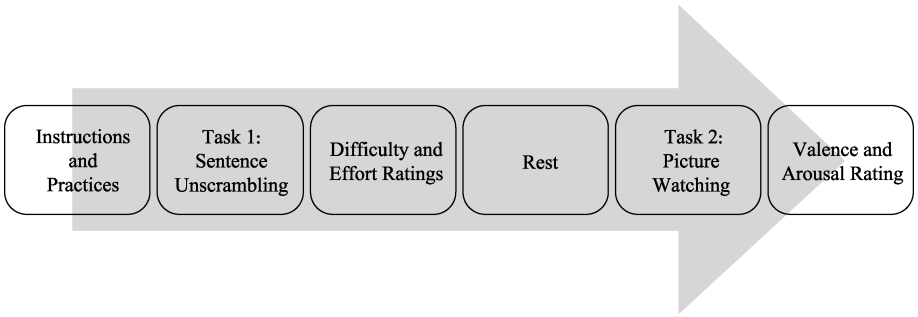

Figure 4. The experimental flow chart of pilot test of the CERWS.

3.2 Results

3.2.1 Manipulation Check

We first tested whether the cognitive efforts required by the sentence-unscrambling task and the task difficulty differed across the six experimental groups. Results showed that there was no significant group difference in the degree of effort (F (5,190) = 2.23, p = 0.053) and in the difficulty rating (F (5,190) = 1.44, p = 0.211).

Secondly, we tested whether the negative pictures could elicit participants' emotion effectively. The paired sample t-test was used to test the emotional valence and arousal ratings of neutral and negative pictures for the control group. Results showed that the valence and arousal of negative pictures were both significantly higher than those of neutral pictures (valence, t (33) = 13.60, p < 0.001, d = 2.33; arousal, t (33) = 12.34, p < 0.001, d = 2.12).

3.2.2 Test of implicit emotion regulation effect

In order to test whether implicit emotion regulation strategy was effective in reducing negative experience, we conducted one-way ANOVA analysis. The type of strategy was used as a between-participants factor, and the valence and arousal ratings of negative pictures were used as dependent variables. The main effects of strategy type were significant for both arousal (F (5,190) = 4.80, p < 0.001, η_p^2 = 0.112) and valence (F (5,190) = 4.06, p = 0.002, η_p^2 = 0.096) ratings.

Post-hoc tests found that the arousal ratings of the distraction (M = 6.84, SD = 1.10), suppression (M = 6.58, SD = 0.92) and reappraisal groups (M = 6.40, SD = 1.54) were significantly lower than those of the control group (M = 7.38, SD = 1.00). There was no significant difference between the acceptance, venting (M = 7.10, SD = 1.02), and the control group (M = 7.50, SD = 1.06) in arousal ratings (Figure 5a).

The valence ratings of the suppression (M = 7.00, SD = 1.14) and the reappraisal groups (M = 7.09, SD = 1.08) were significantly lower than those of the control group (M = 7.69, SD = 0.99). There was no significant difference amongst the control, the distraction (M = 7.47, SD = 1.20), the acceptance (M = 7.53, SD = 0.90), and the venting groups in valence (M = 7.99, SD = 0.87) (Figure 7B).

4 Discussion

This study aims to establish a standard system of emotion regulation words with multiple attribute dimensions to meet the research needs of implicit emotion regulation. First, we selected the words that only matched one emotion regulation strategy and eliminated the ambiguous words based on the degree of correlation between emotion regulation words and multiple emotion regulation strategies. Then, participants rated these words on the dimensions of pleasure, arousal, dominance, motivational tendency, familiarity, and writing complexity. The reliability and validity of the CERWS were satisfactory, shown by the data of test-retest reliablility, internal-consistency coefficient, and inter-rater consistency. We also tested whether these words can initiate effective implicit emotion regulation through a pilot test, and the emotion-regulatory validity of distraction, reappraisal, and suppression words were verified.

In terms of the word attributes, we found that the acceptance words are characterized by high pleasure, high dominance, high motivational tendency, and low arousal. The attentional distraction words are characterized by high arousal, low pleasure, and

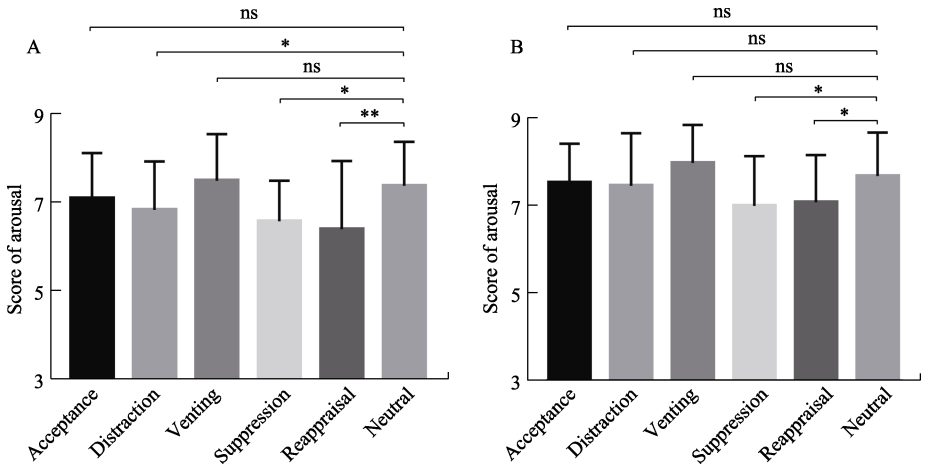

Figure 5. The comparison of emotional arousal (a) and valence (b) ratings between the emotion-regulatory groups and the control group. Error line means *SD*. * means p < 0.05; ** means p < 0.001.

low motivational tendency. The venting words are characterized by high arousal, low pleasure, and low tendency. The suppression words are characterized by high arousal, low pleasure, low dominance, and low tendency. The reappraisal words are characterized by high arousal and low motivational tendency. On the familiarity ratings, there was no significant difference between acceptance and neutral words, and the other emotion regulation words were lower than neutral words. On the ratings of writing complexity, there was no significant difference between acceptance, distraction, and neutral words, and other strategy words are higher than neutral words. These findings showed that acceptance words are more positive, whereas expressive suppression words are more negative, which is consistent with previous research (Cheng et al., 2009). The attributes of the five emotion regulation strategy words are different. Therefore, researchers should take these factors into account when choosing the emotion regulation words from the CERWS. For example, we may consider matching the emotional and linguistic attributes of emotion-regulating words under different conditions of implicit emotion regulation.

In addition, we found that males rated higher than females on the pleasure dimension of distraction words, suggesting that males experienced higher levels of pleasure than females when they saw attention-distracting words. This is consistent with previous research suggesting that males are more likely than females to use attention distraction strategy (Trives et al., 2016). In addition, women are more familiar with acceptance words than men, suggesting that women are more likely to use words related to acceptance in daily life. This is also consistent with previous findings that women use acceptance more consistently as they age than men (Nolen-Hoeksema & Aldao, 2011). These findings suggest that gender differences should be taken into account in the study of implicit emotion regulation.

Moreover, we examined the effects of different implicit emotion regulation strategies using the words selected from the CERWS. We found that implicit expressive suppression and cognitive reappraisal were effective in reducing negative experience, consistent with previous studies (Chen et al., 2017; Yuan et al., 2015). For the implicit attention distraction strategy, Li and Yuan (2018) showed that the implicit attention distraction strategy effectively regulates the negative emotion induced by the frustration task. Consistently, we further found that implicit attention distraction can regulate the emotional arousal elicited by negative pictures. We did not find the regulatory effects of implicit acceptance and venting strategies. However, because this study only used disgust pictures of moderate intensity to induce emotion, the implicit acceptance and the venting strategies may still have moderating effects on other emotions. For example, the implicit venting strategy had a trend of up-regulation effect on anger (Mauss et al., 2007), and the implicit acceptance strategy reduced frustration (Ding et al., 2015). In brief, different implicit strategies may have different effects on different emotions. In the future, researchers who use CERWS should select appropriate emotion regulation strategies according to their research purposes.

It should be noted that although the typical use of CERWS is to initiate implicit emotion regulation, the CERWS can also be used to initiate explicit emotion regulation. For example, researchers often need to use words specific to emotion regulation goals to remind participants of their current emotion regulation strategies, especially in studies involving the choice of emotional regulation strategies (Shafir et al., 2015). In addition, for the study of implementation intention in emotion regulation, researchers usually use words that reflect specific emotion regulation meanings to establish the relationship between certain situations and response style. For example, “If I see a spider, I'll stay calm and relaxed” (Gallo et al., 2009; Ma et al., 2019; Chen et al., 2021). Therefore, the CERWS can promote future research of emotion regulation from multiple aspects.

Some limitations should be acknowledged. First, study 1 has a small sample size (N = 128). The validity of the emotion-regulating words needs to be further verified and improved through the accumulation of sample size in future studies. Second, study 2 only used disgust pictures to induce negative emotions, and future research needs to target at more realistic negative emotions (such as anxiety and depression) or positive emotions. Third, studies have shown that implicit emotion regulation strategies are more effective in regulating physiological emotion responses (Williams et al., 2009; Yuan et al., 2015). However, the effects of implicit emotion regulation on physiological responses using CERWS words have not been verified and need to be further addressed in future. Lastly, only one four-character idiom was included into the attentional distraction strategy after examination. Therefore, we have not provided enough materials for the idiom matching task of the attention distraction strategy, which needs to be supplemented by the follow-up research. However, researchers can still use the two-character words of CERWS to initiate the implicit attention distraction.

In summary, this study first screened out five kinds of emotion-regulatory strategy words and neutral words, and then compiled these words into a standardized Chinese Emotion Regulation Word System (CERWS) with satisfactory relability and validity. The emotional and linguistic attributes of the words were rated on six dimensions: pleasure, arousal, dominance, motivational tendency, familiarity, and writing complexity. Gender differences in the attributes of emotion-regulating words are also explored and discussed. This study also used an experimental design to test the effectiveness of the emotion regulation words in reducing negative experience, providing a reference for future studies using CERWS to initiate emotion regulation.

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Appendix

Table 1
Attributes of acceptance words

Word List	Pleasure	Arousal	Dominance	Motiv. Tend.	Writ. Complex.	Familiarity	Word List	Pleasure	Arousal	Dominance	Motiv. Tend.	Writ. Complex.	Familiarity
接受	5.89	4.58	5.43	6.52	3.59	7.06	兼容并包	6.54	4.37	6.13	7.09	4.55	5.84
包容	6.54	4.70	6.01	6.87	3.56	6.95	顺其自然	6.55	3.81	6.02	7.06	4.27	7.15
接纳	6.41	4.56	5.95	6.84	4.00	6.82	随遇而安	6.33	3.85	5.91	6.74	4.63	7.13
坦然	7.10	4.42	6.21	7.50	3.80	6.73	泰然处之	6.76	3.74	6.20	7.21	4.52	6.40
容纳	5.95	4.35	5.80	6.66	3.96	6.54	处变不惊	6.79	4.10	6.15	7.13	3.85	6.56
自然	6.97	4.31	6.48	7.45	3.47	7.49	从容不迫	6.91	3.95	6.39	7.38	3.45	6.99
接收	5.76	4.61	5.43	6.29	3.74	6.93	安之若素	6.29	3.55	6.17	6.75	4.12	5.84
允许	5.91	4.91	6.02	6.21	2.92	7.16	镇定自若	6.34	3.72	6.27	6.72	4.59	6.66
海纳百川	6.81	4.38	6.38	7.34	4.08	6.77	来者不拒	4.89	5.13	5.58	4.95	3.91	6.52
自然而然	6.53	3.79	6.08	7.18	3.96	7.04							

Table 2
Attributes of distraction words

Word List	Pleasure	Arousal	Dominance	Motiv. Tend.	Writ. Complex.	Familiarity	Word List	Pleasure	Arousal	Dominance	Motiv. Tend.	Writ. Complex.	Familiarity
分散	4.63	5.03	5.03	4.19	3.72	6.18	脱离	4.27	5.63	4.99	3.84	4.55	5.91
分心	3.45	5.05	4.67	3.43	2.59	6.65	转变	5.64	5.33	5.59	5.30	4.09	6.49
发散	5.22	4.77	5.20	4.81	4.02	5.75	分神	3.55	5.09	4.81	3.23	3.41	6.44
离开	3.77	5.71	5.21	3.45	3.88	6.63	远离	3.51	5.77	4.77	3.20	4.02	6.41
转移	4.93	5.10	5.08	4.56	4.25	6.16	走开	3.16	5.61	4.89	3.48	2.81	6.80
转化	5.33	5.05	5.25	5.16	3.98	5.80	一心二用	3.66	5.36	5.07	3.77	2.48	6.77
迁移	4.94	5.17	5.09	4.61	4.04	5.43							

Table 3
Attributes of venting words

Word List	Pleasure	Arousal	Dominance	Motiv. Tend.	Writ. Complex.	Familiarity	Word List	Pleasure	Arousal	Dominance	Motiv. Tend.	Writ. Complex.	Familiarity
揭露	4.37	5.82	5.52	4.76	5.34	5.83	不由自主	5.04	6.10	4.56	4.85	3.17	6.82
疏通	5.66	4.72	5.38	5.95	5.02	6.01	按捺不住	4.73	6.30	4.64	4.17	4.80	6.38
释放	6.52	4.84	5.89	6.52	4.75	6.42	怒火冲天	3.29	6.93	4.30	3.06	4.27	6.37
发表	6.02	5.37	6.08	6.25	3.58	6.66	情不自禁	5.24	6.32	4.52	4.88	4.59	7.12
表达	5.86	5.04	6.28	6.29	3.38	7.01	忍无可忍	3.53	6.82	4.34	3.45	3.98	6.80
表现	5.75	5.28	6.02	6.08	3.66	7.05	拍案而起	4.02	6.91	5.09	3.93	4.61	5.87
表露	5.95	5.30	5.84	5.91	4.82	6.00	不顾一切	4.72	6.69	4.95	4.16	3.66	6.64
展开	5.54	4.73	5.84	5.87	3.63	6.74	喜形于色	5.55	6.18	5.05	4.71	4.17	6.34
抒发	6.50	5.15	6.33	6.65	3.62	6.47	怒发冲冠	3.77	7.17	4.72	3.34	4.98	6.29
展露	5.72	5.02	5.78	5.91	4.66	5.88	嚎啕大哭	3.52	6.87	4.70	3.30	5.79	6.59
显示	5.59	4.77	5.63	5.88	3.19	6.78	揭竿而起	4.73	6.65	5.39	4.02	5.18	5.69
爆发	5.14	6.75	5.73	4.55	5.12	6.52	以牙还牙	4.18	6.48	5.54	4.12	3.25	6.23
怒放	5.85	6.55	5.95	5.38	4.47	5.92	针锋相对	4.05	6.58	5.38	3.89	4.85	6.49
不能自已	4.22	6.11	4.16	4.10	3.40	6.39	以眼还眼	4.21	6.41	5.54	4.02	4.23	5.90
喜不自胜	5.71	6.45	5.01	5.41	4.02	5.91	报仇雪耻	4.91	6.66	5.73	4.27	5.02	6.16

Table 4
Attributes of expressive suppression words

Word List	Pleasure	Arousal	Domi-nance	Motiv. Tend.	Writ. Complex.	Familiarity	Word List	Pleasure	Arousal	Domi-nance	Motiv. Tend.	Writ. Complex.	Familiarity
禁止	3.23	6.18	3.64	2.88	3.85	6.71	关闭	4.07	5.61	4.42	3.86	3.16	6.45
限制	3.23	6.11	3.62	2.98	4.53	6.20	不露声色	4.80	4.93	5.63	4.88	4.67	6.29
隐藏	4.35	5.15	4.58	3.76	5.66	6.28	面不改色	5.13	4.70	5.77	5.45	3.82	6.47
封锁	3.49	5.77	3.73	3.02	4.74	5.45	无动于衷	3.98	4.66	5.36	4.08	3.94	6.64
囚禁	2.03	6.60	3.15	2.24	4.35	4.79	屏气吞声	3.81	5.38	4.72	3.52	4.45	5.44
保留	5.20	4.69	5.42	5.45	3.76	6.70	隐忍不发	4.07	5.33	4.82	3.66	4.62	5.61
压抑	2.95	6.04	3.98	3.12	3.69	5.99	强颜欢笑	3.40	5.96	4.64	3.39	5.14	6.45
掩盖	3.52	5.55	4.41	3.41	4.70	5.91	按行自抑	3.89	5.69	4.70	3.76	4.58	4.17
控制	4.27	5.83	4.81	4.17	4.38	6.48	省身克己	4.91	5.02	5.07	4.84	4.38	4.36
忍受	3.72	5.98	4.18	4.08	3.76	6.66	藏怒宿怨	3.67	5.71	4.70	3.32	6.48	3.36
掩饰	3.53	5.85	4.38	3.80	4.93	6.16	神情漠然	3.72	4.86	5.34	3.69	5.00	5.74
克制	4.51	6.02	4.38	4.29	4.09	6.34	唾面自干	4.02	5.25	4.55	3.97	5.07	3.70
抑制	3.78	6.08	4.00	3.70	4.63	5.95	吞声忍气	3.23	5.74	4.52	3.37	4.30	6.54
隐瞒	3.18	5.85	4.34	3.34	5.49	5.98	委曲求全	3.09	5.75	4.09	2.82	4.41	6.26
忍耐	4.40	5.66	4.56	4.44	4.29	6.38	欲言又止	3.95	5.65	4.68	3.88	3.99	6.67

Table 5
Attributes of cognitive reappraisal words

Word List	Pleasure	Arousal	Domi-nance	Motiv. Tend.	Writ. Complex.	Familiarity	Word List	Pleasure	Arousal	Domi-nance	Motiv. Tend.	Writ. Complex.	Familiarity
反省	4.98	5.26	5.34	5.52	3.86	6.66	塞翁失马	5.68	5.48	5.09	5.45	5.29	6.73
反思	5.23	4.88	5.51	5.96	3.23	6.60	改弦易调	4.68	5.27	5.07	4.52	5.20	4.45
思索	6.07	4.42	6.01	6.60	4.25	6.47	朝过暮改	4.72	5.47	5.01	4.55	5.57	4.71
考量	5.50	4.77	5.54	5.89	4.18	5.95	柳暗花明	6.58	5.61	5.47	6.58	4.88	6.92
重建	5.17	5.18	5.31	5.20	4.72	5.71	弃旧图新	4.88	5.40	5.46	4.74	4.48	4.94
重构	5.28	5.02	5.25	5.18	4.56	5.34	亡羊得牛	5.61	5.49	4.98	5.43	3.53	4.29
变革	5.58	5.99	5.28	5.16	3.95	5.52	得失相当	5.29	5.12	5.23	5.45	3.84	5.40
辨析	5.60	4.84	5.70	5.93	5.09	6.01	乞浆得酒	5.46	5.52	4.91	5.41	5.16	3.73
明察	6.31	5.03	6.00	6.52	4.72	6.00	风移俗改	4.70	5.03	4.91	4.70	4.70	4.23
分析	6.12	4.63	6.21	6.58	3.18	7.05	改朝换姓	4.57	5.38	4.88	4.46	4.59	5.40
查明	6.29	5.05	6.18	6.71	3.73	6.19	否极泰来	6.26	5.69	5.45	6.33	4.70	6.34
因祸得福	6.19	5.82	5.09	5.76	4.84	6.82	别开生面	5.97	5.58	5.59	6.20	3.78	6.27
祸福相依	5.38	5.34	5.18	5.42	4.84	6.70							

Table 6
Attributes of neutral words

Word List	Pleasure	Arousal	Domi-nance	Motiv. Tend.	Writ. Complex.	Familiarity	Word List	Pleasure	Arousal	Domi-nance	Motiv. Tend.	Writ. Complex.	Familiarity
火车	5.54	5.23	5.21	5.91	2.66	7.38	打印	5.17	4.66	5.61	5.28	2.95	7.35
驶出	5.40	5.34	5.20	5.69	3.68	6.73	顾客	5.18	4.76	5.18	5.42	4.29	6.90
上映	5.97	5.94	4.98	6.55	3.33	7.33	挑选	5.51	4.96	6.24	5.68	3.99	6.79
人们	5.41	4.41	5.50	6.23	2.64	7.66	学生	5.53	4.58	5.45	6.38	3.09	8.01
走向	5.36	5.02	5.41	5.81	2.81	6.83	行人	5.37	4.52	5.50	5.72	2.75	7.33
阿姨	4.92	4.87	5.06	5.16	4.09	7.41	打扫	4.98	5.02	5.71	5.14	3.14	7.33
捡起	5.30	4.71	5.97	5.74	3.69	6.88	千丝万缕	5.34	4.98	5.06	5.27	4.66	6.15
飘着	5.66	4.13	5.16	6.08	4.47	6.91	川流不息	5.54	4.99	4.84	5.77	4.25	6.59
球员	5.64	5.07	5.16	5.65	3.63	6.68	历历在目	5.55	5.42	5.27	5.65	3.65	6.44
花篮	6.03	4.53	5.30	6.17	4.07	6.62	人迹罕至	4.66	5.17	4.63	4.32	4.45	5.78
送到	5.48	5.00	5.53	5.80	3.42	6.70	地老天荒	6.16	5.47	4.88	6.48	4.50	6.02
我们	5.98	4.62	5.91	6.77	3.05	7.60	五湖四海	6.09	5.07	5.32	6.09	3.98	6.60
飞机	5.93	5.26	4.83	6.33	2.86	7.16	眼花缭乱	5.16	5.83	4.90	4.99	5.59	6.34
起飞	5.90	5.49	4.74	6.10	2.99	6.74	屈指可数	5.30	5.27	4.89	5.38	4.63	6.13
小溪	6.46	4.23	5.12	6.76	4.03	7.09	鲜为人知	5.13	5.57	4.74	5.40	4.41	5.98
流向	5.35	4.62	5.00	5.73	3.63	6.73	爱岗敬业	6.41	5.23	5.80	6.90	4.78	6.76