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Tracking Emotion: Eye-Tracking Insights into Expressive Flexibility and Context Sensitivity in Emotional Face Processing

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Effective emotion regulation is pivotal for psychological well-being and adaptive social functioning. A key facet of this regulatory capacity is *expressive flexibility* – the ability to modulate emotional expressions in accordance with situational demands. Theoretically, such flexibility should depend on *context sensitivity*, the capacity to detect and interpret relevant contextual cues; yet, the cognitive-attentional mechanisms linking these constructs remain inadequately understood. Addressing this gap, the present study examined whether – and to what extent – expressive flexibility shapes dynamic visual attention to emotional information. To this end, we employed a classic visual search paradigm paired with eye-tracking technology to explore how attentional processes indicative of context sensitivity differ as a function of expressive flexibility. Sixty-five participants (52 females, average age 23.34 ± 2.13 years) with either high or low levels of expressive flexibility completed a visual search task using emotional faces as cues. The findings revealed that individuals with low expressive flexibility exhibited delayed detection of negative cues compared to positive ones, whereas those with high expressive flexibility showed no significant differences in processing emotional cues of different valences. Moreover, individuals with high expressive flexibility demonstrated faster attentional orienting and less prolonged attention to emotional cues compared to their low expressive flexibility counterparts. These findings advance our understanding of how individual differences in expressive flexibility shape context-sensitive attentional dynamics. By clarifying the attentional foundations of expressive flexibility, this study contributes to emotion regulation theory and suggests promising implications for clinical assessment, socio-emotional skills training, and the design of adaptive interventions.

Key words: expressive flexibility, context sensitivity, eye-tracking; individual difference

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Introduction

Consider the following scenarios: Scenario 1: A close friend gifts you a vintage shirt that you don't particularly like. How effectively can you display a more positive emotion than you genuinely feel in order to avoid making them uncomfortable? Scenario 2: At a workplace social event, you're talking to a colleague who frequently spits while speaking. How adept are you at suppressing your negative emotional expressions in this context? In social interactions, individuals often need to adjust their emotional expressions to align with contextual demands – amplifying positive emotional expressions in Scenario 1 and suppressing negative ones in Scenario 2. This ability to modulate displayed emotional expressions based on situational demands is referred to as *expressive flexibility* (EF, Burton & Bonanno, 2016). It represents a crucial dimension of regulatory flexibility, underscoring individual differences in how people manage emotional expression and suppression (Bonanno & Burton, 2013; Chen et al., 2018). Regulatory flexibility encompasses more than just flexible regulation of emotional expressions; it also involves the modulation of emotional experiences, timing, and the selection of emotion regulation strategies (LeBlanc et al., 2017). Recent research has increasingly emphasized the importance of expressive flexibility, as it is positively linked to better social adaptation (Bonanno et al., 2004) and mental health (Shangguan et al., 2022). Specifically, individuals with high expressive flexibility tend to experience greater life satisfaction (Chen et al., 2018), lower levels of depression (Chen & Bonanno, 2021), and reduced anxiety (Strickland & Skolnick, 2020). Therefore, understanding the individual differences in expressive flexibility is essential for fostering this capacity and promoting psychological well-being.

From a theoretical standpoint, the *Three Sequential Components of Regulatory Flexibility Model*, proposed by Bonanno and Burton (2013), offers a foundational framework for understanding individual differences in expressive flexibility. This model posits that emotion regulation flexibility is guided by three sequential components: context sensitivity, repertoire, and feedback responsiveness. Context sensitivity involves the recognition and evaluation of emotional cues within a given context, particularly those that evoke emotions. Repertoire refers to the deployment of a diverse array of regulatory strategies, while feedback responsiveness concerns the monitoring of a strategy's effectiveness and making adjustments as necessary. Among these components, *context sensitivity* is considered the first and most crucial step in flexible self-regulation (Aldao et al., 2015; Bonanno et al., 2020). In this phase, individuals assess the demands or opportunities presented by a situation and select appropriate strategies based on their detection and awareness of emotional cues within the context. Thus, context sensitivity may be intricately linked to expressive flexibility.

Despite the primary role of context sensitivity in the process flexible emotion regulation, limited empirical research has explored the relationship between expressive flexibility and context sensitivity. For instance, Southward and Cheavens (2017) found positive relations between context sensitivity and expressive flexibility in a longitudinal design and suggested that context sensitivity may serve as a compensatory skill for individuals to regulate emotions flexibly. Lenzo et al. (2020) demonstrated that both expressive flexibility and context sensitivity were significant predictors of emotional well-being, such as depression and stress, in a sample of healthcare workers using a cross-sectional design. Moreover, research has shown that deficits in context sensitivity exhibit worse flexibility in emotion regulation and are associated with poor clinical outcomes like depressive and anxious symptoms (Chen & Bonanno, 2021). These findings emphasized the primacy of context sensitivity in emotion regulation flexibility and mental health. However, existing evidence largely derives from questionnaire-based studies, with context sensitivity assessed almost exclusively through self-report instruments (e.g., the Context Sensitivity Index; Bonanno et al., 2020; Nardelli et al., 2024). While useful for capturing general tendencies, these measures lack objective precision and are ill-equipped to reflect the real-time, dynamic processes involved in perceiving and integrating multiple emotional cues – thereby overlooking the core mechanisms of context sensitivity. Besides, as we know, real-life social interactions present a wide array of emotional signals, such as facial expressions (Horstmann, 2003), body posture (Aviezer et al., 2012), vocal tone (De Gelder & Vroomen, 2000), and background scenes (Barrett & Kensinger, 2010), all of which convey rich emotional information. Among these, facial expressions are particularly significant as they play a central role in human communication and social interaction (Horstmann, 2003). Consequently, there is a pressing need for behavioral paradigms that can capture context sensitivity in real time, particularly in response to facial expressions as emotional cues.

Visual search tasks that incorporate emotional stimuli present a promising approach to assessing context sensitivity. Unlike go/no-go paradigms – which assess only facilitation or inhibition in response to isolated emotional cues (e.g., Myruski et al., 2017) – search paradigms recreate complex environments containing multiple, concurrent emotional signals. When coupled with eye-tracking technology—recognized for its millisecond-level resolution in capturing gaze allocation – these tasks offer precise, real-time insights into the temporal dynamics of visual attention (Hollingworth & Bahle, 2020). Specifically, eye-tracking enables the quantification of attentional orienting (e.g., time to first fixation) and attentional holding (e.g., fixation duration) within diagnostically relevant facial regions, thereby shedding light on the attentional mechanisms that support flexible emotion regulation.

Additionally, prior research suggests that emotion regulation capacity modulates both the early and sustained phases of visual processing during exposure to emotional stimuli, offering indirect evidence for the link between expressive flexibility and the dynamic process of context sensitivity. For example, individuals high in regulatory skill – particularly those who habitually employ cognitive reappraisal – exhibit distinctive gaze patterns characterized by prolonged fixation on diagnostic facial regions (e.g., the eyes and mouth), yielding faster and more accurate emotion recognition (Bebko et al., 2011). By contrast, individuals who rely on maladaptive strategies such as expressive suppression tend to avert their gaze from emotionally salient cues, resulting in attenuated attentional engagement and poorer recognition performance (Bebko et al., 2011). Eye-tracking research further demonstrates that instructing participants to reappraise negative images increases dwell time on key expressive features, mediating reductions in self-reported negative affect (Urry, 2010). Moreover, studies in clinical populations (e.g., depression, anxiety) reveal that emotion-regulation deficits exacerbate maladaptive gaze patterns – such as prolonged attention to negative facial cues – which both impair expressive flexibility and perpetuate affective symptoms (Imbert et al., 2024; Quigley et al., 2012). Collectively, these findings suggest a reciprocal feedback loop in which individuals' regulatory capacities shape visual attention – both in terms of attentional orienting and holding – which, in turn, influences the efficiency and flexibility of emotional information processing.

To summarize, while existing research has provided preliminary evidence for the relationship between expressive flexibility and context sensitivity, it has yet to thoroughly examine whether individuals with varying levels of expressive flexibility differ in their context sensitivity, particularly in the dynamic process of perceiving and processing emotional cues within a given context. To address these gaps, the current study employs a classic visual search paradigm to investigate individuals' detection of emotional stimulus cues (e.g., Moriya et al., 2014; Tan et al., 2018) and incorporates eye-tracking experiments to measure eye-tracking metrics in individuals with varying levels of expressive flexibility. Drawing upon the *Three Sequential Components of Regulatory Flexibility Model* (Bonanno & Burton, 2013), we conceptualize context sensitivity as the capacity to detect and adapt to emotionally salient cues in a goal-relevant manner. Eye-tracking indices serve as real-time proxies for this sensitivity: attentional orienting (e.g., time to first fixation, number of pre-fixations before entering the area of interest) captures the speed with which emotional cues are initially detected, while attentional holding (e.g., duration of first fixation, total fixation time, and number of fixations) reflects the depth and persistence of attention once engaged. Given that expressive flexibility reflects the ability to modulate emotional responses in alignment with situational demands, individuals high in this capacity are theorized to exhibit more efficient attentional responses – faster orienting and more flexible disengagement – when processing emotional information (Bonanno et al., 2004; Aldao et al., 2015). Empirical research further supports this notion, indicating that individuals with greater emotional regulatory capacity tend to exhibit more efficient visual processing of emotional stimuli (Bebko et al., 2011; Megreya & Latzman, 2020; Urry, 2010). Accordingly, we hypothesize that individuals with high expressive flexibility will display faster attentional orienting toward emotional faces, as evidenced by shorter times to first fixation and reduced fixation durations – markers of enhanced perceptual readiness and more adaptive allocation of attentional resources. Moreover, we expect them to exhibit shorter attentional holding, reflected in reduced duration of the first fixation, shorter total fixation time, and fewer fixations in areas of interest.

Methods

Experimental Design

The experimental design utilized a 2 (*expressive flexibility*: high, low) × 2 (*emotional face valance*: happy, angry) two-factor mixed design. Expressive flexibility served as the between-subjects variable, whereas emotional face valance operated as the within-subjects variable. The dependent variables encompassed two categories of eye movement metrics: *attention orienting metrics*, which included time to first fixation in the area of interest, the number of pre-fixations before entering the area of interest, and *attention holding metrics*: comprising the duration of the first fixation in the area of interest, total fixation time in the area of interest, and the number of fixations in the area of interest (e.g., DeNicola et al., 2013; Wang et al., 2015).

Participants

A prior analysis to determine the required sample size for this study was conducted using G*Power 3.1 (*F* tests, ANOVA: repeated measures, between factors; Number of groups: 2; Number of measurements: 2), with a medium effect size (*f* = 0.25), a statistical power of 0.80, and an alpha level of 0.05 (Cohen, 1988; Faul et al., 2007). Based on this analysis, a total of 66 participants was deemed necessary. To select participants with high and low levels of expressive flexibility, 223 university students completed the Flexible Regulation of Emotional Expression Scale (FREE, Chinese revised version, Chen et al., 2018). Based on the questionnaire scores, an expressive flexibility index was calculated (see Section Measures), and participants scoring in the top and bottom 27% were invited to participate in the experiment. Ultimately, 69 individuals from the target group voluntarily participated. Of the original sample, two participants were excluded due to incomplete eye-tracking data, and an additional two were excluded because of insufficient eye movement sampling rates, which fell below the acceptable threshold for reliable analysis. The final valid sample comprised 65 participants (52 females, 13 males, mean age 23.34 ± 2.13 years): 34 with high expressive flexibility and 31 with low expressive flexibility. The high expressive flexibility group consisted of 34 participants (27 females, 7 males, mean age 23.06 ± 1.69 years) with a mean FREE score of M = 70.53, SD = 5.15. The low expressive flexibility group consisted of 31 participants (25 females, 6 males, mean age 23.65 ± 2.52) with a mean FREE score of M = 44.45, SD = 6.49. A significant difference in FREE scores was observed between the high and low expressive flexibility groups, $t(63) = 18.03$, $p < .001$, $d = 4.45$, validating the effectiveness of the grouping. No significant difference was found in the male-to-female ratio between the two groups, $\chi^2 = .02$, $p = .90$. All participants were right-handed and had normal or corrected-to-normal vision. This study was approved by the Ethics Committee of the School of Psychology at Shanghai Normal University and informed consent was obtained from all participants in the current study.

Measures

The Chinese version of *Flexible Regulation of Emotional Expression Scale (FREE)* was adopted to screen targeted participants in the current study. This scale includes 16 items divided into two dimensions: the ability to enhance emotional expression (**Enhancement**) and the ability to suppress emotional expression (**Suppression**) (Chen et al., 2018; Shangguan et al., 2024). Participants assess, within given scenarios, the extent to which they can express more emotion than they actually feel and the extent to which they can enhance or conceal their emotions. The scale employs a 1-6 rating system (1 indicating “not at all” and 6 indicating “completely”). Following the guidelines of Burton & Bonanno (2016), the expressive flexibility score is calculated by first determining the total scores for both the enhancement and suppression dimensions. The score is then computed using the following formula: (Enhancement + Suppression) – |Enhancement – Suppression|, which represents the sum of the enhancement and suppression scores, minus the absolute difference between them. This approach captures both the ability to enhance and suppress emotions while considering the balance between these two dimensions (Burton & Bonanno, 2016; Chen et al., 2018), and has been adopted in numerous related studies (e.g., Ang & Tsai, 2025; Shangguan et al., 2025). Higher scores indicate greater ability of expressive flexibility. The fit indices for this scale meet acceptable standards: $\chi^2/df = 2.12$, RESEA = 0.051, CFI = 0.931, TLI = 0.913, SRMR = 0.064. The internal consistency coefficient (Cronbach’s α) for this scale in the current study is 0.85.

Materials

The emotional face pictures were selected from the *Chinese Facial Affective Picture Sys-*

tem (Gong et al., 2011), in which six neutral facial pictures, one happy and one angry facial picture were selected. Using the selected pictures, we created stimulus images for each experimental trial arranged in a circular distribution (e.g., Tan et al., 2018; Wang et al., 2015). Each stimulus image measured 1280 × 720 pixels, with each image within the stimulus measuring 425 × 369 pixels. The emotional facial images were evenly distributed in a circular ring around the central fixation point on the screen, with a visual angle of 16.66° × 8.38°. A total of eighteen trails were consisted in this experiment, and no stimulus material was repeated. Examples of the three types of stimulus materials and areas of interest are illustrated in Figure 1.

Experimental Instruments and Procedures

The Tobii TX300 eye-tracking system was utilized to present stimuli and record both behavioral and eye-tracking data. The experiment was conducted in a standard eye-tracking laboratory, with a sampling rate of 120 Hz. The eye-tracker's display size was 23 inches, and the screen resolution was set at 1366 × 768 pixels. The distance between the participants and the display was approximately 64 centimeters, determined through a calibration process conducted before the formal experiment.

Prior to the experiment, participants signed an informed consent form for psychological research. The eye-tracking experiment began with a five-point calibration. After participants read the instructions and understood the experimental requirements, they proceeded to the visual search task. The task started with a fixation point displayed for 500 ms, followed by the presentation of a stimulus image. Participants were asked to determine whether there was an emotional face in the presented stimulus image. Upon completion of the experiment, participants received corresponding compensation (25 RMB, around 3.5 USD).

Eye-Tracking Metrics

The present study employed a set of eye-tracking indices centered on predefined areas of interest to capture two core components of visual attention: attentional orienting and attentional holding. Attentional orienting was assessed using the following metrics: 1) Time to first fixation – defined as the latency between stimulus onset and the participant's initial fixation within the target areas of interest. This measure reflects the speed of attentional allocation, with shorter latencies indicating more rapid orientation to emotionally salient cues. 2) Number of pre-fixations before entering the area of interest – refers to the total number of fixations occurring between stimulus onset and the first fixation within the areas of interest. A lower number indicates a quicker attention shift to the tar-

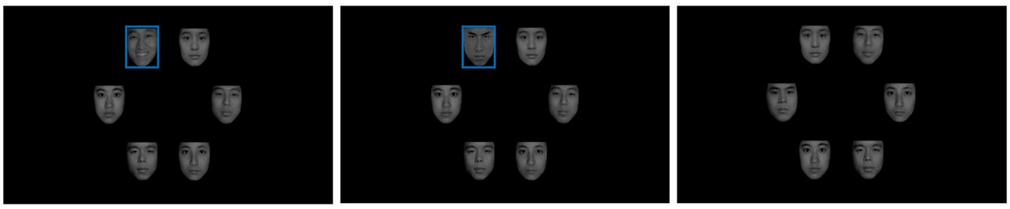


Figure 1 Three types of Stimulus Materials. Areas of Interest are highlighted with blue rectangles.

get stimulus. Attentional holding was evaluated via the following indicators: 1) Duration of first fixation – denotes the duration of the initial fixation within the target area of interest, indicating the initial processing time dedicated to the target stimulus. 2) Total fixation time – refers to the cumulative time spent fixating within the area of interest, representing the overall processing time dedicated to the target stimulus. 3) Number of fixations – refers to the total number of fixations within the area of interest, reflecting the total number of processing attempts for the target stimulus. Together, these metrics offer a comprehensive profile of both the temporal dynamics and sustained engagement components of attentional processing in response to emotional facial cues.

Data Analysis

Eye-tracking data were exported using Tobii Studio 3.2.2.0 software. Trials classified as extreme, defined as those exceeding three standard deviations from the mean of the raw eye-tracking data, were excluded from the analysis to ensure data accuracy and reliability. All measures, experimental conditions, and data exclusions were reported in this paper for transparency and rigor. The data were then subjected to a 2 (*expressive flexibility level*: high, low) × 2 (*emotional face valance*: happy, angry) repeated measures analysis of variance (RM-ANOVA) using SPSS 26.

Results

Manipulation Check: Emotional Face Images and Potential Gender Differences

Although the emotional face images used in the current study were selected from the standardized Chinese Facial Affective Picture System (Gong et al., 2011), a more rigorous manipulation check was conducted to verify the effectiveness of the experimental materials. To this end, we recruited 32 college students (18 males, 14 females; mean age 26.41 ± 2.88) to assess the valance and arousal of the selected images (happy vs. angry face pictures). The results revealed a significant difference in valance between the happy and angry faces, $t = 819.44$, $p < .001$, $d = 289.72$, no significant difference in arousal dimension, $t = .094$, $p = .51$, suggesting that the materials were appropriate for use in the current study.

Additionally, to further examine potential gender differences in expressive flexibility, a 2 (*expressive flexibility level*: high, low) × 2 (*gender*: male, female) analysis of variance (ANOVA) was conducted with expressive flexibility as dependent variable. The results revealed no significant main effect of *gender*, $F(1,61) = .48$, $p = .49$, and no interaction effect between *expressive flexibility level* and *gender*, $F(1,61) = 1.14$, $p = .29$. These findings suggest that gender did not systematically influence expressive flexibility in the current study.

Descriptive Statistics

The descriptive of eye movement indices of high and low levels of expressive flexibility are presented in Table 1.

Attention Orientating

Time to First Fixation in the Area of Interest

The results of time to first fixation in the area of interest revealed a significant main effect of *emotional face valance*, $F(1,63) = 13.43$, $p < .001$, $\eta^2_p = .18$, with the time to first fixation on the happy face significantly shorter than that on the angry face. The main effect of *expressive flexibility* was not significant, $F(1,63) = .13$, $p = .72$, while the interaction effect between *emotional face valance* and *expressive flexibility* was significant, $F(1,63) = 4.51$, $p = .04$, $\eta^2_p = .07$. Further analysis of simple effects indicated that for individuals with high expressive flexibility there was no significant difference in time to first fixation between happy and angry faces, $F(1,63) = 1.25$, $p = .27$, while for individuals with low expressive flexibility the time to first fixation on the angry face was significantly longer than on the happy face, $F(1,63) = 16.01$, $p < .001$, $\eta^2_p = .20$ (see Figure 2).

Number of Pre-Fixations before Entering the Area of Interest

The analysis of the number of pre-fixations before entering the area of interest revealed a significant main effect of *emotional face valance*, $F(1,63) = 16.67$, $p < .001$, $\eta^2_p = .21$, with the number of pre-fixations before entering the area of interest for the happy face was significantly lower than for the angry face. The main effect of *expressive flexibility* approached conventional significance, $F(1,63) = 3.46$, $p = .07$, $\eta^2_p = .05$. Notably, individuals with high expressive flexibility exhibited fewer pre-entry fixations than those with low expressive flexibility (see Figure 3A). The observed effect size ($\eta^2_p = .05$) indicates a moderate magnitude of effect (Cohen, 1988), suggesting a potentially meaningful difference. No interaction effect between the two was found, $F(1,63) = 2.46$, $p = .12$.

Attention Holding

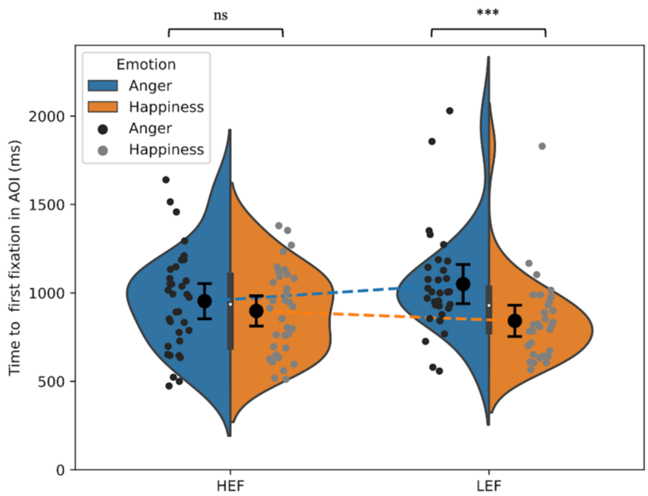
Duration of First Fixation in the Area of Interest

The analysis of the duration of first fixation in the area of interest revealed no significant results of either main effects or interaction effect, $Fs \leq 1.5$, $ps > .05$.

Table 1 *Means and standard deviation of eye-tracking indicators in different groups*

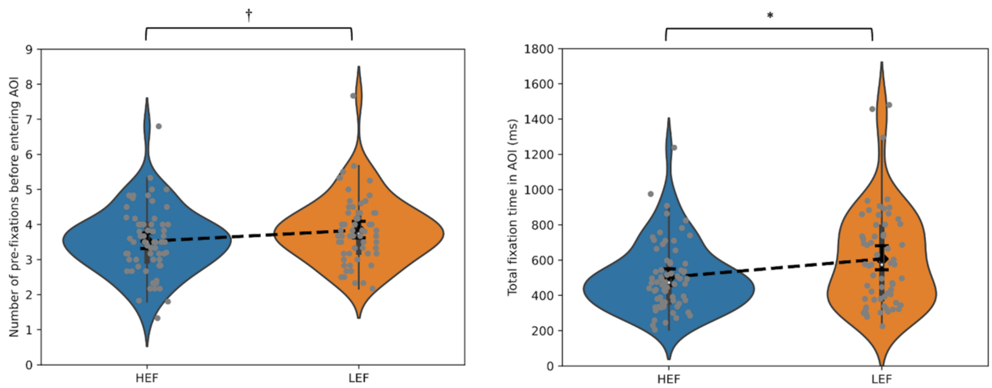
Eye-tracking Indices	High expressive flexibility (n = 34)		Low expressive flexibility (n = 31)	
	Anger	Happiness	Anger	Happiness
Time to first fixation in AOI (ms)	953.45 ± 285.35	898.12 ± 244.86	1049.91 ± 302.03	842.18 ± 241.22
Number of pre-fixations before entering AOI	3.70 ± .17	3.34 ± .13	4.24 ± .18	3.43 ± .14
Duration of fist fixation (ms)	233.54 ± 64.42	248.86 ± 61.24	239.50 ± 55.70	245.83 ± 49.72
Total fixation time (ms)	561.67 ± 222.69	445.02 ± 141.09	702.78 ± 312.99	510.87 ± 198.40
Number of fixations	2.41 ± .17	1.96 ± .11	2.79 ± .18	2.11 ± .12

Note. AOI refers to area of interest.



Note. HEF refers to high expressive flexibility, LEF refers to low expressive flexibility, AOI refers to area of interest, ns refers to not significant, *** refers to $p < 0.001$.

Figure 2 The interaction effect between emotional face valance and expressive flexibility on time to first fixation in AOI (ms).



Note. HEF refers to high expressive flexibility, LEF refers to low expressive flexibility, AOI refers to area of interest, † refers to $0.05 < p < 0.1$, * refers to $p < 0.05$.

Figure 3 The main effect of expressive flexibility on number of pre-fixations before entering AOI (A) and total fixation time in AOI (ms) (B).

Total Fixation Time in the Area of Interest

The analysis of the total fixation time in the area of interest revealed a significant main effect of *emotional face valance*, $F(1,63) = 28.70$, $p < .001$, $\eta^2_p = .31$, indicating that the total gaze duration for angry faces was longer than for happy faces. There was also a significant main effect of *expressive flexibility*, $F(1,63) = 4.64$, $p =.04$, $\eta^2_p = .07$, showing that participants with low expressive flexibility had a longer total fixation time compared to those with high expressive flexibility (see Figure 3B). However, the interaction effect between the two was not significant, $F(1,63) = 1.71$, $p = .20$.

Number of Fixations in the Area of Interest

The analysis of the number of fixations in the area of interest indicated a significant main effect of *emotional face valance*, $F(1,63) = 27.03$, $p < .001$, $\eta^2_p = .30$, with the number of fixations being greater for angry faces compared to happy faces. The main effect of the *expressive flexibility* was not significant, $F(1,63) = 2.19$, $p = .14$. Furthermore, the interaction effect between the two was not significant, $F(1,63) = 1.18$, $p = .28$.

Discussion

Theoretical frameworks regarding regulatory flexibility, particularly the *Three Sequential Components of the Regulatory Flexibility Model* (Bonanno & Burton, 2013; Pruessner et al., 2020), underscore the strong correlation between context sensitivity and adaptive emotion regulation. Despite the increasing interest in expressive flexibility as a fundamental element of this adaptive regulation, empirical studies examining its relationship with context sensitivity remain limited. This study aims to address this gap by using eye-tracking technology to examine the connection between expressive flexibility and context sensitivity during a classic visual search task. Our findings provide some of the first empirical evidence that individual differences in expressive flexibility influence the dynamics of context sensitivity, particularly in the perception of emotional cues. Specifically, individuals exhibiting higher levels of expressive flexibility displayed quicker attention orientation and diminished attention holding compared to their lower expressive flexibility ones.

Our findings indicate that the valence of emotional faces significantly influences visual search processes. Specifically, happy faces showed a clear advantage across several measures: they were associated with faster time to first fixation within the area of interest, fewer fixations before entering the area of interest, shorter total fixation duration, and a lower overall number of fixations compared to angry faces. These findings corroborate the well-documented "happiness superiority effect", which posits that happy facial expressions are detected and recognized more rapidly and accurately than other emotional expressions, including anger (Becker et al., 2011; Calvo & Nummenmaa, 2008). This effect has been further substantiated by recent empirical evidence from visual search paradigms directly comparing happy and angry expressions. For instance, Halamová et al. (2023) demonstrated that happy faces were more efficiently identified in complex visual arrays, while Savage et al. (2016) compared the superiority of happy expressions over angry ones and indicated the critical role of emotional stimulus. The diagnostic cue hypothesis may account for these observations, as the pronounced curvature of the mouth in happy expressions serves as a salient perceptual cue that expedites recognition (Tan et al., 2018). Additionally, the frequent exposure to happy faces in daily life may enhance perceptual fluency, thereby further facilitating their rapid recognition (Xu et al., 2019; Yu et al., 2018). Notably, these processing advantages were consistent across individuals regardless of their expressive flexibility, suggesting that the observed effects are primarily driven by intrinsic stimulus properties rather than by observer-specific regulatory capabilities. Collectively, these data contribute to a refined understanding of the interplay between perceptual mechanisms and emotional expression processing, advancing theoretical models of attentional allocation in emotion recognition.

Secondly, regarding the differences in emotional detection between individuals with high and low expressive flexibility, a significant difference was observed in total fixation duration, with the high flexibility group displaying significantly shorter total fixation times compared to the low flexibility group. Although the difference in the number of pre-fixations before entering the area of interest was not statistically significant, the moderate effect size ($\eta^2_p = .05$) suggests a possible trend, with high expressive flexibility individuals showing fewer fixations. Given the exploratory nature of this finding, interpretation should remain cautious (e.g., DeNicola et al., 2013; Wang et al., 2015). Taken together, our findings may suggest that individuals with high expressive flexibility exhibit faster attentional orientation, greater search efficiency, and reduced processing time, facilitating more rapid detection and evaluation of emotional information within a given context. This evidence supports the notion that variations in expressive flexibility are indicative of contextual sensitivity (Bonanno & Burton, 2013; Myruski et al., 2017). The results are also consistent with prior research examining the relationship between the components of emotion regulation flexibility (Chen & Bonanno, 2021), indicating that expressive flexibility is a multifaceted phenomenon involving several subcomponents. Contextual sensitivity, as an initial and critical phase, may play a pivotal role in its relationship with expressive flexibility – an association that merits further empirical investigation.

Further, our results revealed an interaction between emotional facial valence and group differences in time to first fixation within the area of interest among individuals with varying levels of expressive flexibility. Specifically, the results showed no significant difference in time to first fixation for either happy or angry faces among individuals with high expressive flexibility. However, for those with low expressive flexibility, the time to first fixation was significantly longer for angry faces compared to happy faces. This finding suggests that individuals with low expressive flexibility may experience delays in detecting or attending to certain emotional information, particularly negative stimuli, which could hinder their ability to flexibly express or suppress emotions in subsequent situations. Future research should further explore the boundary effects in the processes of contextual and emotional information detection and recognition among individuals with different levels of expressive flexibility.

Drawing on the present findings, we observed a clear “happiness superiority effect” in the detection of emotional faces, along with individual differences in processing angry expressions between high and low expressive flexibility groups within an East Asian sample. These results are noteworthy as they offer culturally contextualized evidence of emotional face processing, particularly in relation to individual variability in expressive flexibility. Prior cross-cultural research suggests that Western and East Asian observers adopt distinct gaze strategies when viewing emotional faces. For instance, Falon et al. (2024) found that Western Europeans exhibit early attentional bias toward the central features of negative cues, while East Asians tend to distribute gaze more diffusely, potentially dampening early detection of negativity. Similarly, Miellet et al. (2012) showed that Western participants rely on a triangular scan path (eyes–mouth–eyes), whereas East Asians favor extrafoveal processing – differences that disappear when central facial regions are masked, indicating the influence of culturally learned scanning strategies. Moreover, Stanley et al. (2013) reported that American participants more frequently shift gaze between targets and distractors when processing negative expressions, facilitating faster anger discrimination compared to Chinese participants. Such culturally embedded attentional styles may amplify the delayed orienting to angry faces observed among low-expressive-flexibility individuals. Those who already exhibit difficulty in regulating emotional attention may default to less efficient, culturally normative scanning strategies, further hindering the timely detection of threat-related cues. Future studies should investigate the interaction between expressive flexibility and cultural background by including culturally balanced samples to disentangle learned from inherent visual processing tendencies.

From a theoretical standpoint, the present study contributes to the emotion regulation flexibility theories, especially the *Three Sequential Components of Regulatory Flexibility Model* (Bonanno & Burton, 2013), by providing empirical evidence for the association of context sensitivity and regulatory flexibility (i.e., expressive flexibility). Specifically, our findings highlight how individual differences in expressive flexibility modulate attentional mechanisms involved in detecting emotionally salient contextual cues. This offers novel support for the model's assertion that context sensitivity is a foundational prerequisite for adaptive emotion regulation. By integrating eye-tracking methodology with a visual search paradigm, the study further refines conceptualizations of the dynamic processes underlying regulatory flexibility, emphasizing the attentional substrates through which individuals perceive and respond to emotional information in contextually appropriate ways. Beyond theoretical implications, the findings also carry significant practical value, which suggest that individuals with lower expressive flexibility may exhibit reduced sensitivity to negative emotional cues, potentially impairing their ability to navigate emotionally complex social environments. These insights can be useful in the development of targeted intervention strategies – such as emotion recognition training or attentional retraining programs – to enhance context sensitivity and, consequently, improve adaptive emotion regulation. Such interventions may be particularly beneficial in clinical, educational, or therapeutic settings, where deficits in emotional attunement contribute to maladaptive functioning. By fostering the ability to flexibly detect and respond to emotional cues in diverse contexts, practitioners may help individuals build more effective regulatory repertoires and support broader goals related to emotional competence, resilience, and psychological well-being (Gaukroger, 2018; Myruski et al., 2017).

While the current study established the link between individual difference in expressive flexibility and context sensitivity, and how this individual difference modulated the dynamics of context sensitivity, several potentially limitations should be noted for future research to understand the results. Firstly, this study is limited to examining the detection of static emotional information in complex contexts. However, emotions in real-world scenarios are often dynamic and change over time. Thus, it will be worth investigating how individual differences in expressive flexibility influence the detection of emotional changes in more ecologically valid, real-world settings. Secondly, the study focused exclusively on facial expressions as the primary source of emotional information. However, effective emotion recognition and regulation in naturalistic contexts rely heavily on other non-verbal channels – such as vocal prosody (De Gelder & Vroomen, 2000) and body posture (Aviezer et al., 2012) – which convey critical affective signals. Future investigations should integrate these additional modalities to more fully elucidate the mechanisms through which expressive flexibility operates across varied forms of non-verbal communication. Thirdly, this study only considers two emotions, happiness and anger, thereby constraining the generalizability of the findings. Although these emotions are representative of prototypical positive and negative affective states, future research should encompass a broader spectrum of basic emotions (e.g., sadness, surprise) and complex emotions (e.g., pride, embarrassment) to provide a more comprehensive understanding of the interplay between emotional flexibility and contextual sensitivity. Lastly, the sample exhibited a gender imbalance, with a predominance of female participants, which may restrict the applicability of the results across genders. Given documented gender differences in both expressive behavior and attentional strategies toward emotional information, future research should aim for a more balanced gender representation to enhance the generalizability and robustness of the findings across populations.

Conclusion

Taken together, the current study revealed the link between expressive flexibility and context sensitivity, demonstrating that individual difference in expressive flexibility influences the dynamics of context sensitivity. Specifically, individuals with high expressive flexibility were more responsive to emotional cues compared to those with low expressive flexibility, as evidenced by faster attention orientation and reduced attention holding during visual search tasks. Conversely, individuals with low expressive flexibility exhibited slower attention orientation to negative stimuli compared to positive ones, which may explain their difficulty in regulating emotions when required by the context. These findings underscore the importance of individual differences in expressive flexibility and their impact on context sensitivity.

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