Dynamic fearful expressions enhance gaze-triggered attention orienting in high and low anxiety individuals

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Running Head: Attention orienting by fearful gaze

Abstract

In previous studies using static stimuli it has been shown that gaze-triggered attention orienting is facilitated by fearful expressions, moderated by high anxiety. However, uncertainty remains regarding the effect of anxiety on responses to dynamic stimuli. We investigated this using dynamic fearful and neutral gaze as cues. Participants detected a peripheral target following the cue. Anxiety levels were measured after experiment (Experiment 1) or between anxiety manipulation and experiment (Experiment 2). We found a reaction time advantage for fearful vs. neutral gazes in both high and low state/trait anxiety participants . The results showed that dynamic fearful expressions facilitate gaze-triggered attention orienting, without moderation by high anxiety.

Keywords: anxiety; attention orienting; dynamic facial expression; fearful gaze

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Introduction

The direction in which others are gazing, along with their facial expressions, provides crucial information about the environment. The ability to orient attention rapidly according to the gaze of others confers an evolutionary advantage in that it enables detection of biologically significant stimuli (Emery, 2000). Facial expressions reflecting emotions inform others about the adaptive value of objects located within the line of vision. In particular, fearful expressions signal that objects targeted by gaze are threatening and warrant avoidance (Blair, 2004). Therefore, gazing when a person has a fearful facial expression may orient and hold attention more strongly than gazing in other conditions.

Hietanen and Leppänen (2003) tested this hypothesis using a gaze-cueing paradigm (e.g., Friesen & Kingstone, 1998), a modified version of Posner 's (1980) cueing paradigm. The study involved presenting still images of faces as cue stimuli; these stimuli included neutral and emotional (happy, angry, and fearful) faces gazing right, left, or straight ahead. Subsequently, a target appeared at the right or left side of the face. Participants were told that gaze direction was nonpredictive of the location of the target. The results showed a clear effect of gaze; shorter reaction times (RT) were obtained when detecting a target at a gaze-cued location (valid condition) than at a gaze-uncued location (invalid condition). Contrary to expectations, however, the study indicated that faces showing a fearful emotional state did not enhance gaze-triggered attention orienting compared to neutral or other emotional faces.

In other studies this issue was investigated using a similar paradigm (Hietanen & Leppänen, 2003), and it was found that emotional facial expressions enhanced gaze-triggered attention orienting when the state or trait anxiety of participants was high (Fox, Mathews, Calder, & Yiend, 2007; Holmes, Richards, & Greene, 2006; Mathews, Fox, Yiend, & Calder, 2003; Uono, Sato, Michimata, Yoshikawa, & Toichi, in press). For example, Uono et al. (in press) found that the RT in valid gaze condition was shorter for fearful than for neutral faces only in the high state anxiety group. Regression analyses showed a positive relationship between the effect of attentional shift by fearful gaze and state anxiety. These results indicate that fearful faces facilitate gaze-triggered attention orienting more than do neutral faces as participants' state anxiety levels increase. Fox et al. (2007) showed that the gaze-cueing effect of fearful expressions was stronger than that of other expressions among participants with high trait anxiety, and was positively correlated with the state and trait anxiety levels of subjects. These data indicate that emotional faces facilitate gaze-cueing effects only in participants with high anxiety levels.

Another line of research was used to investigate this issue using dynamic rather than static presentations of facial expressions yielded different results (Putman, Hermans, & van Honk, 2006; Tipples 2006). Tipples presented neutral, fearful, or happy expressions gazing right or left, following neutral faces gazing straight ahead. Putman et al. presented dynamic facial expressions portraying happiness and fear, while simultaneously shifting the direction of the gaze. The results of these studies consistently showed that the gaze-cueing effect of fearful expressions was larger than those of neutral or happy expressions, without considering the factor of participants' anxiety level. These data suggest that dynamic emotional gazes facilitate gaze-triggered attention even in the absence of high anxiety. However, this remains unproven based on the results of previous studies, and these results may be attributable to the inclusion of individuals with high levels of anxiety.

Dynamic depictions of emotional facial expressions represent more ecologically valid and powerful means of emotional communication than do static depictions of such expressions. In a previous study the results indicated that dynamic presentations of facial expressions elicited more intense emotional responses than did static presentations (Sato & Yoshikawa, 2007). The results of a previous neuroimaging study also indicated that depictions of dynamic facial expressions produced greater activation of emotion-related brain regions, such as the amygdala, than did static facial expressions (Sato, Kochiyama, Yoshikawa, Naito, & Matsumura, 2004). Based on these observations, we hypothesized that presentation of dynamic fearful expressions would enhance gaze-triggered attention orienting not only in high anxiety but in low anxiety participants.

We conducted a series of experiments to investigate the effects of presenting dynamic depictions of fearful expressions on gaze-triggered attention orienting, and to examine the relationship between such effects and anxiety levels. In Experiment 1, we measured the participants' state and trait anxiety level after the experiments. In Experiment 2, we experimentally manipulated the state anxiety level using film presentations.

Experiment 1

In this experiment, fearful, happy, and neutral expressions were presented in the same manner as in previous studies (Putman et al. 2006; Tipples, 2006). After the experiment, we measured the state and trait anxiety levels of participants. Based on the previous observation that the dynamic display of facial expression enhanced emotion processing (Sato et al., 2004; Sato & Yoshikawa, 2007) and the theoretical suggestion that fearful expressions signal that objects targeted by gaze are threatening and warrant avoidance (Blair, 2004), we predicted that the gaze-cueing effect of dynamic fearful expressions would be greater than that of dynamic neutral and happy facial expressions in both high and low anxiety participants.

Methods

Participants.

Thirty-two healthy volunteers (21 females and 11 males; $M \pm SD$ age: 19.3 ± 0.9 years) participated in this experiment. All participants had normal or corrected-to-normal visual acuity.

Design.

The experiment was designed as a within-participants two-factorial design, with facial expression (fearful, happy, and neutral) and validity (valid and invalid) as the factors.

Stimuli.

We selected the cue stimuli from the report by Ekman and Friesen (1976). Photographs of two models (one male and one female) showing a neutral, fearful, and happy facial expression were selected and manipulated. Four intermediate images, situated 20 percentage points between neutral (0%) and emotional (100%) expressions, were generated using computer morphing techniques (Mukaida et al., 2000) on a computer running Microsoft Windows to represent the dynamic emotional expressions.

We manipulated gaze direction independently of the morphing process. The irises and pupils of the eyes were extracted from the original photographs (neutral and 100% fearful), and inserted at the right or left side of the eyeball, using Adobe Photoshop 5.0. For the intermediate dynamic fearful expression stimuli, the irises and pupils were extracted from the intermediate image (20–80% fearful expression) and inserted to portray each gaze position within the range of transformation percentages. For the intermediate neutral expression stimuli, the irises and pupils were extracted from the original neutral image and inserted to portray each intermediate gaze position. We cropped all the photographs to an ellipse shape, 2.68° wide and 3.82° high, to exclude the hair and background.

Emotional expression stimuli were sequentially presented from 0% (neutral) to 100% (original emotion). Emotional expression and gaze direction were changed simultaneously. The first 0% image was presented for 300 ms, and each intermediate image was presented for 20 ms. The final 100% images were presented and remained until participants responded. In the neutral conditions, only the gaze direction was changed dynamically. We used a total of 62 photographs as dynamic cue stimuli: facial expression (fearful, happy, and neutral) × gaze direction (4 intermediate positions for right and left, and the end positions for right and left) × person (2 models), and the neutral face with a straight gaze for two models. An example of the dynamic emotional expression cue is shown in Fig. 1.

A letter T (0.6° wide and 0.6° high), presented 5.7° to the left or right side of the center of the screen, was used as a target stimulus.

Apparatus.

Stimulus presentation and data acquisition were controlled by Presentation (Neurobehavioral Systems) on a computer running Microsoft Windows (HPxw4300Workstation). Stimuli were presented on a 17-inch CRT monitor (Iiyama; screen resolution 1024 × 768 pixels; refresh rate 100 Hz). The distance between the monitor and the participants was fixed at approximately 90cm using a headrest.

Procedure.

The sequence of stimulus presentation is shown Fig. 1. In each trial, a fixation cross was first presented at the center of the screen for 600 ms. Subsequently, a dynamic emotional or neutral facial cue, with the eyes gazing sideways (right or left), was presented at the center of the screen. After 80 ms, a target letter, “T” appeared to the left or right side of the cue stimulus. In the valid condition, the target appeared in the direction of gaze. In the invalid condition, the target appeared in the opposite direction to gaze. Participants were asked to press a button as quickly as possible when the target appeared, but not to respond if the target did not appear. The duration from appearance of the target to button response was measured in each trial. The target and cue remained until the response. If 1500 ms elapsed without a response, the next trial was started. Participants were told that cues were nonpredictive of target location, and were instructed to fixate on the center of the screen in each trial.

The experiment consisted of 12 blocks of 24 trials, including 48 catch trials, which is in the absence of the target appearance. Each condition consisted of 40 trials. Trials were presented in pseudorandom order, which means that the same condition does not continue for the fourth consecutive trials. Participants could rest freely between blocks. The experimental trials were preceded by 30 practice trials.

After completion of this task, the participants filled out the Japanese version (Hidano, Fukuhara, Iwasaki, Soga, & Spielberger, 2000) of the STAI (Spielberger, Gorsuch, & Lushene, 1970). The Japanese version of the STAI consisted of two anxiety measures (state and trait anxiety inventory). Each measure includes 20 items and the score of each measure ranges from 20 to 80. The average of trait anxiety scores in a representative Japanese sample of male and female college students were about 48.8 and 47.7 respectively. That of state anxiety scores were about 47.3 and 45.9 respectively.

Data analysis.

The data were analyzed using SPSS 10.0J (SPSS Japan). Incorrect responses and <100-ms responses were excluded from the RT analysis. The median RT under each condition was calculated for each participant. Then, the RT differences between invalid and valid condition for facial expression conditions were calculated as the measure of the shift of attention or gaze-cueing effect as had been done in previous studies (e.g., Okada, Sato, & Toichi, 2006). The RT differences were analyzed by repeated-measures ANOVA using within-participant factors of facial expression (fearful, happy, and neutral) and between-participant factors of state or trait anxiety level (high and low). For significant main effects, follow-up multiple comparisons were performed using Tukey's HSD test. To confirm our prediction, even when the interaction did not reach significance, planned simple comparisons between fear and neutral expressions were conducted using one-tailed *t* test (c.f., Rosenthal, Rosnow, & Rubin, 2000).

Results

Effects of state anxiety on the gaze cueing effect.

Participants were divided by the median state anxiety score (44) into two groups. Seventeen participants (6 men and 11 women), whose state anxiety score was above 44 ($M \pm SD = 48.4 \pm 4.4$), were placed into the high state anxiety group. Fifteen participants (5 men and 10 women) whose state anxiety score fell below 43 ($M \pm SD = 37.5 \pm 4.1$) were placed into the low state anxiety group. The state anxiety scores of the high and low state anxiety groups were significantly different, $t(30) = 6.44$, $p < .001$.

The mean (with *SE*) median RTs for each state anxiety group are shown in Table 1a. The mean (with *SE*) RT differences between invalid and valid conditions for each state anxiety group are shown in Fig. 2.

When the state anxiety group was used as a between-participants factor, a significant main effect for facial expression was obtained, $F(2, 60) = 3.61$, $p < .05$. There was a marginal significant main effect of anxiety, $F(2, 60) = 3.15$, $p < .1$, indicating that gaze-cueing effect in the low state anxiety group tended to be greater than that in the high state anxiety group. No significant interaction between facial expression and anxiety was obtained, $F(2, 60) = .59$, $p > .1$. To further examine the main effect for facial expression, we conducted multiple comparisons of the gaze-cueing effects of fearful, happy, and neutral face conditions. The gaze-cueing effect of fearful expressions was significantly greater than that for neutral expressions, $p < .05$. The difference for the gaze-cueing effect of happy vs. neutral expressions also tended toward significance, $p < .1$. Planned comparisons confirmed that gaze-cueing effects for fearful expressions were significantly larger than for neutral expressions in both high and low state anxiety groups, $p < .05$ for both groups.

Effects of trait anxiety on the gaze cueing effect.

Participants were divided by the median trait anxiety score (50.5) into two groups. Sixteen participants (10 men and 6 women) whose trait anxiety score was above 51 ($M \pm SD = 56.3 \pm 5.1$) were placed into the high trait anxiety group. Sixteen participants (1 man and 15 women), whose trait anxiety score fell below 50 ($M \pm SD = 43.6 \pm 6.0$), were placed into the low trait anxiety group. We found a significant difference between the trait anxiety scores of the high and low trait anxiety groups, $t(30) = 7.30$, $p < .001$.

The mean (with *SE*) of median RTs for each trait anxiety group are shown in Table 1b. The mean (with *SE*) RT differences between invalid and valid conditions for each trait anxiety group are shown in Fig. 3.

When trait anxiety group was used as a between-participant factor, we obtained results that were similar to those obtained for state anxiety. A significant main effect for facial expression was found, $F(2, 60) = 3.54$, $p < .05$. No significant main effect for anxiety, $F(1, 30) = .53$, $p > .1$, or for interaction between facial expression and anxiety, $F(2, 60) = .34$, $p > .1$, was obtained. Follow-up multiple comparisons for the main effect of facial expression indicated that the gaze-cueing effect for fearful expressions was significantly greater than that for neutral expressions, $p < .05$. The difference in the gaze cueing effect between happy and neutral expressions also tended toward significance, $p < .1$. Planned comparisons confirmed that gaze-cueing effects for fearful expressions were significantly greater than for neutral expressions in both high and low trait anxiety groups, $p < .05$ for both groups.

Discussion

The results of the present study indicated that the gaze-cueing effect for fearful expressions was greater than that for neutral expressions in both high and low state/trait anxiety groups. These results were consistent with those of the previous study using dynamic presentations (Tipples, 2006). This clear facilitative effect of fearful faces, in the absence of high anxiety levels, may be attributable to the effects of dynamic presentations. Dynamic presentations of facial expressions have been shown to enhance overall emotional experiences (Sato & Yoshikawa, 2007). In a previous neuroimaging study it was also found that dynamic facial expressions produced greater activation of the emotion-related brain regions than did static facial expressions (Sato et al. 2004). In view of these data, our results suggest that compared with static presentation, the dynamic presentation of fearful expressions was construed as reflecting greater emotional significance, and therefore facilitated gaze-triggered attention orienting.

Our results did not show a significant difference in the gaze-cueing effect of fearful and happy expressions. Similarly, Tipples (2006) reported that the gaze-cueing effect for fearful, but not happy, faces was greater than that for neutral faces; however, in that study the gaze cueing effect for fearful faces was not compared to that for happy faces. In contrast, Putman et al. (2006) showed that the gaze-cueing effect of fearful expressions was greater than that for happy expressions. One possible explanation for these discrepant results is that in both studies neutral as well as fearful and happy expressions were used for stimuli. Neutral expressions are understood to be mildly negative (Phillips et al. 1997), and their inclusion may weaken the contrast between fearful and happy expressions.

Our results did not show the interaction between facial expression and anxiety. We hypothesized that anxiety levels were not sufficiently high to produce an effect on the relationship between gaze-triggered attention orienting and fearful gaze. This possibility was examined in Experiment 2.

Experiment 2

Experiment 2 was performed to confirm the null influence of state anxiety on the relationship between gaze-triggered attention orienting and fearful gaze found in Experiment 1. For this purpose, we experimentally manipulated state anxiety levels using film presentations as a within-participants factor. In other respects, the experimental procedures were similar to those of Experiment 1, with the additional exception that we used only fearful and neutral expressions as stimuli to simplify the experimental design. We hypothesized that the gaze cueing effect of dynamic fearful expressions would be greater than that of dynamic neutral expressions in both high and low anxiety participants.

Methods

Participants.

Twenty-two healthy volunteers (4 females and 18 males; *M* ± *SD* age, 19.5 ± 1.5 years) participated in this experiment. All participants had normal or corrected-to-normal visual acuity. Trait anxiety scores ranged from 34 to 58 points in the present experiment (*M* ± *SD* = 47.7 ± 9.00).

Design.

The experiment had a within-participants three-factorial design, with facial expression (fearful and neutral), validity (valid and invalid), and anxiety induction (high and low state anxiety) as factors.

Apparatus.

The apparatus was the same as that used in Experiment 1.

***Stimuli and Procedure*.**

For the gaze cueing task we used nearly identical stimuli and procedures nearly identical to those used in Experiment 1. One exception was our use of the anxiety induction procedure. The gaze-cueing task was divided into two sessions. State anxiety level was manipulated within participants by presenting a film prior to each experimental session. In the high state anxiety session, a participant watched an excerpt from the film The Silence of The Lambs, depicting a climactic scene in which an Federal Bureau Ivestigation agent tries to arrest a serial killer in a dark basement. In the low state anxiety session, the same participant watched a film clip depicting sea waves washing over the shore. The order of these sessions was counterbalanced across participants. The total lengths of each of these films were 229 and 43 s, respectively. These films were selected from the film stimuli set developed by Gross and Levenson (1995). The validity of these stimuli for inducing high and low levels of fear has been confirmed in a previous study (Sato, Noguchi, & Yoshikawa, 2007). Participants completed the State Anxiety Inventory, Japanese version (Hidano et al., 2000) after watching the presentation of the film and prior to the experimental session. Two experimental sessions were conducted on the same day with a brief rest between the sessions.

Each session consisted of eight blocks of 28 trials, including 32 catch trials, which are in the absence of the target appearance. Each condition consisted of 48 trials. Trials were presented in pseudorandom order, which means that the same condition does not continue for the fourth consecutive trials.

Data analysis.

The RT data were processed by a procedure similar to that used in Experiment 1. The RT differences were analyzed by repeated-measures ANOVA with within-participant factors of facial expression (fearful and neutral) and anxiety induction (high and low state anxiety). To confirm our prediction, even when the interaction did not reach significance, planned simple comparisons between fear and neutral expressions were conducted using one-tailed *t* test (c.f., Rosenthal et al., 2000).

Results

Anxiety manipulation.

We compared the state anxiety levels of participants in the high and low state anxiety film conditions by paired-samples *t* test to ensure that the manipulation of anxiety was in accordance with the experimental design. The results showed that the state anxiety score of participants in the high state anxiety condition (M ± *SD* = 55.5 ± 7.5) was significantly higher than that of those in the low state anxiety condition (M ± *SD* = 40.5 ± 5.2), $t(21) = 9.56$, $p < .001$.

Effects of state anxiety on the gaze cueing effect.

The mean (with *SE*) median RTs are shown in Table 2. The mean (with *SE*) RT differences between invalid and valid conditions are shown in Fig. 4.

The ANOVA revealed a main effect of facial expression, $F(1, 21) = 7.42$, $p < .05$, indicating that the gaze-cueing effect for fearful expressions was greater than that for neutral expressions. The main effect of anxiety induction was also significant, $F(1, 21) = 7.62$, $p < .05$, indicating that the gaze cueing effect in the low state anxiety condition was greater than that in the high state anxiety condition. There was no significant interaction between facial expression and anxiety induction, $F(1, 21) = .52$, $p > .1$. Planned comparisons showed that simple main effects of facial expression were significant in low state anxiety condition, $p < .05$, and marginally significant in high state anxiety condition, $p < .1$.

Discussion

Consistent with Experiment 1, these results indicated that the gaze-cueing effect of fearful expressions was greater than that of neutral expressions in both high and low state anxiety conditions. The data also showed that the film presentations effectively induced differences between high and low state anxiety conditions with regard to the state anxiety levels of participants. Hence, these results excluded the possibility that the gaze-cueing effect of dynamic fearful expressions was not modulated by state anxiety because the state anxiety level of participants was too low to produce an effect. These results, together with those of Experiment 1, indicated that dynamic fearful expressions facilitate gaze-triggered attention orienting, independent of the moderation of state and trait anxiety.

Our results showed that high state anxiety decreased the overall gaze-cueing effect. Although there was a trend toward significant effect, this same finding was also obtained in experiment 1. In a previous study by Engelmann and Pessoa (2007) using the cueing paradigm with peripherally presented cues they found that the motivational state, manipulated by rewards or punishments, promotes the efficiency of attention reorienting and decreases the cueing effect. The present study might extend these findings, since these indicated that high state anxiety states can interrupt attention that is oriented by a centrally presented gaze.

General Discussion

In this study, we investigated the facilitative effects of dynamic fearful expressions on gaze-triggered attention orienting, and examined the possible moderating role of anxiety level in this relationship. Our results indicated that the identical RT advantages for dynamic fearful vs. neutral faces emerged in both high and low anxiety participants.

Our results indicated that, in the case of dynamic stimulus presentations, fearful expressions enhance gaze-triggered attention orienting in both high and low anxiety participants. The dynamic presentations of fearful expressions would enhance emotional processing and emotional experience (Sato & Yoshikawa, 2007). Therefore, it seems that the emotional impact of dynamic fearful expressions is sufficiently strong that anxiety may be unnecessary for the enhancement of gaze-triggered attention orienting. This is consistent with the findings of previous studies. When less intense emotional stimuli (static facial expressions) were used as stimuli, fearful expressions enhanced gaze-triggered attention orienting only when the anxiety levels of participants were considered (Fox et al. 2007; Hietanen & Leppänen, 2003; Holmes et al., 2006; Mathews et al., 2003; Uono et al., in press).

Our results indicate that effective attention orienting can result from a dynamically presented fearful gaze, this makes sense when considered in the context of the adaptive functions of emotionally expressive gazes and anxiety. High anxiety levels may be adaptive in that they amplify the emotional salience of less intense facial expressions, leading to enhanced gaze-triggered attention orienting. A dynamic fearful gaze may signal the sudden appearance of threatening objects; rapid orientation to this situation would confer survival value in the absence of amplification by anxiety.

An alternative account of the facilitated gaze cueing effect of fearful faces can be constructed. In the present study, the total amount of facial change differed between neutral and emotional face conditions, even though all conditions included dynamic gaze shifts. Therefore, the amount of visual change may represent a matter of concern for interpretation of the facilitated gaze cueing effect in the fearful face condition. However, in the present study we found that not happy but fearful facial expressions enhanced gaze-triggered attention orienting to a greater extent than neutral faces. This finding was consistent with those of previous studies using dynamic presentations of stimuli; Tipples (2006) found the same pattern of results as in the present study, and Putman et al. (2006) reported that the gaze cueing effect for dynamic fearful expressions was greater than that for dynamic happy expressions. Although these studies did not control the amount of visual change occurring between fearful and happy face conditions, the evidence suggested that the facilitated gaze cueing effect of fearful faces could not be explained by the differences in visual changes. At present, it is difficult to control the amount of visual change between facial expression conditions without decreasing the ecological validity. Further efforts are needed to establish a new method to overcome this problem.

Promising directions for further studies include investigation of psychological states other than anxiety. One such possible state would be depression. In a previous psychological study. it was found that depressed participants showed heightened fearful reactions as compared to control participants while viewing the emotional expressions of others (Persad & Polivy, 1999). In a neuroimaging study Sheline et al. (2001) reported that depressed patients showed higher amygdala activity than did controls while viewing fear expressions. These observations suggest that when a person is deeply depressed this may facilitate the effect of fearful expressions on gaze cueing.

In summary, we found that the gaze cueing effect was greater for dynamic fearful expressions than for neutral expressions in both high and low anxiety participants. These results suggest that dynamic facial expressions have great emotional significance, and enhance gaze-triggered attention orienting, in the absence of amplification by anxiety.

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Table 1 The mean (with SE) median RTs for each condition in Experiment 1

(a)State anxiety

	Low-state anxiety group		High-state anxiety group	
Facial expression	Valid	Invalid	Valid	Invalid
Fearful	275.4(5.6)	297.9(6.5)	268.5(5.2)	287.7(6.1)
Happy	272.1(6.2)	293.9(6.2)	266.6(5.9)	280.7(5.9)
Neutral	286.1(6.6)	301.0(6.6)	281.8(6.2)	294.5(6.2)

(b)Trait anxiety

	Low-trait anxiety group		High-trait anxiety group	
Facial expression	Valid	Invalid	Valid	Invalid
Fearful	269.7(5.4)	292.0(6.5)	273.8(5.4)	292.9(6.5)
Happy	268.4(6.1)	285.8(6.3)	270.0(6.1)	288.0(6.3)
Neutral	282.8(6.4)	298.1(6.4)	284.8(6.4)	296.9(6.4)

Table 2 The mean (with SE) median RTs for each condition in Experiment 2

	Fearful		Neutral	
State anxiety	Valid	Invalid	Valid	Invalid
High	282.4(8.3)	299.7(9.3)	293.8(8.8)	307.1(9.5)
Low	279.4(6.6)	304.1(8.0)	293.4(7.2)	311.1(9.2)

Figure Captions

Fig. 1. The sequence of stimulus presentation in Experiment 1.

Fig. 2. The mean (with SE) RT differences between invalid and valid conditions for each state anxiety group in Experiment 1.

Fig. 3. The mean (with SE) RT differences between invalid and valid conditions for each trait anxiety group in Experiment 1.

Fig. 4. The mean (with SE) RT differences between invalid and valid conditions in Experiment 2.

Figure 1.

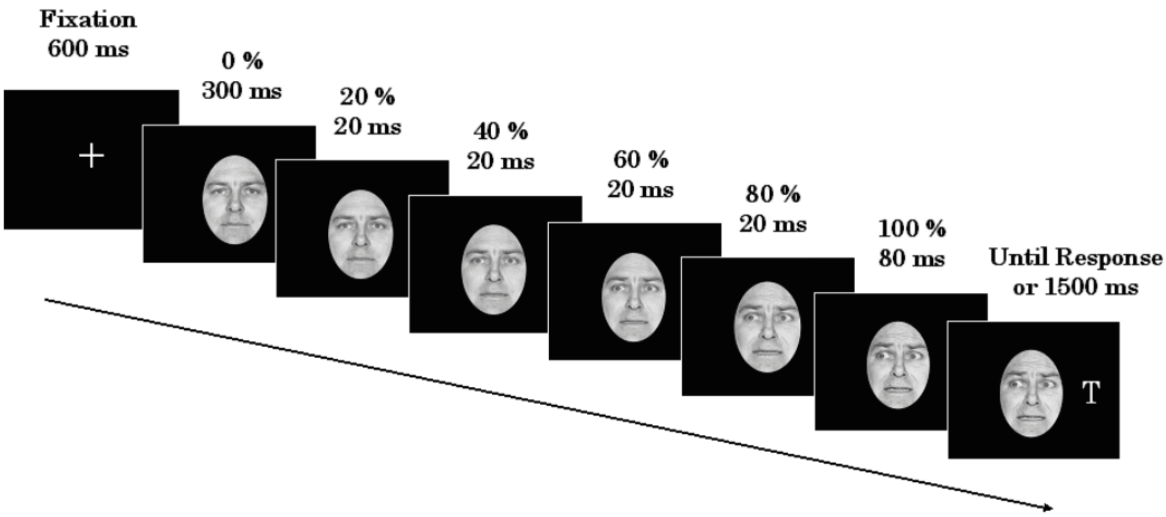

Fixation
600 ms
0 %
300 ms
20 %
20 ms
40 %
20 ms
60 %
20 ms
80 %
20 ms
100 %
80 ms
Until Response
or 1500 ms
T

Figure 2.

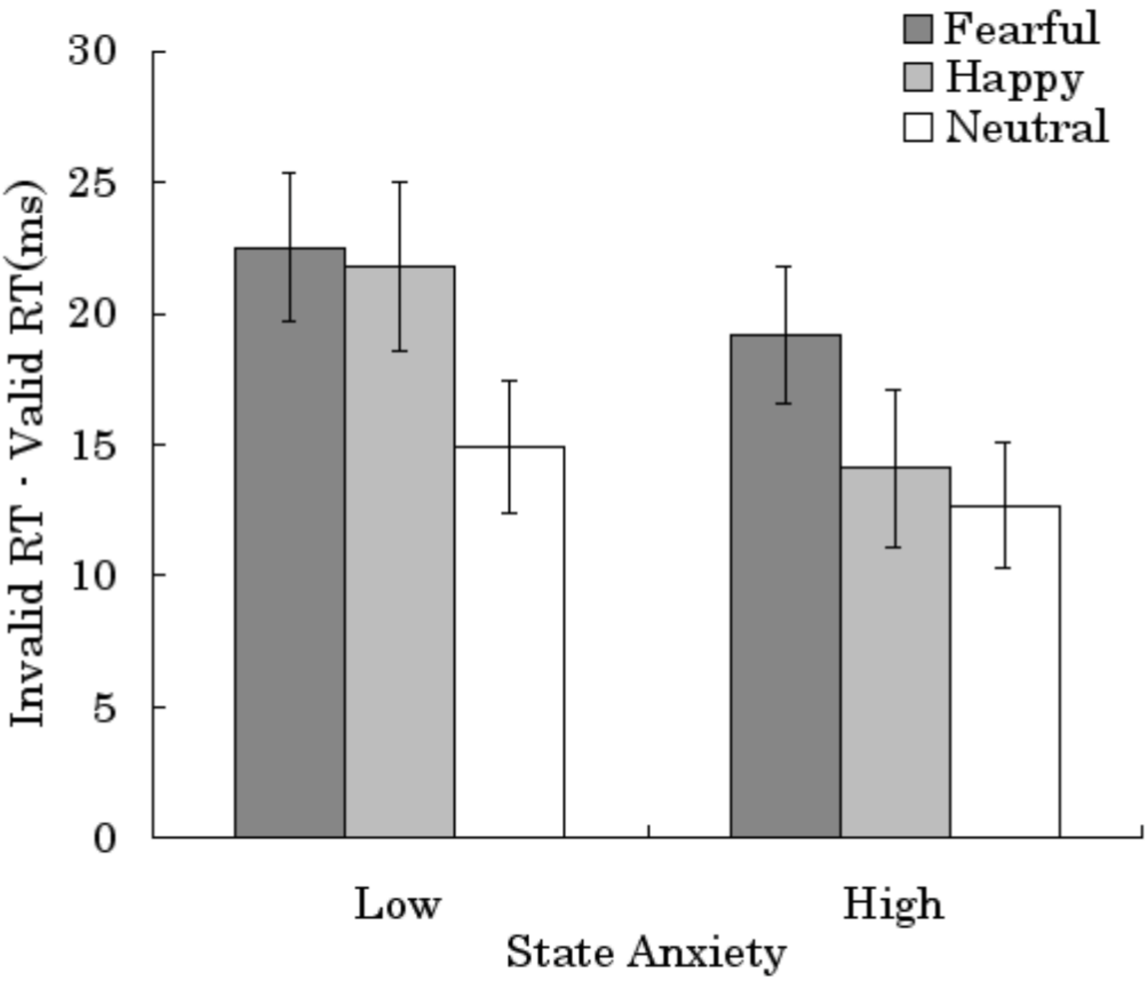

Fearful
Happy
Neutral
30
25
20
15
10
5
0
Invalid RT - Valid RT(ms)
Low
High
State Anxiety

Figure 3.

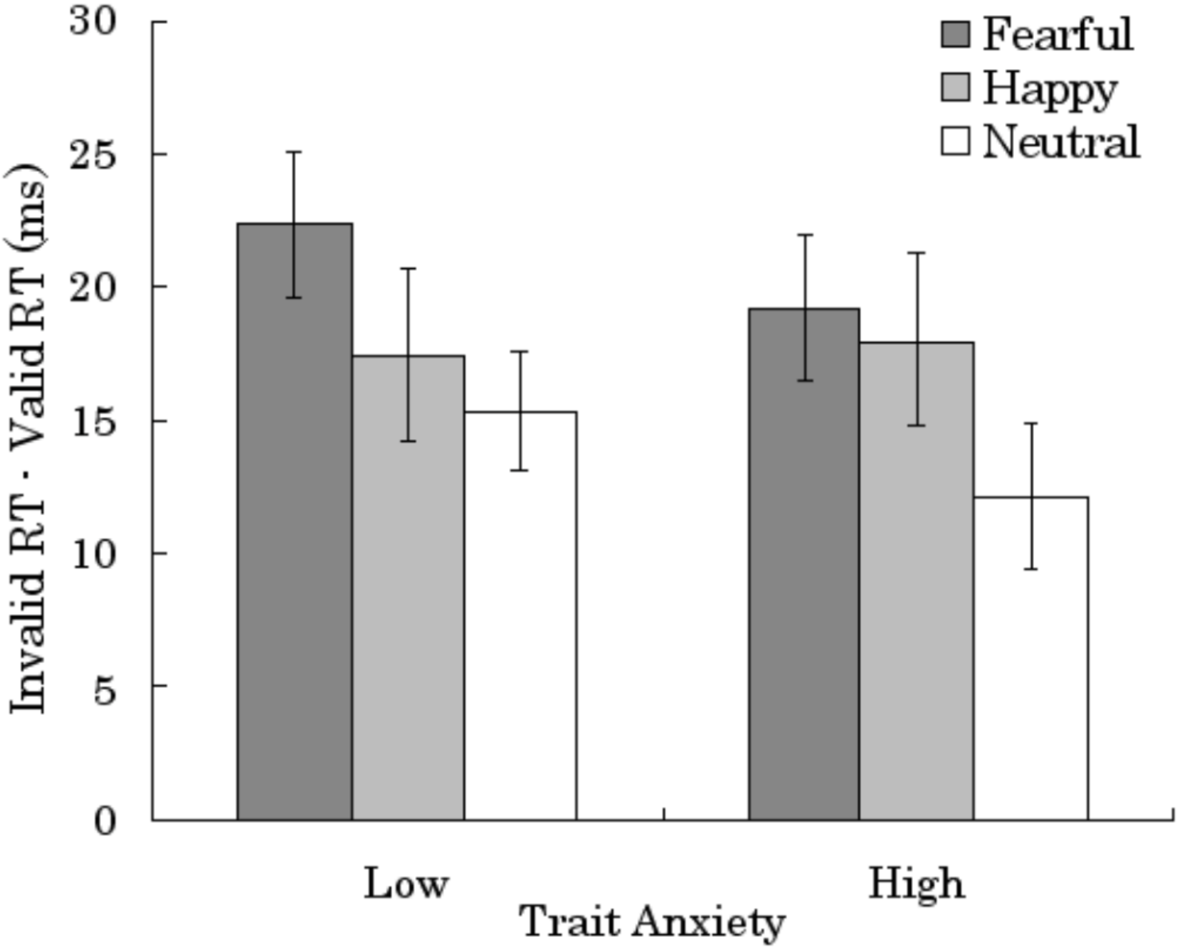
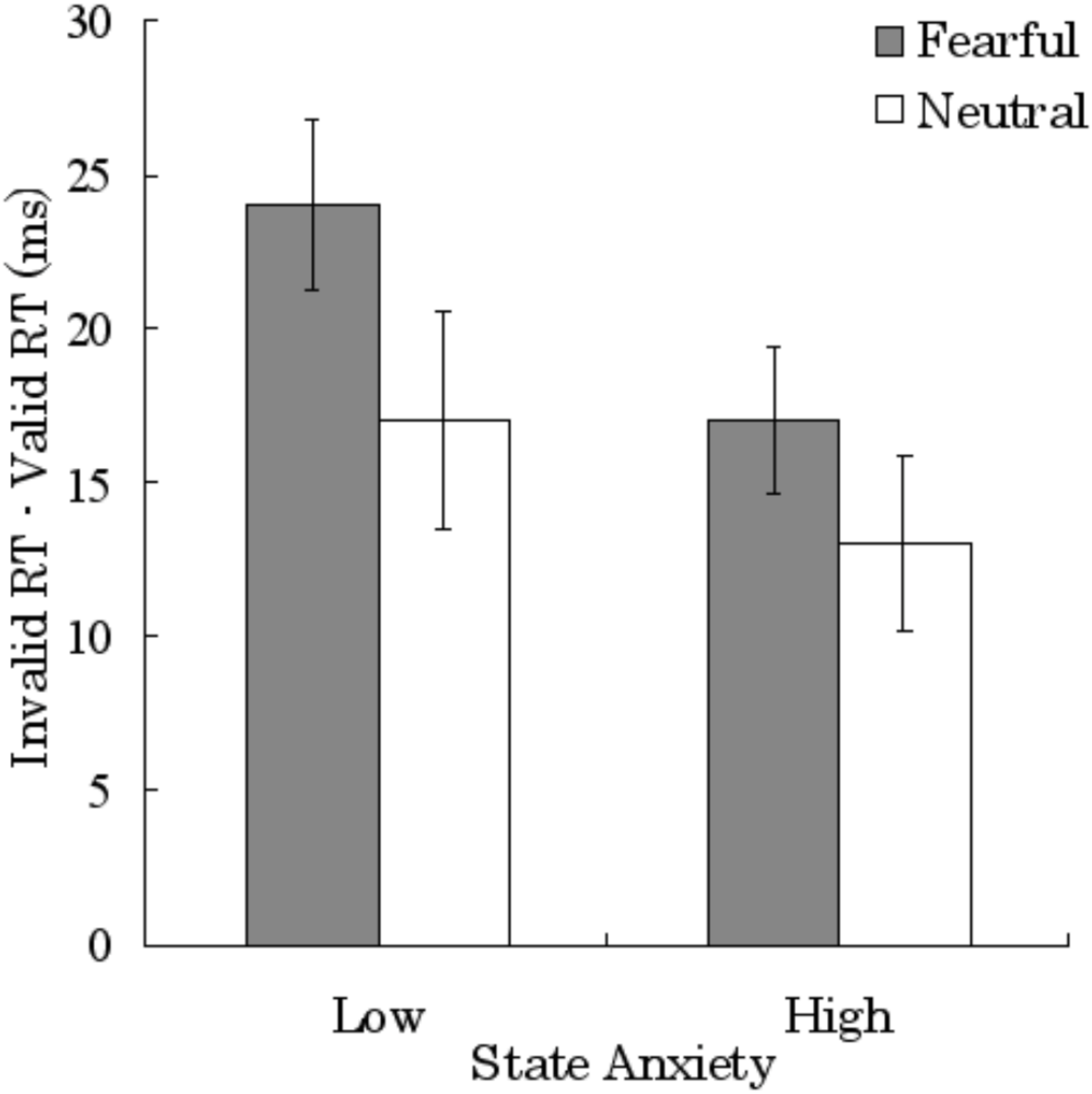

30
25
20
15
10
5
0
Invalid RT · Valid RT (ms)
Fearful
Happy
Neutral
Low
High
Trait Anxiety

Figure 4.


30
25
20
15
10
5
0
Invalid RT - Valid RT (ms)
Fearful
Neutral
Low
High
State Anxiety