3-2010

Spatial Attention-related Modulation of the N170 by Backward Masked Fearful Faces

Joshua M. Carlson
joshcarl@nmu.edu

Karen S. Reinke

Follow this and additional works at: https://commons.nmu.edu/facwork_journalarticles

Recommended Citation

This Journal Article is brought to you for free and open access by the FacWorks at NMU Commons. It has been accepted for inclusion in Journal Articles by an authorized administrator of NMU Commons. For more information, please contact kmcdonou@nmu.edu,bsarjean@nmu.edu.
Spatial attention-related modulation of the N170 by backward masked fearful faces

Article in Brain and Cognition · March 2010
DOI: 10.1016/j.bandc.2010.01.007 · Source: PubMed

CITATIONS
29

READS
144

2 authors, including:

Joshua M Carlson
Northern Michigan University

49 PUBLICATIONS 706 CITATIONS

SEE PROFILE
Spatial attention-related modulation of the N170 by backward masked fearful faces

Joshua M. Carlson a,b,*, Karen S. Reinke a,c

a Department of Psychology, Southern Illinois University Carbondale, IL 62901, USA
b Department of Biomedical Engineering, State University of New York at Stony Brook, NY 11794, USA
c Department of Psychology, University of Illinois Springfield, IL 62703, USA

Abstract

Facial expressions are a basic form of non-verbal communication that convey important social information to others. The relevancy of this information is highlighted by findings that backward masked facial expressions facilitate spatial attention. This attention effect appears to be mediated through a neural network consisting of the amygdala, anterior cingulate, and visual cortex. However, a direct investigation of the neural time course associated with orienting to such stimuli has yet to be performed. In the current investigation, a backward masked fearful face dot-probe task was performed while ERPs were recorded. Reaction time results suggest that spatial attention is captured by backward masked fearful faces and attention is focused at the location of the fear stimulus. Masked right visual field fearful faces enhanced the N170 amplitudes of contralateral occipito-temporal electrodes. The rapid contralateral N170 enhancement was positively correlated with participants’ behavioral index of spatial attention. Thus, backward masked fearful face-elicited spatial attention facilitates behavior and modulates the early stage of facial processing reflected by the N170.

1. Introduction

Fearful facial expressions are important non-verbal forms of biological communication that signal potential threat and elicit attention from observers (LeDoux, 1996; Ohman, 2005). Backward masking is a procedure in which an initial stimulus (e.g., a face) is immediately followed by a “masking” stimulus (e.g., a second face). The masking stimulus is thought to interrupt the re-entrant processing of the initial stimulus in sensory cortex and accordingly replace and restrict the initial representation (Enns & Di Lollo, 2000). Thus, backward masking is a method in which stimulus processing can be restricted and is commonly used to assess the sensitivity in which fearful faces influence observers (e.g., Mogg & Bradley, 1999a; Whalen et al., 1998). Dot-probe studies1 indicate that both unmasked (Mogg & Bradley, 1999b; Pourtois, Grandjean, Sander, & Vuilleumier, 2004) and backward masked (Carlson & Reinke, 2008; Fox, 2002; Mogg & Bradley, 1999a, 2002) threatening (fearful and angry) faces facilitate spatial attention. Recent evidence suggests that masked fearful faces facilitate spatial attention through a neural network consisting of the amygdala, anterior cingulate, and visual cortex (Carlson, Reinke, & Habib, 2009). However, the neural time course in which backward masked fearful face-elicited spatial attention modulates visual cortex has yet to be assessed. Event-related potentials (ERP) provide excellent neurotemporal resolution and are thus a well suited method to address this issue. Therefore, the purpose of this study was to assess the neural time course of backward masked fearful face-elicited spatial attention with ERP at posterior electrode sites.

The N170 is a face-sensitive visually-evoked component with a negative peak amplitude occurring approximately 170 ms (130–190 ms) post-stimulus onset at lateral posterior electrode sites and represents the first reliable ERP indication of facial representations (Bentin, Allison, Puce, & Perez, 1996; Jeffreys, 1989). While the later N2 (200–300 ms) has been modulated by backward masked fearful faces (Liddell, Williams, Rathjen, Shevlin, & Gordon, 2004; Williams et al., 2004), the extent to which fearful facial expressions modulate the N170 is unclear. Some studies report unmasked emotional facial expression-related enhancements in N170 amplitudes (Batty & Taylor, 2003; Blau, Maurer, Tottenham, & McCandliss, 2007; Cabarel, Courtoy, Bernard, Lalonde, & Rebai, 2005; Krombholz, Schaefer, & Boucsein, 2005).
Spatial attention can be subdivided into orienting, engagement, and disengagement (Posner, 1980). However, without a baseline to compare congruent and incongruent trials it is unclear which aspect(s) of attention is affected (Carlson & Reinke, 2006; Koster, Crombez, Verschueren, & De Houwer, 2004). Dot-probe and visual cueing studies, which have used baseline conditions, indicate that masked fearful faces initiate a rapid covert orienting of spatial attention (Carlson & Reinke, 2008) while unmasked faces typically delay disengagement from threat (Fox, Russo, Bowles, & Dutton, 2001; Yiend & Mathews, 2001).

The aims of the current study were to explore the modulatory effects of backward masked fearful face-elicited spatial attention on reaction times and the face-sensitive N170 ERP component. Based on previous behavioral results (Carlson & Reinke, 2008; Fox, 2002; Moog & Bradley, 1999a, 2002) we expected that masked fearful faces would facilitate behavioral measures of spatial attention. Specifically, the orienting of spatial attention was predicted to be enhanced by masked fearful faces (Carlson & Reinke, 2008). Based on evidence discussed above (Blau et al., 2007; Di Russo et al., 2003; Fu et al., 2005; Holmes et al., 2003; Natale et al., 2006) it was predicted that masked fearful faces would enhance the amplitude of the contralateral N170. Finally, correlation analyses were performed to test the hypothesis that the predicted N170 and behavioral effects were related.

2. Method

2.1. Participants

Twelve participants (5 male and 7 female) participated in the study. Participants were recruited with fliers posted on the campus of Southern Illinois University and were compensated for their time. All participants were self-reported right handed individuals between the ages of 18 and 35. Additionally, participants were screened to ensure that they were not regularly taking prescription or recreational drugs in addition to screening for serious neurological or psychological disorders. Participants were provided with informed consent and treated according to the guidelines of the Institutional Review Board.

2.2. Procedure and materials

Four (two male and two female) gray scale facial identities of fearful and neutral faces (Gur et al., 2002) were used as the initial face. A fifth neutral female face from this database was used as the mask. Stimuli were presented on a 60 Hz 16" computer monitor. As shown in Fig. 1, each trial started with a white fixation cue (+) centered on a black background for 1000 ms. Two face stimuli were simultaneously presented (33 ms) to the left and right of fixation. Facial stimuli subtended approximately 5° x 7° of visual angle and were separated by 14° of visual angle. Consistent with masking procedures from other ERP studies (Liddell et al., 2004; Williams et al., 2004), the initial neutral and fearful faces were instantly masked with a neutral face (100 ms). Masks were offset by 1° of visual angle on the vertical Y-axis to reduce apparent motion (Liddell et al., 2005). Shifts on the X-axis were not used in order to prevent biasing attention. Immediately after the masks, a target dot was presented in the location of either the left or the right face. The target remained until a response was recorded. Participants' used an Electrical Geodesics Inc. (EGI) response pad with their right hand to indicate the location of the target dot (using their index finger for left and middle finger for right). The fixation cue remained in the center of the screen throughout the entirety of each trial and participants were instructed to always fixate on this cue.

Fearful–fearful (FF) and neutral–neutral (NN) trial types were considered baseline conditions independent of an attentional bias to one face over the other. Directed spatial attention trials consist of one fearful and one neutral face occurring in either the LVF or RVF. These trials were half congruent (target dot and fearful face presented on the same side of the screen) and half incongruent (target dot and fearful face on opposite sides of the screen). Trials were weighted so that there were approximately 428 congruent and 428 incongruent trials counterbalanced for visual field in addition to 428 undirected trials (214 NN and 214 FF). The experiment was divided into 15 blocks with a total of 1284 experimental trials. Participants' were provided with feedback of their average reaction time after each block in order to elicit fast responses and provide task motivation.

2.3. EEG acquisition

The ERP experiment was programmed with E-Prime and linked to Net Station acquisition software, which allowed for flagging the EEG data with the time points in which the initial face occurred. By time locking the EEG data to the presentation of the initial face we were able to examine the ERPs associated with each trial type. Electroencephalographic information was recorded with the EGI 128 electrode HydroCel Geodesic Sensor Net. Amp calibrations for gains and zeros were completed prior to each participant's session. The EEG signal was digitized at 250 Hz. All participants'
impedance levels were kept below 75 kΩ at the beginning of each session.

2.4. ERP data processing

All aspects of EEG data processing were performed with EGI Net Station Waveform Tools. A 0.1 Hz high pass and 100 Hz low pass hardware filter were applied during data acquisition. A 30 Hz low pass filter was applied after data collection in order to eliminate 60 Hz noise-related signal in addition to other high frequency noise. The EEG data was segmented in 800 ms epochs time locked to the onset of the first set of faces with 200 ms pre-stimulus and 600 ms post-stimulus. ERP data underwent an artifact detection process where amplitude deflections of at least 70 μV at eye-blink electrodes (LH: 21, 25, and 127 and RH: 8, 14, and 126, see Fig. 2) were considered eye-blinks and amplitude deflections of 30 μV or greater at eye-movement electrodes (LH: 128 and RH: 125) were considered horizontal eye-movements. This conservative 30 μV criterion for horizontal eye-movements was used to ensure that any differential ERP effects were not due to shifts in overt attention (eye movements), but rather covert attention. Segments containing eye-blinks or eye movements were excluded from data analysis. Additionally, segments with more than 10 bad channels were discarded. Channels were considered bad in each segment if the fast average amplitude exceeded 200 μV (this is a weighted running average algorithm within the EGI software where a single data point exceeding threshold would not necessarily be marked as a bad channel, but several beyond threshold data points would be marked as bad), the differential average amplitude exceeded 100 μV, or a channel displayed zero variance. Additionally, channels were considered bad and replaced across segments if they met the abovementioned criteria in more than 20% of segments. Bad channels were replaced with interpolated data using spherical splines from the remaining channels. The ERP segments were then averaged for each participant so that each electrode had a single waveform for each condition. A 100 ms baseline correction was applied and the data was re-referenced from Cz to the average of all 128 electrodes. Peak N170 amplitudes were extracted between 150–190 ms for each participant. This N170 extraction was limited to symmetrical electrode clusters (similar to those used in other N170 studies with an EGI sensor net; e.g., Blau et al., 2007), located at temporal occipital electrode sites (RH: 50, 51, 57, 58, 63, 64 and LH: 101, 97, 100, 96, 99, 95, see Fig. 2).

3. Results

3.1. Reaction time data

Only correct responses occurring between 100–750 ms were included in the analysis of reaction time (RT) data; resulting in 5.9% of the data respectively, being discarded for incorrect, premature, and delayed responses. A 2 Cued Visual Field (LVF vs. RVF) x 2 congruency (congruent vs. incongruent) repeated measures analysis of variance (ANOVA) was conducted on participants’ RTs. There was a significant congruency effect, \( F(1, 11) = 41.91, p < .001, \eta^2 = .79 \) where congruent (307.65 ms) trials had faster RTs than incongruent (327.05 ms) trials. There were no main (\( F(1, 11) < 1, \eta^2 = .003 \)) or interaction (\( F(1, 11) < 1, \eta^2 = .007 \)) effects of visual field.

FF(316.94 ms) and NN(316.61 ms) RTs did not significantly differ (\( t(11) = -.12 \)) and were therefore combined to form an undirected attention “baseline” for orienting and disengagement comparisons. If reaction times for congruent trials are faster than baseline, this indicates that backward masked fearful faces speeded the orienting of spatial attention. If incongruent reaction times are slower than baseline, this indicates a slow disengagement of spatial attention from backward masked fearful faces and/or a delayed reorienting of attention to the target dot. As depicted in Fig. 3a, a congruent vs. baseline, paired samples \( t \)-test revealed a significant orienting effect (mean difference = −9.13 ms, \( t(11) = -5.94, p = .001 \)) whereas a incongruent vs. baseline \( t \)-test
Fig. 2. The EGI 128 electrode Hydro Cel Geodesic Sensor Net is displayed above. Note that channels used for eye-blink (EB) and eye-movement (EM) artifact detection are marked. Additionally, the 12 bilateral occipito-temporal channels used in assessing N170 modulation are shaded.

Fig. 3. (a) Reaction times for congruent trials were significantly faster than incongruent trials. This difference represents the overall capture of attention or attention index (AI). A comparison of congruent and baseline trials revealed an enhanced orienting effect (OE) of masked fearful faces. Additionally, incongruent trials were significantly slower than baseline trials indicating there was a slow disengagement effect (DE) from backward masked fearful faces. (b) The contralateral enhancement of the N170 event-related potential at occipito-temporal electrode sites for each participant was highly correlated with their behavioral attention index ($r = .88$). Note that negative N170 differences represent enhanced contralateral amplitudes and negative attention indices represent speeded reaction times for congruent, relative to incongruent, trials. • The X-axis in Fig. 3a is located at the baseline (combined undirected FF and NN trials) reaction time of 316.78 ms.
revealed a significant disengagement effect (mean difference = 10.27 ms, t(11) = 3.95, p = .002).

3.2. ERP data

Artifact detection resulted in 9.38%, 5.85%, and 0.03% of segments discarded for eye blinks, eye movements, and bad channels respectively, which left approximately 181 remaining trials per condition. Similar to previous research with separate facial stimuli presented in a rapid sequence (Jeffreys, 1989), the cue and mask condition. Similar to previous research with separate facial stimuli respectively, which left approximately 181 remaining trials per conditions discarded for eye blinks, eye movements, and bad channels respectively, which left approximately 181 remaining trials per condition. Similar to previous research with separate facial stimuli presented in a rapid sequence (Jeffreys, 1989), the cue and mask condition.

A four-way repeated measures ANOVA assessed the effects of Masked Fearful Face Cued Visual Field (LVF vs. RVF), hemisphere (LH vs. RH), and electrode (1–6) on posterior occipito-temporal N170 amplitudes. As predicted, there was a significant Cued Visual Field (LVF vs. RVF), and electrode (1–6) on posterior occipito-temporal N170 amplitudes. There was a main effect of trial type (F(1, 11) = 4.73, p < .01, ηp² = .30). Follow up Bonferroni corrected t-tests revealed an marginal effect of fear in undirected attention conditions such that there were larger N170 amplitudes for FF (~3.23 μV), relative to NN (~2.89 μV, pcorr = .07) trials. Additionally, Cued LVF (~2.75 μV, pcorr = .06) trials resulted in marginally lower N170 amplitudes than RVF trials. There was a trial type × hemisphere interaction (F(1, 11) = 4.45, p = .01, ηp² = .29) where follow up t-tests indicate that in the LH, Cued LVF trials (~2.04 μV) had smaller N170 amplitudes than the Cued RVF (~2.58 μV, pcorr < .05) and FF (~2.84 μV, p < .001) trial types, while the LH difference between Cued LVF and NN trials approached significance (~2.52 μV, pcorr = .12). Additionally, N170 amplitudes for Cued LVF trials where larger in the RH (~3.47 μV) than LH (~2.04 μV, pcorr < .05). No other comparisons reached or approached significance.

A correlation between participants’ overall contralateral N170 enhancement (average of the RFV–VF difference in the LH and the LVF–RFV difference in the RH) and attention index (congruent–incongruent RTs) indicates that enhanced RTs to fear congruent trials were positively associated with the contralateral enhancement of the N170 (r = .88, p < .001, see Fig. 3b). That is, larger N170 amplitudes for contralateral relative to ipsilateral masked fearful faces were associated with faster reaction times for congruent compared to incongruent trials (i.e., greater attentional capture). Given that the baseline RT in which orienting and

![Fig. 4. Depicted are the ERPs for Cued LVF, Cued RVF, Fearful–Fearful, and Neutral–Neutral trial types at representative electrodes in the left (57) and right (100) hemispheres.](image-url)

In the left hemisphere (LH), the Cued RVF had larger N170 amplitudes relative to the Cued LVF. There was a trend, although not reaching significance, for Cued LVF, relative to Cued RVF, N170 amplitudes to be larger in the right hemisphere. Cued LVF trials elicited larger N170 amplitudes in the RH than LH. Additionally, there was a trend for larger P1–N170 peak-to-peak differences for the Cued RVF, relative to Cued LVF, in the LH and larger differences for the Cued LVF, relative to Cued RVF, in the RH. This indicates there may be a small difference between cue visual fields at the level of the P1.
disengagement effects are calculated as the difference between congruent and incongruent trials and that the attention index is calculated as the difference between congruent and incongruent RTs, the attention index should therefore capture both orienting and disengagement effects. Thus, an overall measure of spatial attention was correlated with the contralateral N170 enhancement.

4. Discussion

To the best of our knowledge, this is the first study to assess the spatial attention-related effects of backward masked fearful faces on the N170. The results are consistent with our hypothesis that masked fearful face-evoked spatial attention enhances the amplitudes of the contralateral N170. In particular, RFV (compared to LVF) fearful faces significantly enhanced the LH N170; however, while the same pattern was observed for LVF fearful faces this contrast failed to reach statistical significance (see Fig. 4). Cued LVF trials elicited larger N170 amplitudes in the RH than LH. Therefore, spatial attention elicited by masked fearful faces modulates the early stage of facial processing reflected by the N170. The behavioral (RT) results add to the existing body of work suggesting that spatial attention is captured by masked fearful faces (Carlson & Reinke, 2008; Fox, 2002) and suggest that this effect is attributed to both speeded orienting and delayed disengagement (Fig. 3a). Finally, the behavioral attention index was found to be highly correlated with the overall contralateral N170 modulation (Fig. 3b). The interpretations of these behavioral and electrophysiological effects are explored below.

4.1. Behavioral spatial attention effects

Previous behavioral research has revealed that masked fearful faces facilitate the orienting of spatial attention (Carlson & Reinke, 2008) while other research indicates that unmasked fearful faces primarily affect spatial attention by delaying disengagement (Fox et al., 2001; Yiend & Mathews, 2001). Here we provide further evidence that the orienting aspect of spatial attention is facilitated by masked fearful faces and provide novel evidence suggesting that the disengagement (and/or reorienting) of spatial attention is also involved. Unmasked threat stimuli have relatively long stimulus durations, which result in a delayed sampling of attention that may be insensitive to the initial allocation of spatial attention or orienting. Therefore, it is possible that facilitated orienting to unmasked threat occurs at a time point earlier than that typically sampled in studies of unmasked threat. In addition to fearful faces, backward masked angry faces have been shown to facilitate spatial attention (Mogg & Bradley, 1999a, 2002). However, future research is needed to determine which aspect(s) of spatial attention is modulated by masked angry faces (or other emotional faces) and if this effect is reflected on the N170.

4.2. ERP spatial attention effects

While previous research has reported mixed results of emotional facial expressions on the N170 (Batty & Taylor, 2003; Blau et al., 2007; Cabarel et al., 2005; Eimer & Holmes, 2007; Holmes et al., 2003, 2005; Krombholz et al., 2007; Leppanen et al., 2007), our results and other research (Eimer, 2000a; Holmes et al., 2003) suggests that directed spatial attention to faces enhances N170 amplitudes. Therefore, the rapid attention grabbing effects of masked fearful faces appear to facilitate visual and facial processing at retinotopically distinct areas of sensory cortex.

The masked fearful face enhancement of the contralateral occipito-temporal N170 may indicate there is a fast fear-based feedback mechanism, which modulates the initial processing of faces and facilitates behavior. This rapid mechanism is consistent with a subcortical route to the amygdala (LeDoux, 1996; Liddell et al., 2005; Morris, Ohman, & Dolan, 1999; Paley, Mayes, & Schultz, 2004) and an amygdala mediated attention network for orienting to crude threat signals (Carlson et al., 2009). However, it should be noted that the amygdala may be sensitive to a simple facial feature such as the eyes rather than faces per se (Adolphs et al., 2005; Hoffman, Gothard, Schmid, & Logothetis, 2007; Whalen et al., 2004). Subcortical responses are believed to be inhibited by cortical regulation during conscious, but not during nonconscious emotional processing (Jolij & Lamme, 2005). This inhibitory interaction may account for the lack of N170 modulations (Pourtois et al., 2004), behavioral orienting effects (Fox et al., 2001; Yiend & Mathews, 2001), and the relatively late amygdala responses (200 ms, Krolak-Salmon, Henaff, Viglietto, Bertrand, & Mauguiere, 2004) observed in unmasked fearful face studies. However, N170 and orienting effects were found in the current backward masking dot-probe task (also see Carlson & Reinke, 2008 for orienting effects). Thus, enhanced orienting to masked fearful faces may be mediated by an amygdala response eliciting more detailed cortical-based sensory processing, which is reflected in enhanced N170 amplitudes. These effects may be absent in studies of unmasked fearful face processing due to inhibitory cortical regulation (Jolij & Lamme, 2005), which suppresses this subcortical response. On the other hand, the enhanced N170 may reflect a feed forward mechanism in which fearful faces are preferentially processed in the face processing regions of occipito-temporal cortex. Evidence for this possibility is mixed as some ERP studies have reported general emotion related enhancements in the N170 (Batty & Taylor, 2003; Blau et al., 2007; Cabarel et al., 2005; Krombholz et al., 2007; Leppanen et al., 2007) while others have not (Eimer & Holmes, 2007; Holmes et al., 2003, 2005). Further research is needed to clarify whether this effect is attributed to a feed forward or backward mechanism.

In either case, the results are consistent with a location specific modulation of the signal (threat) to noise (non-threat) ratio at the occipito-temporal N170. Specifically, we found that RFV, relative to LVF, fearful faces enhanced N170 amplitudes in the LH, but not the RH, which suggests signal was enhanced in the LH relative to the RH. Within the RH the Cued LVF, Cued RFV, NN, and FF trial types all elicited larger N170s and did not significantly differ from each other. This observation could be associated with the RH’s relatively greater role in general facial processing, which may preferentially engage this hemisphere across trial types. However, only the fearful cued LVF elicited larger N170s in the RH relative to LH. This RH-LH difference suggests that the fear signal was enhanced in the RH relative to the LH for Cued LVF trials. Therefore, both the Cued LVF and RFV may produce a relative amplification of signal at contralateral occipito-temporal electrode sites; although through different means. Conversely, in undirected attention conditions, FF trials bilaterally enhanced N170 amplitudes (although only marginally) relative to NN trials, which may represent a distributed attentional spotlight. Unlike, the location specific modulation of the N170 in directed spatial attention trials, the distributed spotlight in FF, relative to NN, trials was not accompanied by a facilitation of behavioral responses. The lack of a behavioral facilitation for FF trials may be due to an increase in both signal and noise in this distributed spotlight. Thus, it appears that spatial attention and the facilitation of subsequent location specific behavior are enhanced by a focused spotlight of attention (Posner, 1980).

The spatial attention-related enhancement of the N170 may reflect an enhanced N1 (or early N170) to the neutral face mask that immediately follows the fearful face. This interpretation would be consistent with other unmasked emotional (Pourtois et al., 2004) and non-emotional (Di Russo et al., 2003; Fu et al., 2005; Natale et al., 2006) ERP studies of spatial attention that find enhance-
ments for non-emotional (congruent) targets that follow attention cues. However, unlike unmasked spatial attention paradigms, the first stimulus after the initial fearful face cue (in the current paradigm) is the neutral face mask, not the non-emotional target. Therefore, the current N170 effect may reflect a congruent-like enhancement in the neutral mask face, similar to congruent target effects in unmasked spatial attention studies. Future research should use variable cue-to-mask stimulus onset asynchrony and masks that do not elicit N170 responses to determine if the contralateral modulation of spatial attention is elicited solely by the masked fearful face or the initial face-mask pair. Additionally, while the interaction effect for the peak-to-peak analysis was only marginally significant, the small differences at the level of the P1 may have contributed to the observed contralateral modulation of the N170.

Previous research (Carlson & Reinke, 2008) suggests that the change of expression between the initial neutral face and facial expression does not account for the behavioral facilitation of spatial attention to backward masked fearful faces. In the current study, we found that the behavioral attention index was highly correlated with the attentional modulation of the N170, which indirectly suggests that the N170 and behavioral effects are commonly attributed to a facilitation of spatial attention by masked fearful faces. However, the effect of the perceptual difference between the initial face and the mask face on ERPs has yet to be directly tested.

Our correlation between the behavioral and electrophysiological indices of spatial attention indicates that these measures are closely linked. Given that the N170 enhancement occurs prior to the speeded reaction time it appears that the contralateral N170 enhancement reflects a neural mechanism in which fear faces modulate spatial attention and influence subsequent behavior. This contralateral enhancement is location specific and may reflect a modulation of the signal to noise ratio where there is enhanced cortical activity during visuo-spatial attention. This modulation of the signal to noise ratio may reflect a facilitation of spatial attention by masked fearful faces.

In summary, the ERP data indicate that contralateral N170 amplitudes are enhanced by masked RVF fearful faces in the LH while the behavioral data indicate that masked fearful face spatial attention effects are attributable to both rapid orienting and delayed disengagement. Finally, individuals’ overall contralateral N170 enhancement predicted the facilitation in RTs associated with directed spatial attention to backward masked fearful faces.

References

