

ERP Correlates of Emotional Face Processing in Psychopathy: Tracking Down the Psychopathy Effect in Faces

Meghan J. Weissflog, Sidney J. Segalowitz, Gillian E. S. Munro, & Jane Dywan
Brock University, St. Catharines, Ontario CANADA

Background

Emotion Processing in Psychopathy

- Emotion recognition deficits, particularly for fearful expressions, have been reported in populations high in psychopathic traits.¹
- Recent neuroimaging data suggest there may be functional differences in the way psychopaths process emotion.²
- Munro et al. examined the performance of violent offenders who varied on psychopathy and prison staff controls using an emotional flanker task.³



Figure 1. Example face flanker stimuli

- Offenders made more errors on the face flanker task compared to staff controls.
- Offenders' error rates could be predicted by their psychopathy (PCL-R) scores, such that higher psychopathy scores predicted more errors.

Current Study

The current study extends the findings of Munro et al. by examining the stimulus-locked ERP correlates of face processing observed during the face flanker task.

Research Question

Do early visual ERP components related to face processing (P1, N170 & VPP) differ in offenders relative to controls and, within the offender group, as a function of psychopathy?

Hypotheses

If emotion processing deficits are related to reduced efficiency in face processing, then offenders should show reduced face processing-related ERP components relative to controls and, within the offender group, the size of ERPs should be reduced in those with higher levels of psychopathy.

Presented at the 49th annual meeting of the Society for Psychophysiological Research, Berlin, Germany, Oct 21-25, 2009. Supported by Natural Sciences and Engineering Research Council of Canada grants to SJS and JD. Correspondence: sid.segalowitz@brocku.ca

Method

Psychopathy

- Psychopathy was diagnosed in the offender group using the Hare Psychopathy Checklist-Revised⁴

Participants

- 15 male inmates (M age = 45.9 ± 3.5 years)
 - 10 psychopathic (PCL-R ≥ 25 ; $M = 31.4 \pm 4.01$)
 - 5 nonpsychopathic (PCL-R ≤ 20 ; $M = 11.4 \pm 4.67$)
- 15 male controls (M age = 46.6 ± 1.78 years)

Face Flanker tasks

- An adaptation of the Eriksen letter flanker task⁵ in which participants were required to discriminate between angry and fearful target emotions (Figure 1)

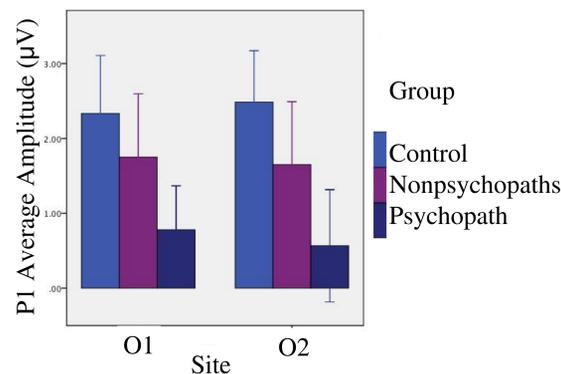
ERPs

- 128-channel BioSemi System; -200ms baseline corrected
- Gratton & Coles ocular correction;
- Average referenced with 1-30Hz filter
- Scoring: P1 at O1, O2; N170 at P7, P8; VPP at Fz, FCz

Results

P1 Analyses

- Psychopaths' Face Flanker P1 amplitudes were smaller at sites O1, $t(23) = 2.39, p = .025$, and O2, $t(23) = 3.03, p = .006$, than controls'.
- Psychopaths and nonpsychopathic offenders did not differ on Face Flankers P1 amplitudes.



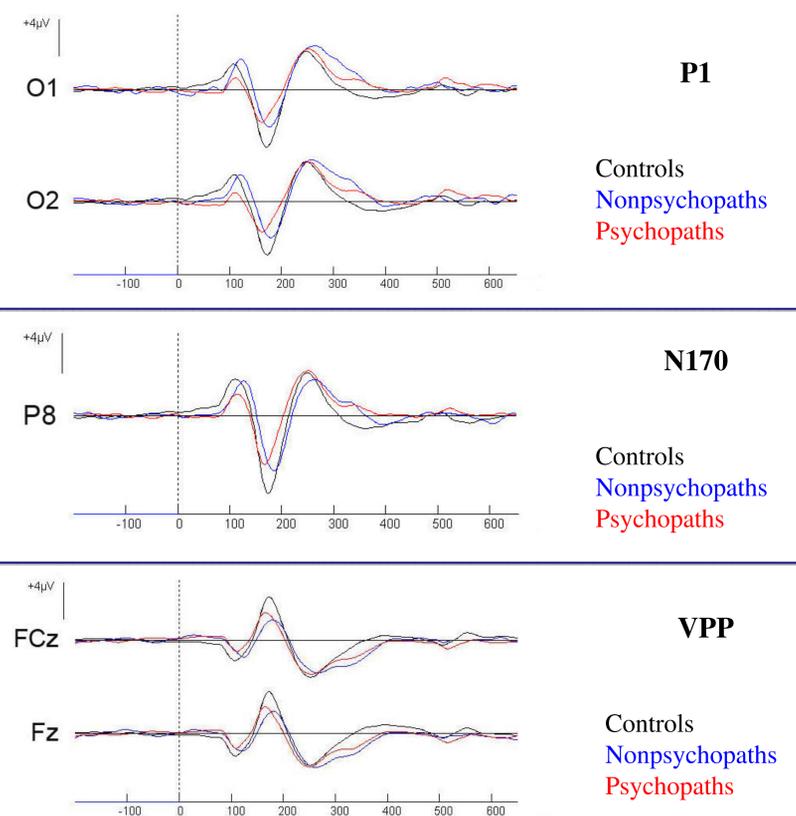
- P1 amplitudes did not correlate with PCL-R scores in the offender group ($r = -.291, n.s.$).

N170 & VPP Analyses

- Nonsignificant trends were found between groups on the amplitudes of the N170, $F(2,26) = 2.77, p = .081$, and VPP, $F(2,26) = 2.92, p = .072$, components, such that psychopathic offenders produced smaller average N170 and VPP amplitudes compared to staff controls, but not to nonpsychopathic offenders.

- Latencies: P1, $F(2,26) = 0.49, ns$; N170, $F(2,26) = .080, ns$; and VPP, $F(2,26) = 0.57, ns$, did not differ on latencies between groups, nor did latencies correlate with PCL-R score.

Group Overlays



Conclusions

- Psychopaths produced significantly smaller average P1 amplitudes in response to face stimuli compared to controls but these did not differ from nonpsychopathic controls nor did they relate to PCL-R scores within the offender group.
- Additionally, we failed to observe any significant differences between groups on the early, face-related N170 and VPP components, suggesting that observed differences in emotion recognition cannot be explained on the basis of a deficit in the initial processing of face stimuli.
- These data do not contradict the view that psychopathy-related deficits in the processing of facial expression are due primarily to an impairment in the ability to process some forms of emotional stimuli.^{1,2,3}

References

1. Blair, R. J. R. (2001). Neurocognitive models of aggression, the antisocial personality disorders and psychopathy. *J. of Neurol, Neurosurg & Psychiatry*, 71, 727-731.
2. Deeley, Q. et al. (2006). Facial emotion processing in criminal psychopaths. *Brit J. of Psychiatr*, 189, 533-539.
3. Munro, G.E.S., Dywan, J., Harris, G.T., McKee, S., Unsal, A., & Segalowitz, S.J. (2007b). ERN varies with degree of psychopathy in an emotion discrimination task. *Bio. Psych.*, 76, 31-42.
4. Hare, R.D. (2003). *The Hare Psychopathy Checklist-Revised* (2nd ed.). Toronto, Ontario: Multi-Health Systems.
5. Eriksen, B.A., Eriksen, C.W., 1974. Effects of noise letters in the identification of target letters in a non-search task. *Perception and Psychophysics*, 16, 143-149.