

Differential Anterior EEG Brain Activity While Viewing Violent or Neutral Video Clips

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Abstract

EEG alpha power difference scores between left and right anterior brain areas were obtained from 23 participants who watched a neutral or violent video clip. Increased activity at the right frontal Fp2 site was observed for the violent clip condition while increased activity at Fp1 was associated with the neutral clip. No difference between conditions was observed in alpha power difference scores for F4-F3, F8-F7, or T4-T3. These findings are consistent with the idea that the neutral game clip was associated with an approach tendency and the violent video clip was associated with a withdrawal tendency.



Introduction

- Interest in the relationship between violent video game playing and instances of violence has been of considerable interest of recent (Vitelli, 2013; Kain, 2013).
 - However, the link between the two has largely been inconclusive (Mitrofan, Paul, & Spencer, 2009).
- In an effort to shed more light on the topic, brain activity has previously been examined while viewing violent video segments.
 - Research has linked violent video games with activation in multiple areas, including anterior brain regions, using fMRI (Murray et al., 2009) as well as a reduction in P3 amplitude in response to violent images after viewing violent video segments.
- No studies have been located that examine differences in activity between right and left anterior brain regions from an approach/avoidance perspective (Davidson, Ekman, Saron, Senulis, & Friesen, 1990).

Method

Participants

- Twenty-three right-handed undergraduate participants (10 male, 13 female, $M_{age} = 19.78$, $SD = 2.79$) free of any previous head injury or trauma and use of psychotropic medication were recruited for the study.
 - a. Participants self-selected using the University's participant management system, SONA, and may have received course credit.

Materials and Equipment

- All participants completed the Edinburgh Handedness Inventory and a medical screening questionnaire assessing any previous head injury and use of any psychotropic medications.
- EEG data was collected and analyzed using an iWorx IX-EEG 10-20 recording system and iWorx LabScribe software respectively.
- A five-minute segment of *Journey PS3* (thatgamecompany, 2012) was used for the neutral video condition and a five-minute clip of *Call of Duty-Modern Warfare 2* (Infinity Ward, 2009) was used as the violent condition.

Procedure

- After obtaining informed consent, participants filled out the questionnaires.
- EEG sites at Fp1, Fp2, F3, F4, F7, F8, and T3, T4 using a 10-20 Electro-Cap were prepared. Linked A1-A2 reference was used.
 - All impedances were kept below 5k and corresponding L/R sites kept below 500 ohms difference.
- EEG activity at all sites was collected while participants viewed the five-minute video clip (neutral or violent). Demographics were administered, followed by debriefing.



Results

- After screening for and removing any EEG data for all channels due to artifact in any channel, alpha power in $\mu V/Hz$ was obtained for all sites using the iWorx LabScribe software.
 - All power values were then log transformed to normalize distributions.
- Difference scores were then calculated by subtracting log left values from log right values.
- Independent t-test analysis showed a significant difference in logFp2-log Fp1 difference scores between the neutral group ($M = 0.038$, $SD = 0.191$) and the violent group ($M = -0.1986$, $SD = 0.209$), $t(21) = 2.787$, $p = 0.011$ (See figure 1 and table 1).
 - Positive difference scores indicate increased left activity and negative values indicate increased right activity.
- No significant differences were observed for logF4-logF3, logF8-logF7, or logT4-logT3 .

Discussion

- Results suggest that the neutral video clip was associated with increased activity at the left frontal pole (BA10) at Fp1 while the violent video clip was associated with increased activity on the right side at Fp2.
- From the approach avoidance perspective (Davidson et al., 1990), this would indicate the neutral video clip was associated with an approach tendency while the violent video clip was associated with an avoidance/escape tendency.



Table 1. Descriptive Statistics and t-test results by mirrored site difference scores for Neutral and Violent Stimuli.

	Video	N	Mean	Std. Deviation	Std. Error of Mean	T-Test	df	Sig (2-tailed)
Log(Fp2)-Log(Fp1)	Neutral	10	0.3776	0.1909	0.0603	2.787	21	0.011
	Violent	13	-0.1986	0.2094	0.0581			
Log(F4)-Log(F3)	Neutral	10	-0.2735	0.4481	0.4481	0.076	21	0.94
	Violent	13	-0.2878	0.4401	0.4401			
Log(F8)-Log(F7)	Neutral	10	-0.0385	0.2796	0.2796	0.447	21	0.659
	Violent	13	-0.1013	0.3694	0.3694			
Log(T4)-Log(T3)	Neutral	10	-0.2933	0.7088	0.7088	0.429	21	0.672
	Violent	13	-0.4146	0.6423	0.6423			

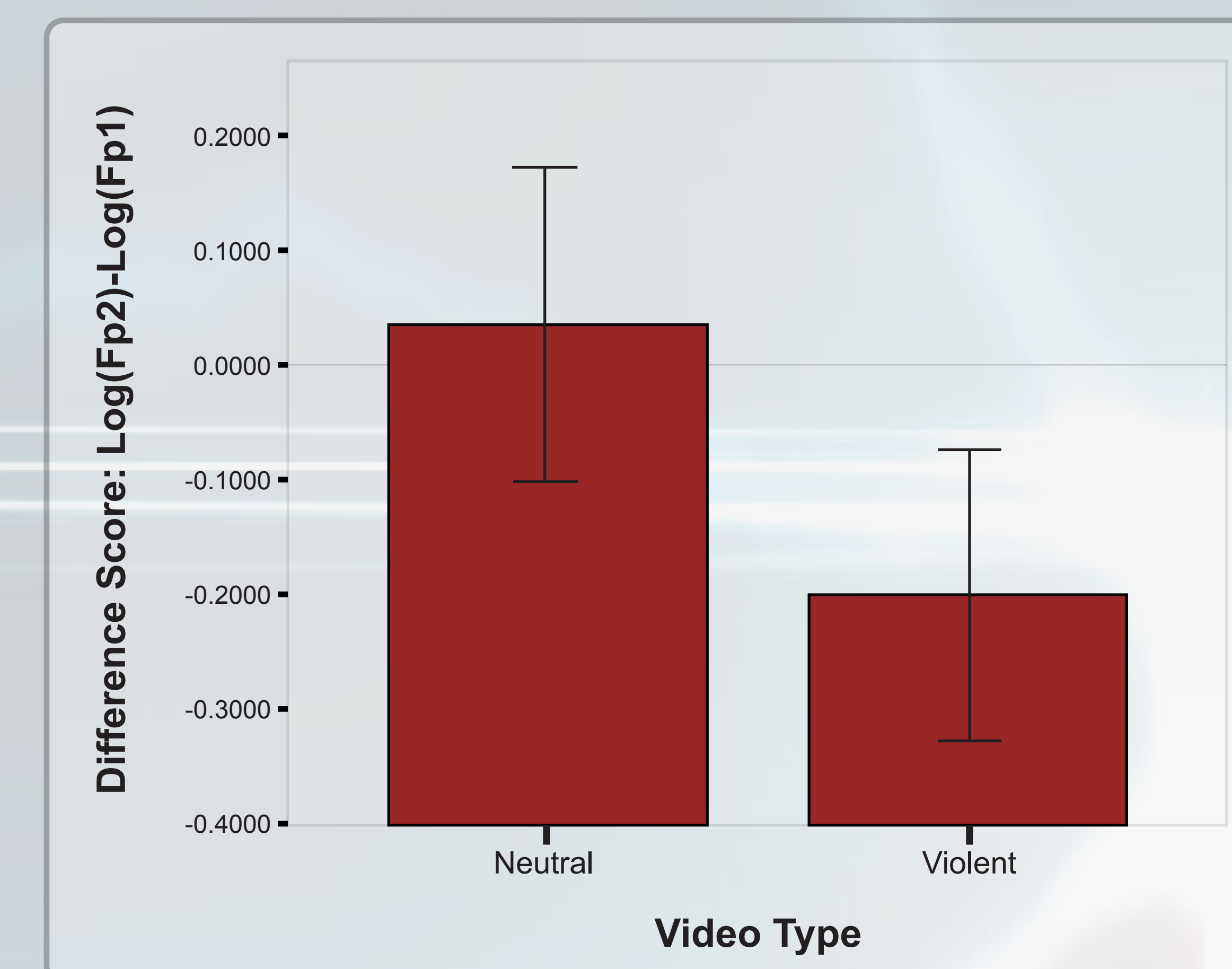


Figure 1. Mean Difference Score Log(Fp2)-Log(Fp1) for participants viewing neutral and violent video game clips. Error bars represent 95% Confidence Interval

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