

# EEG: Frontal Pole Asymmetry and Video Game Addiction

Adam Runyan, Michael Omerza, Amanda Fuller, Taylor Rodieck, Darby Simon, Isaac Flint, Teigan Hockman, Patrick Ament  
University of Central Missouri, Department of Psychological Science

## Abstract

Frontal brain activation, in the left hemisphere (LH) and right hemisphere (RH), has been associated with approach and avoidance behaviors. EEG brain activity was recorded from eight homologous frontal sites while participants viewed a violent videogame. Difference scores were computed between the homologous sites (i.e. fP2-fP1). Positive scores reflect increased brain activity in the LH. Analysis revealed a positive Person correlation between the difference score for the frontal poles (fP2-fP1) only, and scores on the Video Game Addiction Test (VGA) ( $r = .488, p = .045$ ). This study suggests LH activation is associated with videogame addiction.

## Introduction

Interest in the relationship between violent video game playing and instances of violence has been of considerable interest of recent (Vitelli, 2013, In Kain, 2013) though 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 been examined while viewing violent video segments and has shown 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 between right and left anterior brain regions from an approach/avoidance perspective (Davidson et al., 1990) in regards to video game addiction.

## Method

### Participants

Thirteen college undergraduate students (6 males, 7 females;  $M$  Age = 20.69,  $SD$  3.47) that were free of any head injury, head trauma, or the use of psychotropic medication participated in the study. Participants self-selected into this study through the University's research management system, SONA.

### Materials and Equipment

All participants completed the Edinburgh Handedness Inventory, a medical screening questionnaire assessing any previous head injury and use of any psychotropic medications, and the Video Game Addiction Test (VGA, Rooij et al., 2012). 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 *Call of Duty-Modern Warfare 2* was used for the stimulus video.

## Method (continued)

### Procedure

After obtaining informed consent, 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 5 kohms and corresponding L/R sites kept below 500 ohms. EEG activity at all sites was collected while participants viewed the 5 minute violent video clip. All assessments and questionnaires were administered prior to the EEG data collection session followed by debriefing.



Download the free app, Aurasma - search for and follow UCMO to view the first minute of the video.

## Results

After visually screening for and removing any EEG data for all channels due to artifact in any channel, alpha power in  $\mu V^2 / Hz$  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. SPSS was used to calculate correlations between the VGA measure and the EEG Difference scores. A significant correlation was found between log Fp2- log Fp1 and VGA ( $r = .488, p = .045$ ). See figure 1 for a scatterplot of EEG Fp2-Fp1 scores with VGA scores and table 1 for the complete correlation table.

## Discussion

Results suggest that higher levels of violent video game addiction are associated with increased activity at the frontal pole (BA10) on the left side at Fp1. From the approach avoidance perspective (Davidson et al., 1990), this would indicate that higher levels of video game addiction are associated with an approach tendency.

Table 1: Correlation Table for VGA and EEG Difference Scores (with one-tailed p-value)

	VGA
log Fp2- log Fp1	.488 (.045)
log F4 - log F3	-.173 (.286)
log F8 - log F7	-.157 (.304)

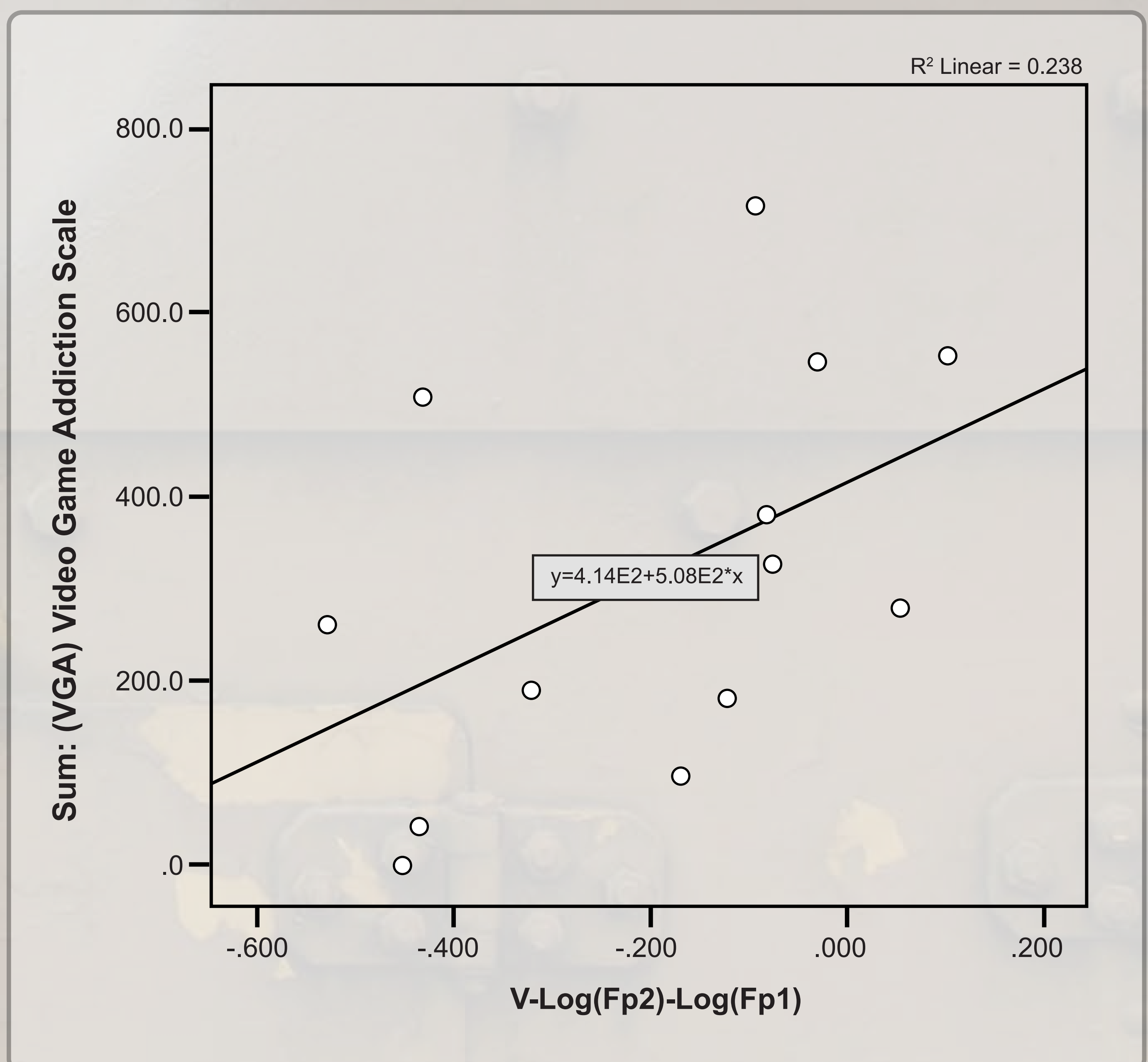


Figure 1: Scatterplot for Correlation between VGA and log Fp2 - log Fp1