10-2020

Predictors of Pathology Smartphone Use: Reward Processing, Depressive Symptoms, and Self-Control

Ashley Dapore
DePauw University

Robert West
DePauw University

Carl Ash
DePauw University

Bridget Kirby
DePauw University

Kaitlyn Malley
DePauw University

See next page for additional authors

Follow this and additional works at: https://scholarship.depauw.edu/srfposters

Part of the Neuroscience and Neurobiology Commons, and the Psychology Commons

Recommended Citation

Authors

Ashley Dapore, Robert West, Carl Ash, Bridget Kirby, Kaitlyn Malley, and Shasha Zhu

Predictors of Pathology Smartphone Use: Reward Processing, Depressive Symptoms, and Self-Control

Robert West, Carl Ash, Ashley Dapore, Bridget Kirby, Kaitlyn Malley, Shasha Zhu

Background

Smartphones represent a ubiquitous part of everyday life, allowing us to keep in touch with others, stay up to date on current events, and fill leisure time. As they have become more popular, so has the pathological use of the devices (i.e., smartphone addiction), with some studies revealing that as many as 20-40% of uses may meet the criteria for smartphone addiction (De-Sola Gutierrex et al., 2016).

The current study was designed to examine the relationship between pathological smartphone use in a college aged sample and feedback processing elicited by gains and losses in a modified 2 Doors Task. In the task, subjects or the computer selected 1 of 2 doors on each trial and the subject won or lost some money on each trial. This allowed us to examine the effect of agency of the choice on the ERPs related to feedback processing.

Based upon the addiction literature, we predicted that the amplitude of the reward positivity (RewP) would decrease as pathology increased. We also predicted that the amplitude of ERPs related to losses would decrease as pathology increased.

Method

Participants: Participants: 99 individuals participated in the study (age M = 19.3 years, 25 male, 67 female, 1 gender non-conforming, 1 unidentified). SAS-SV range 9-54.

Procedure:

Smartphone Addiction Scale-Short Version (Kwon et al., 2013): 10 item scale measuring physical, psychological, and social impact of smartphone use (e.g., Missing planned work due to smartphone use, Using my smartphone longer than I had intended, Having my smartphone in my mind even when I am not using it). Chronbach's alpha = .83 current sample.

2 Doors Task: The task represented at 2 (Choice: self or computer) x 2 (Outcome: win or loss) factorial with 20 trials in each condition. The choice cue remained on the screen until the space bar was pressed, then the doors appeared and remained on the screen either until a key was pressed (self select) or for 800-1200 ms (computer select). One second later the feedback was presented, that remained on the screen for 1.5 seconds.

EEG/ERPs:
32 channel Brain Vision system with active electrodes. EEGLAB and ERPLAB used for data processing and analysis.

ERPs averaged for four outcomes (win or loss in the subject or computer select trials).

ERPs are plotted for Lower, Middle, and High SAS-SV scores for ease of visualization. SAS-SV scores were treated as a continuous variable in analyses. One-tailed tests were used for the correlations given the prediction of a negative association.
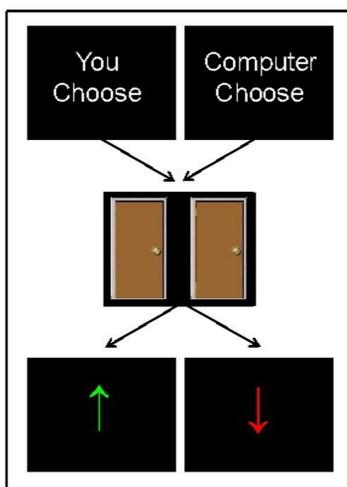

Wins vs. Losses

The RewP revealed significant main effects of agent (F(1,93) = 166.42, p < .001), outcome (F(1,93) = 25.59, p < .001), and interaction (F(1,93) = 8.44, p = .005). The effect of the outcome was significant for the person select trials (F(1,93) = 24.26, p < .001), but not for computer select trials (F(1,93) = 3.40, p = .068).

The frontal P3 had a main affect of agent (F(1,93) = 206.56, p < .001)).

The parietal P3 showed a significant main effect of agent (F(1,93) = 150.47, p < .001), while the effect of outcome (F(1,93) = 1.74, p = .19) and interaction were not significant (F(1,93) = 1.86, p = 18).
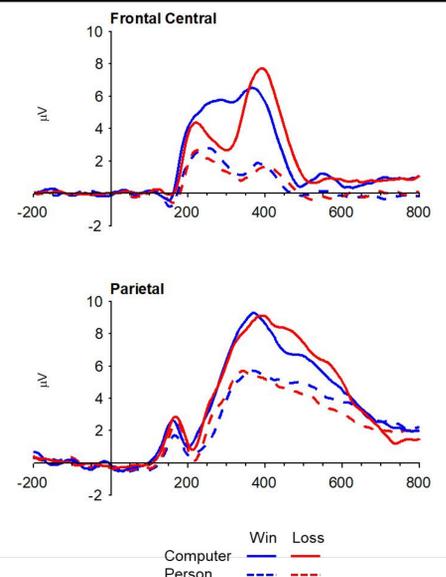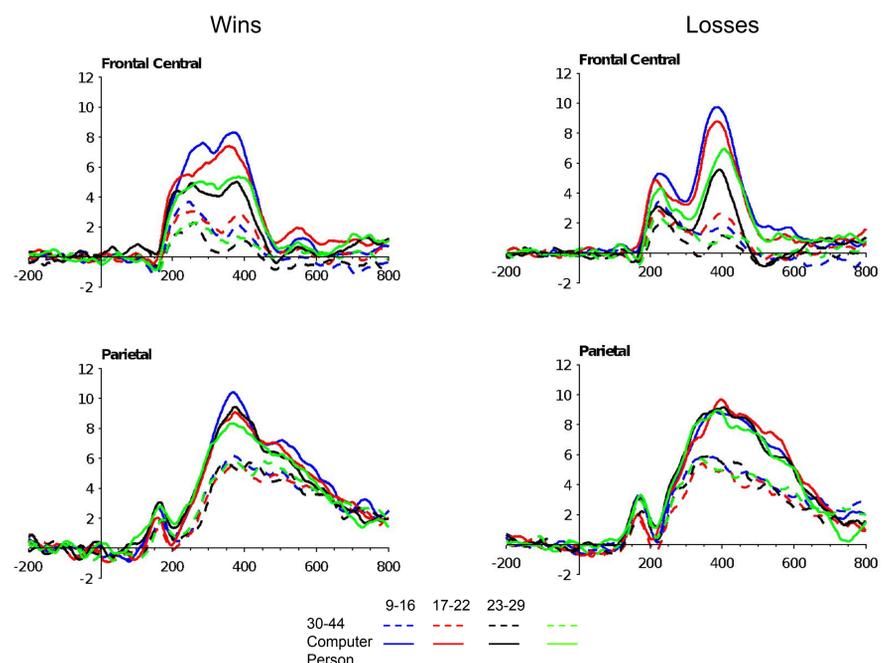

Pathology vs. Agency

In the person select condition, the amplitude of the RewP and the frontal P3 were significantly correlated with smartphone pathology.

In the computer select condition, there was no significant correlation found.

The parietal P3 was not correlated with smartphone pathology.


Regression Modeling

Using data including wins for the RewP, losses for the frontal P3, and collapsing across the effect of outcome for the parietal P3, models were consistent previously calculated correlations.

For the RewP (wins), the agent x smartphone pathology interaction was significant (F(1,92) = 7.76, p = .006). The frontal P3 interaction was also significant when in the person select condition. (F(1,92) = 5.65, p = .02)

The parietal P3 for this interaction was not significant (F(1,92) = 1.45, p = .234).
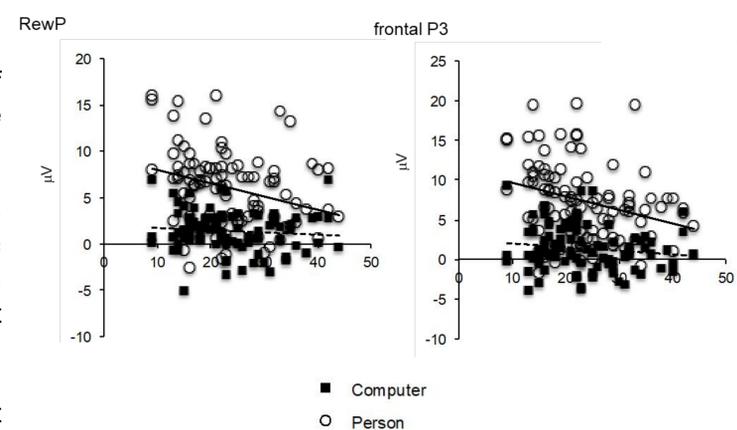
Conclusions

- The RewP and frontal P3 revealed an interaction between outcome and agent.

- The association between smartphone pathology and neural activity was specific to reward processing; the parietal P3 was not related to smartphone pathology.

- The association between pathological use and reward processing suggests that poor decision-making observed in individuals expressing gaming and Internet addiction may result from a disruption of feedback processing.

- Self-control was found to influence smartphone pathology, but not depressive symptoms; smartphone pathology was related to risk-taking and emotional regulation.

Funding