

The Brains of Problematic Online Game Users Seek Strong Sensation: An ERP Study on Problematic Online Game Users

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Introduction

Online gaming is the most popular social activity for adolescents. After online games grow in popularity, many studies have focused on the outcome of excessive using of online game. However, despite a growing body of literature describing problematic online game users, we know little about neural basis of problematic patterns' occurrence. Sensation seeking is considered to be a biological trait of excessive online game users associated with a need for novel experience. Many scholars have found that sensation seeking of addicted people like alcoholics is related to N2 component. Therefore, authors attempts to investigate N2 component of online game users, which may be a reliable marker to clarify a specific trait-sensation seeking-of problematic online game users. We assess the event-related potentials of online game users during simple experiment, the Go/No-Go task. In the Go/No-Go task, because a novel stimulus (a no-go stimulus) conflicts with the habitual propensity for a go stimulus, subjects must inhibit habitual response for go trials during no-go trials. When ERPs elicited by the no-go trials, N2 component which is a front central negative wave peaking around 200-400 ms has been reported repeatedly. In the task, we expect that the no-go trials will be one of very reliable indicators as exploring problematic online game user's sensation seeking, because the no-go stimuli reveal at very rare intervals. Due to these associations between online gaming and the task, the present study expects that greater N2 amplitudes would be detected when problematic online game users respond to the no-go stimuli.

Method

Eighteen healthy right-handed male undergraduate students between the ages of 19 and 27 ($M_{age}=23.94$, $SD_{age}=2.88$) participated in the present study. All responses to 19 items in the Problematic Online Game Use scale (POGU scale) were measured on 6-point scales ranging from one (strongly disagree) to six (strongly agree) [1]. The average POGU scores for the participants was 2.22 ($SD_{POGU}=1.02$). We divided the 18 participants into two groups: the High-POGU group ($N=9$, $M_{POGU}=3.04$, $SD_{POGU}=0.75$) and Low-POGU group ($N=9$, $M_{POGU}=1.41$, $SD_{POGU}=0.41$). The authors employed the Go/No-Go task, consisting of a set of frequent stimuli (80%) and infrequent stimuli (20%) (Figure 1). The subjects were required to respond as quickly as possible. On each trial, either the letter "M" or "W" was presented in the center of a computer monitor [2]. The experimental paradigm consisted of a sequence of three visual stimuli: "M", "W", and "+". Every trial began with a fixation cross (+), presented 500 ms. Following the fixation cross, a stimulus was presented for 100 ms, and replaced by a blank screen for 500 ms. The inter-stimulus interval was 600 ms. Participants completed 500 trials of the Go/No-Go task in five blocks of 100 trials each. Time limits of breaks were chosen by participants, and then the breaks were given between each block [3]. During each block, frequent stimulus and infrequent stimulus were presented in a randomly intermixed fashion.

Results

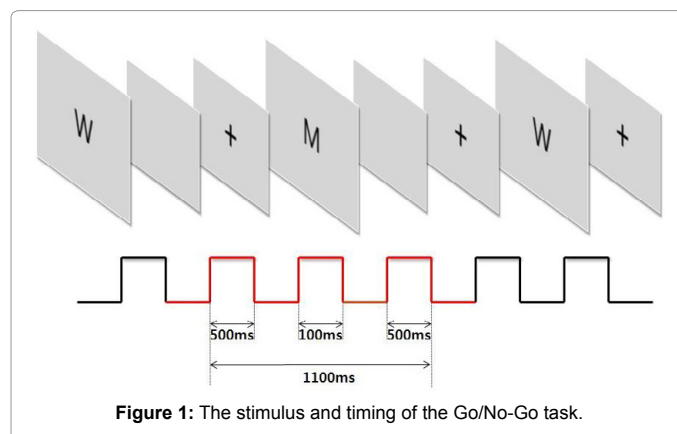
Performance accuracy rate and reaction time were compared between the high-POGU group and the low-POGU group (Table 1).

The Go/No-Go task elicited strong N2 component in the window of 250-290 ms following a novel stimulus and also yielded significant statistical differences between the high-POGU group and the low-POGU group. Mean of subject's POGU scores tended to be significantly correlated with N2 on ACC region ($r(18)=-0.484$, $p<0.05$ at site Fz, $r(18)=-0.554$, $p<0.05$ at site Cz) (Figure 2).

Discussion

The present study clarified that the levels of excessive online game using reflected individual differences in the functioning of a neural mechanism related to activation against novel stimuli. Also, the results supported that the ACC region is related to excessive online game use, particularly in the area of N2 activation.

Higher POGU scores may reflect more neural sensitivity to rare stimuli. These findings are consistent with previous researches that excessive online game users are associated with a need for novel experience, and sensation seeking is a biological and cognitive trait of the need for varied, novel and complex experiences.



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		High-POGU group		Low-POGU group		t
		Mean	SD	Mean	SD	
Accuracy Rates (%)	Go trials	96.2	5.4	97.4	2.62	-0.625
	No-go trials	47.4	20.6	47.7	25.6	-0.032
	Total	85.5	7.9	87.5	6.5	-0.573
Reaction Time (ms)	Go trials	282	51.8	306	56.3	-0.974
	No-go trials	312	27.9	323	57.9	-0.502
	Total	281	46.4	304	65.2	-0.888

Table 1: The reaction time and the accuracy rates of the high-POGU group and the low-POGU group.

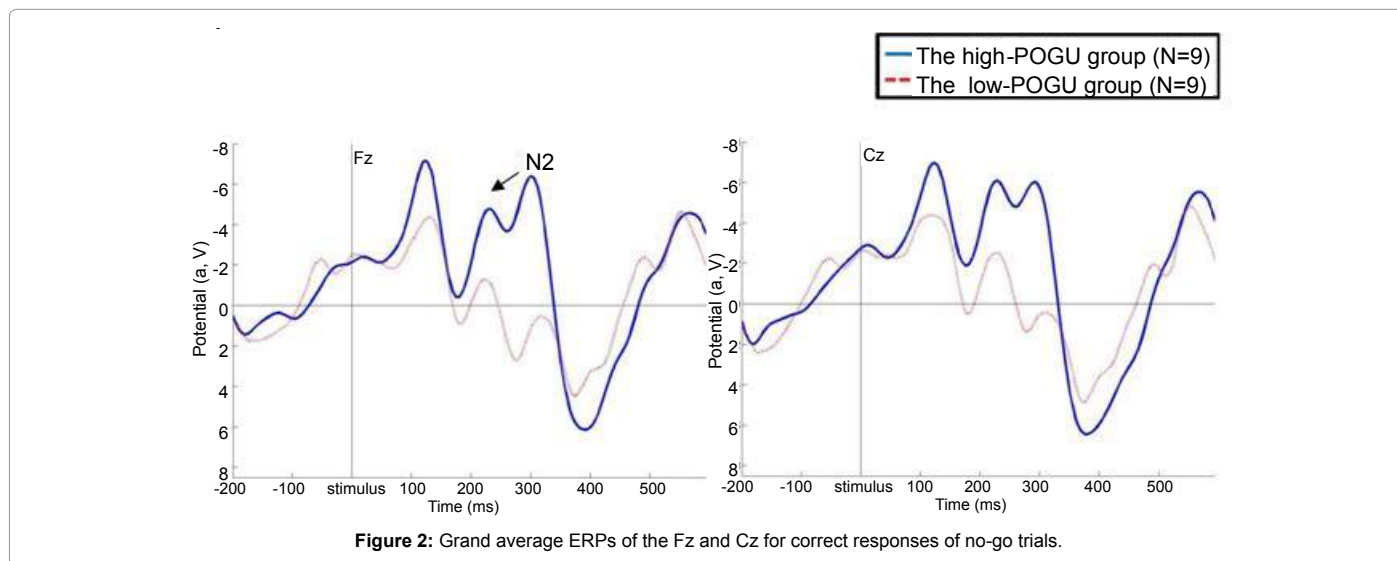


Figure 2: Grand average ERPs of the Fz and Cz for correct responses of no-go trials.

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