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Bupropion in the treatment of problematic online game play in patients with major depressive disorder

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Abstract

As one of the problematic behaviors in patients with major depressive disorder (MDD), excessive online game play (EOP) has been reported in a number of recent studies. Bupropion has been evaluated as a potential treatment for MDD and substance dependence. We hypothesized that bupropion treatment would reduce the severity of EOP as well as depressive symptoms. Fifty male subjects with comorbid EOP and MDD were randomly assigned to bupropion + education for internet use (EDU) or placebo + EDU groups. The current study consisted in a 12-week, prospective, randomized, double-blind clinical trial, including an eight-week active treatment phase and a four-week post treatment follow-up period. During the active treatment period, Young Internet Addiction Scale (YIAS) scores and the mean time of online game playing in the bupropion group were greatly reduced compared with those of the placebo group. The Beck Depression Inventory (BDI) scores in the bupropion group were also greatly reduced compared with those of the placebo group. During the four-week post-treatment follow-up period, bupropion-associated reductions in online game play persisted, while depressive symptoms recurred. Conclusively, bupropion may improve depressive mood as well as reduce the severity of EOP in patients with comorbid MDD and online game addiction.

Keywords

Bupropion; major depressive disorder; online game play

Introduction

Problematic online game playing and major depression

A number of psychiatric diseases, including attention deficit hyperactivity disorder, major depression, schizophrenia, and impulse control disorder, are thought to be linked to comorbid excessive internet use in children and adolescents (Ha et al., 2006, 2007; Yoo et al., 2004). Of these disorders, major depression is regarded as one of the more prevalent

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Conflict of interest

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comorbid psychiatric disorders in Korean adolescents with problematic internet use (Aboujaoude et al., 2006; Park, 2009). The current research was conducted in South Korea, a country where gaming is a prevalent and significant public health problem (Fitzpatrick, 2008). Ninety-nine percent of South Korean elementary and middle school students use the internet (KADO, 2009). South Korea has an 80.6% high-speed internet market penetration (KOSIS, 2009). In a large study of Korean high school students, 37.9% of students met criteria for possible internet addiction (Young Internet Addiction Scale score (YIAS) 40–70) and 1.6% of students met criteria for internet addiction (YIAS> 70) (Kim et al., 2006). In this study, the internet addiction group showed higher depressive symptom scores and greater suicidal ideation than other students (Kim et al., 2006). Compared with other factors, including self esteem (50.9%), life satisfaction (26.4%), stress (20.1%), and negative life events (28.5%), internet use was reported to increase the risk for depressive symptoms by 20.7% in Korean adolescents (Park, 2009). Among various internet activities, the most frequent reason for Korean adolescents to use the internet is for online gaming (Ha et al., 2006; KISA, 2009).

Recent reports have emphasized the relationship between excessive online game play and depression not only in adolescents (Ha et al., 2006; Mathers et al., 2009), but also in adults (Kraut et al., 1998). In a cross-sectional community study, excessive online game play was associated with depression, anxiety, and poor health status in an Australian teenage school population (Mathers et al., 2009). Kraut et al. (1998) have reported that excessive internet use may be associated with depression, loneliness, and disturbed communication in family and society. These symptoms can be frequently observed in adult patients with depression and anxiety disorders (Moody, 2001; Shapira et al., 2000).

Although several studies regarding criteria for internet addiction have been conducted, it remains uncertain whether internet addiction alone, which is relatively less common, is really an independent psychiatric disorder as opposed to a symptom of other, primary psychiatric disorders (Aboujaoude et al., 2006). Studies of both groups will be needed to clarify this issue. Given the uncertainty regarding this point, for this study we recruited patients with major depressive disorder (MDD) and problematic internet use rather than a pure internet addiction group.

Antidepressant treatment for internet addiction and bupropion treatment in substance abuse

There are a limited number of reports on clinical trials for the treatment of patients with excessive internet use. Sattar and Ramaswamy (2004) noted that patients with severe internet addiction could be successfully treated with 10mg escitalopram. Dell'Osso et al. (2008) reported that 10 weeks of escitalopram treatment decreased the time of internet use in patients with impulsive-compulsive internet usage disorder.

Although published studies are not entirely consistent, there have been several clinical trials showing modest treatment effects in patients with comorbid major depression and substance abuse, including alcohol (Nunes et al., 1994; Thase et al., 2001), cocaine, or nicotine dependence (De Lima et al., 2002; Pettinati et al., 2003; Thase et al., 2001). Due to its weak inhibition of both dopamine and norepinephrine reuptake (Cooper et al., 1980, 1994),

bupropion has been evaluated as a potential treatment for patients with substance dependence such as cocaine dependence (Poling et al., 2006) and nicotine dependence (De Lima et al., 2002; Hays et al., 2009; Pettinati et al., 2003; Thase et al., 2001), as well as for those with pathologic gambling (Dannon et al., 2005). However, Black et al. (2007) reported that bupropion has no superior effect on the treatment of pathologic gambling compared with placebo.

Current treatment strategies for excessive internet use or online game playing involving psychotherapy and behavioral therapy are thought to have only limited efficacy for the treatment of pathologic internet addiction associated with comorbid psychiatric diseases (Beard, 2005; Wieland, 2005). To date, few pharmacologic trials have been reported in subjects with excessive internet use or online game play.

Hypothesis

In this cohort study of patients with comorbid excessive internet game playing and MDD, we hypothesized that bupropion sustained release (SR) treatment would reduce online game playing time and the severity of online game addiction. We also hypothesized that bupropion SR would be effective in the treatment of depressive symptoms. In addition, we expected that the improvement in depressive symptoms would be associated with reductions in online game playing time and the severity of online game addiction.

Methods

Subjects

Through advertisements posted in Chung Ang University Medical Center, 57 male patients with problematic online game play and MDD agreed to participate in a placebo-controlled trial of bupropion SR. All subjects (13–45 years old) were screened with the Structured Clinical Interview for DSM-IV and diagnosed by a psychiatrist as having MDD. The definition for problematic online game play in this study was extensive game play time (more than 4 hours per day/30 hours per week) (Ko et al., 2009); a score of more than 50 on the YIAS (Ha et al., 2006; Young, 1996); and impaired behaviors or distress due to a maladaptive pattern of online game play. These criteria were selected to be consistent with DSM-IV criteria for substance abuse. All subjects reported a persistent desire to play internet games every day and had difficulty in reducing or controlling online game play. Academic reports from school or work performance in the office had declined. Subjects also had disrupted diurnal rhythms (sleeping during the day and gaming at night, irregular meals, and failure to wash face and body) and were irritable, anxious, and aggressive when family members asked them to stop playing online games. Twenty-nine patients were absent from school due to playing internet video games in internet cafés. One patient had been divorced due to excessive internet use at night. Nine patients had lost their jobs due to frequent absences from work without notice. Seven patients fell into debt due to the purchase of online game and online gambling materials. Eleven patients stopped attending school due to excessive internet video game play. The genre of online game which patients preferred included role playing games (RPG, $N = 25$), first person shooting games (FPS, $N = 15$), real-time strategy games (RTS, $N = 7$), and online gambling ($N = 3$).

All participants were randomly assigned to bupropion + education for internet use or placebo + education for internet use in a 1:1 ratio. Bupropion and placebo tablets were prepared by the Chung Ang University Hospital Pharmacy. Of the 57 subjects with MDD and excessive internet game play, four subjects in the bupropion group discontinued bupropion SR treatment due to nausea and headache. One subject in the placebo group stopped placebo treatment due to nausea. Two subjects in the placebo group were excluded due to the addition of an antidepressant in response to increased depressive symptoms. Finally, we recruited 50 male subjects (25 bupropion group, 25 placebo group). Exclusion criteria included (1) history of prior MDD or current episode of other axis I psychiatric diseases, (2) substance abuse history (except for alcohol and tobacco abuse), and (3) patients with neurological or medical disorders. The Chung Ang University Hospital Institutional Review Board approved the research protocol for this study and written informed consent was provided by all participants. In the case of an adolescent under the age of 18 years, written informed consent was provided by the patient and the patient's parent. During the four-week post-treatment follow-up phase, three subjects in the bupropion group and two subjects in the placebo group dropped out. One patient in the bupropion group and two patients in the placebo group did not attend a scheduled follow-up visit. One patient in the bupropion group was started on a different antidepressant due to worsening symptoms of depression.

There were no between-group differences in terms of age (bupropion group: 21.2 ± 8.0 (13–42) years; placebo group: 19.1 ± 6.2 (13–39) years, $z = 1.12$, $p = 0.27$), education (bupropion group: 11.9 ± 3.2 years, placebo group: 11.1 ± 3.0 years, $z = 0.99$, $p = 0.32$), alcohol consumption (bupropion group: 17 non-drinking, 12 social drinking, placebo group: 19 nondrinking, 9 social drinking, $\chi^2 = 0.52$, $p = 0.47$), smoking (bupropion group: 20 non-smokers, 9 smokers, placebo group: 17 non-smokers, 11 smokers, $\chi^2 = 0.43$, $p = 0.51$), marital status ($\chi^2 = 0.54$, $p = 0.77$), or occupational status ($\chi^2 = 1.91$, $p = 0.60$) (Table 1).

Between the two groups, there was no significant difference in terms of YIAS scores (YIAS, $z = 1.04$, $p = 0.30$), total playing time ($z = 1.09$, $p = 0.28$), Clinical Global Impression-Severity (CGI-S) scores ($z = 0.72$, $p = 0.47$), or Beck Depression Inventory (BDI) scores ($z = 0.14$, $p = 0.89$). The mean duration of game play in the bupropion group and the placebo group at baseline were 47.3 ± 9.2 hours per week and 44.3 ± 8.2 hours per week, respectively. The mean YIAS scores of the bupropion group and the placebo group at baseline were 71.5 ± 13.7 and 68.5 ± 10.7, respectively. The mean CGI-S scores of the bupropion group and the placebo group at baseline were 3.7 ± 0.8 and 3.6 ± 0.8, respectively. The mean BDI scores of the bupropion group and the placebo group at baseline were 27.6 ± 6.7 and 27.5 ± 10.5, respectively. The YIAS scores were correlated with CGI-S scores ($r = 0.45$, $p < 0.01$) and BDI scores ($r = 0.28$, $p = 0.04$) in all patients (Table 1).

Study procedure

This study was designed as a 12-week prospective trial, including eight weeks of double-blind (bupropion or placebo) active treatment and a four-week post-treatment follow-up period. Patients recorded their YIAS and BDI scores on a weekly basis. For an objective time recording, the patient's main care-taker (parent or spouse) recorded total game play

time each week. Investigators documented the CGI-S scores at baseline, eight weeks (end of active treatment period), and 12 weeks (end of four-week follow-up period).

Eight-week medication trial phase

The patients in the bupropion group were started on bupropion SR 150 mg/day and increased to 300 mg/day during the first week of treatment (bupropion group). During weeks 2–7, the patients in the bupropion group were asked to maintain a consistent dose of bupropion SR. The patients in the placebo group were started on one pill of placebo and raised to two pills during the first week of treatment (placebo group). During weeks 2–7, patients in the placebo group were asked to maintain this number of pills. All subjects received drug bottles containing bupropion SR (150 mg/300 mg) or placebo on the first day of each weekly education session during the eight-week medication trial period.

In this study, all subjects received a weekly education session focused on healthy internet use and the adverse consequences of excessive video game play. The ‘education for internet use’ was provided for ethical reasons for patients with internet addiction who participated in this trial. This intervention is also used with all patients who are referred to our University-based internet addiction clinic. This education consists of eight sessions (Ss): S1, a comparison of the present situation of internet access between Korea and other nations; S2, a review of adverse consequences of internet addiction in terms of academic, job, and economic performance; S3, discussion of the damage caused by internet addiction in terms of body and mind; S4, a comparison of addiction and preference; S5, a review of the genre of online games and their relative tendencies for addiction; S6, treatment methods for internet addiction; S7, guidelines for the healthy use of internet and online games; S8, inviting guest speakers who have recovered from game addiction. These materials were selected based on the promotional materials for a healthy internet use campaign and our previous studies (Han et al., 2007, 2008; KADO, 2009; Lee et al., 2008).

Trial outcomes were measured in two domains: (1) internet video game play and (2) mood improvement. The severity of problematic online game play was assessed by total time of internet video game play per week and YIAS scores (Young, 1996). Mood changes were assessed with the CGI-S (Guy, 1976) and BDI (Beck et al., 1961). These outcomes were measured at baseline, following eight weeks of active treatment, and after the end of the four-week follow-up period.

Four-week post-treatment follow-up phase

Four weeks after completing the trial, 45 patients reported on their current internet game use and mood state, assessed using the same methods which were employed at baseline and following eight weeks of active treatment.

Statistics

Between-group differences in terms of age, education, and alcohol and smoking habits were analyzed with the Mann–Whitney *U* test or the χ^2 test. Changes in depressive symptoms and the severity of internet addiction between baseline, week 8 and week 12 were analyzed using a repeated measure ANOVA. In the analysis between responders and non-responders in the

bupropion group, responders are defined as patients with post-treatment BDI scores of less than 30% of baseline scores.

Controlling for the change of BDI scores, changes in YIAS scores between baseline, week 8, and week 12 were also analyzed with repeated measure ANOVA. Correlations between depressive symptoms and the severity of internet video game addiction were analyzed with Pearson correlations. For all statistical analyses, the a level for significance was set at 0.05 and all analyses were performed using Statistica 6.0. Intent to treat (ITT) analysis was used and last observation carry forward (LOCF) was performed for missing values. At study onset, we assumed that 60 subjects would complete the trial and the difference in response rate between drug and placebo groups would be 0.30. This would project a power of greater than 0.82. However, the current study achieved a power of 0.74 with a total of 50 subjects, 10 less than we had hoped to assess.

Results

Change of YIAS scores, online game play time, and BDI scores between the bupropion and placebo groups during the eight-week medication trial period

During the medication trial period, YIAS scores in the bupropion group were greatly reduced compared with those of the placebo group ($F = 12.9$, $p < 0.01$). The mean time of online game playing was also greatly reduced compared with that of the placebo group ($F = 13.6$, $p < 0.01$). The BDI scores ($F = 7.6$, $p < 0.01$) and CGI-S scores ($F = 10.9$, $p < 0.01$) in the bupropion group were greatly reduced compared with those of the placebo group ($F = 7.6$, $p < 0.01$) (Table 2) (Figure 1). The response rates in the bupropion group were better than the placebo group according to BDI (56% *vs.* 16%, $\chi^2 = 34.7$, $p < 0.01$) and YIAS (48% *vs.* 12%, $\chi^2 = 30.9$, $p < 0.01$) (Figure 2). In the LOCF population, the results of the changes in YIAS scores ($F = 11.1$, $p < 0.01$), the mean time of online game playing ($F = 8.9$, $p < 0.01$), BDI scores ($F = 8.2$, $p < 0.01$), and CGI-S scores ($F = 9.3$, $p < 0.01$) were similar to those of study completers. In non-completers, three subjects treated with 150 mg bupropion showed no significant change in the mean time of online game playing ($z = 0.75$, $p = 0.48$), YIAS ($z = 1.0$, $p = 0.42$), BDI ($z = 3.0$, $p = 0.23$), or CGI-S ($z = 1.0$, $p = 0.42$). One subject treated with 300 mg bupropion showed a change in the mean time of online game playing (baseline: 35 h/wk, last observation: 25 h/wk), YIAS (baseline: 68, last observation: 59), BDI (baseline: 32, last observation: 19), and CGI-S (baseline: 4 h/wk, last observation: 3). Three subjects receiving placebo demonstrated no change in the mean time of online game playing ($z = 0.72$, $p = 0.45$), YIAS ($z = 0.71$, $p = 0.51$), BDI ($z > 0.01$, $p < 1.0$), and CGI-S ($z = 1.0$, $p = 0.42$). In the bupropion group, 14 patients who responded to bupropion showed abrupt decreases in YIAS scores compared with 11 patients who did not respond to bupropion ($F = 9.96$, $p < 0.01$) (Figure 2).

The change in YIAS scores was positively correlated with the changes in BDI scores ($r = 0.57$, $p < 0.01$) and CGI-S scores ($r = 0.56$, $p < 0.01$) for all subjects. When controlling for changes of BDI scores and CGI-S scores, there were no significant differences in the change of YIAS scores ($F = 1.10$, $p = 0.30$) and the mean time of online game playing time ($F = 0.78$, $p = 0.38$) between the two groups.

Changes in YIAS scores, online game play, and BDI scores between the bupropion and placebo groups during the four-week post-treatment follow-up period

During the four-week post-treatment follow-up period, the severity of online game addiction in the bupropion group did not change, but the depressive symptoms in the bupropion group increased. During this four-week period, there were no significant changes in YIAS scores ($z = 1.4$, $p = 0.17$) or the mean time of online game playing ($z = 0.3$, $p = 0.80$) while the BDI scores in the bupropion group were increased ($z = 2.4$, $p = 0.02$). The CGI-S scores in the bupropion group were also marginally increased ($z = 1.81$, $p = 0.07$). There were no significant changes in the YIAS scores ($z = 0.71$, $p = 0.48$), the mean time of online game playing ($z = 0.9$, $p = 0.37$), the BDI scores ($z = 0.04$, $p = 0.97$), or CGI-S scores ($z = 0.38$, $p = 0.71$) in the placebo group (Table 2). There was no correlation between the change in YIAS scores and the change in BDI scores ($r = -0.11$, $p = 0.49$) in all subjects. In addition, there was no correlation between the change in YIAS scores and the change in BDI scores in the bupropion group ($r = -0.05$, $p = 0.82$) or the placebo group ($r = -0.18$, $p = 0.41$).

Discussion

The current results note that improvements in terms of the severity of online game addiction were associated with parallel changes in depressive symptoms in patients with problematic online game play and MDD during bupropion treatment. Interestingly, internet addiction symptoms did not get worse during the four-week follow-up phase while depression symptoms recurred. In addition, there was no correlation between the change of BDI scores and YIAS scores. Taken together, these results suggest that bupropion SR was effective in improving problematic online game play in patients with MDD.

Demographic and clinical features of study subjects

Although the study protocol did not restrict the sex of subjects, only male patients were recruited in the current research. This most likely reflects the fact that internet video game addiction is much more common in males (Ha et al., 2006). Park (2009) has noted that female Korean teenagers participate in a wider range of online activities than male Korean teenagers, including chat room or messenger, email, club, activities, and online bulletin boards. Future studies should include female subjects. It is speculated that female patients with internet addiction (not just online game addiction) are likely to have an equivalent level of severity of internet addiction compared with male patients (Park, 2009)

In the analysis of complete data during the eight-week medication trial period, reductions in depressive symptoms and improvement of online game addiction severity were observed in the bupropion group compared with the placebo group. In LOCF data, the results were not significantly different from the overall study data. However, there was no change of depressive symptoms and severity of online game addiction in the three bupropion subjects who did not complete the trial. We believe that the short medication trial period for these subjects (less than seven days) was not long enough to result in a changed mood or online addiction symptoms.

The response rate (56%) for bupropion treatment of depressive symptoms in patients in the current study was similar to that observed in patients with MDD alone (38–53%) (Jefferson et al., 2006). However, the response rate (48%) of bupropion on the severity of online game addiction of patients in current research was slightly lower than the response rate of escitalopram reported for the treatment of patients with impulsive–compulsive internet usage disorder alone (64.7%) (Dell'Osso et al., 2008). The difference in response rates for internet addiction between the two studies could be due to the different medications and the comorbidity of MDD in the present study. Although we analyzed the correlation between the changes in depressive symptoms and the severity of internet addiction symptoms, readers should interpret the data cautiously considering the interaction of MDD and online game addiction.

Improvement of the severity of online game addiction during the eight-week bupropion treatment period

During the eight-week bupropion treatment period, subjects showed a consistent reduction of online game addiction measures (YIAS scores and weekly playing game time) and depressive mood measures (CGI-S and BDI scores). These results may be regarded as being consistent with the dual action of bupropion: norepinephrine and dopamine reuptake inhibition (Cooper et al., 1980, 1994).

Dopamine release in addiction is thought to lead to an increased sensitivity to pleasure seeking or reward (Bowirrat and Oscar-Berman, 2005). Interestingly, the pleasure can be triggered not only by substance use, but also by several external stimuli including alcohol, drugs, gambling, food, sex, and risk-taking behaviors (Comings and Blum, 2000). Urge-driven behaviors in pathologic gamblers are thought to be mediated by dopamine neurons in the mesolimbic pathway (Bechara, 2003). Alterations in dopaminergic neurotransmission have also been implicated in video game play (Koepp and Silver, 1998; Schultz et al., 1993). The role of bupropion, in terms of increasing dopamine, might replace dopamine release induced by online game play. Interestingly, this response to bupropion would be inconsistent with the role of the dopamine system in pathologic gambling and compulsive behavior (Aiken, 2007; Bostwick et al., 2009). Dopaminergic agents such as pramipexole have been reported to induce pathologic gambling or hypersexuality in patients with Parkinson's disease (Bostwick et al., 2009).

By increasing noradrenergic activity, bupropion treatment may reduce impulsivity (Ascher et al., 1995), which could lead to improved early treatment outcomes. Indeed, internet addiction has been referred to as impulsive–compulsive internet usage disorder in psychiatric journals (Shapira et al., 2000; Stein, 1997) and bupropion has been proposed as a treatment for pathologic gambling, one of the impulse control disorders, in several pharmacologic studies (Black, 2004; Dannon et al., 2005).

No change of the YIAS scores and online game time between bupropion and placebo groups during the four-week post-treatment follow-up period

While the BDI scores in the bupropion group were increased to the level of the placebo group during the follow-up period, there was no change of YIAS scores or the mean time of

online game playing in either group during the post-treatment follow-up period. It may be speculated that four additional weeks were not enough for relapse of online game addiction in the bupropion and placebo groups. Nevertheless, an effect of bupropion on the regulation of online game play time, independent of effects on mood, is suggested by these observations.

Limitations

There are several limitations to the current study. First, the study was of short duration and there was a small number of subjects. The short duration of the trial, especially the post-treatment observation period, may not have been long enough to fully document the effects of treatment. Due to small subject numbers, we cannot clearly rule out the possibility that the improvement in internet addiction scores might be due to improvement in depression scores. In addition, the education for internet use could have resulted in some benefits independent of the pharmacologic effects of bupropion on the severity of internet addiction. However, an identical educational intervention was provided to all study subjects. Second, because the criteria for online game addiction were based on the diagnostic criteria for substance abuse, it is unknown whether these criteria can fully represent the characteristics of online game addiction. In the future, it might be useful to consider online game addiction in the context of impulse control disorders. Third, the current study did not consider cognitive variation, temperament characteristics, and socio-cultural background, which may explain a high prevalence of online game addiction. Future studies assessing the reasons for the high incidence of online game addiction in Korea are necessary.

Conclusion

The mechanism of action of bupropion, decreasing dopamine and norepinephrine reuptake, could improve depressive mood as well as reduce online game play time and the severity of online game addiction in patients with comorbid MDD and online game addiction. However, we cannot clearly rule out the possibility that the improvement in internet addiction scores might be due to improvement in depression scores.

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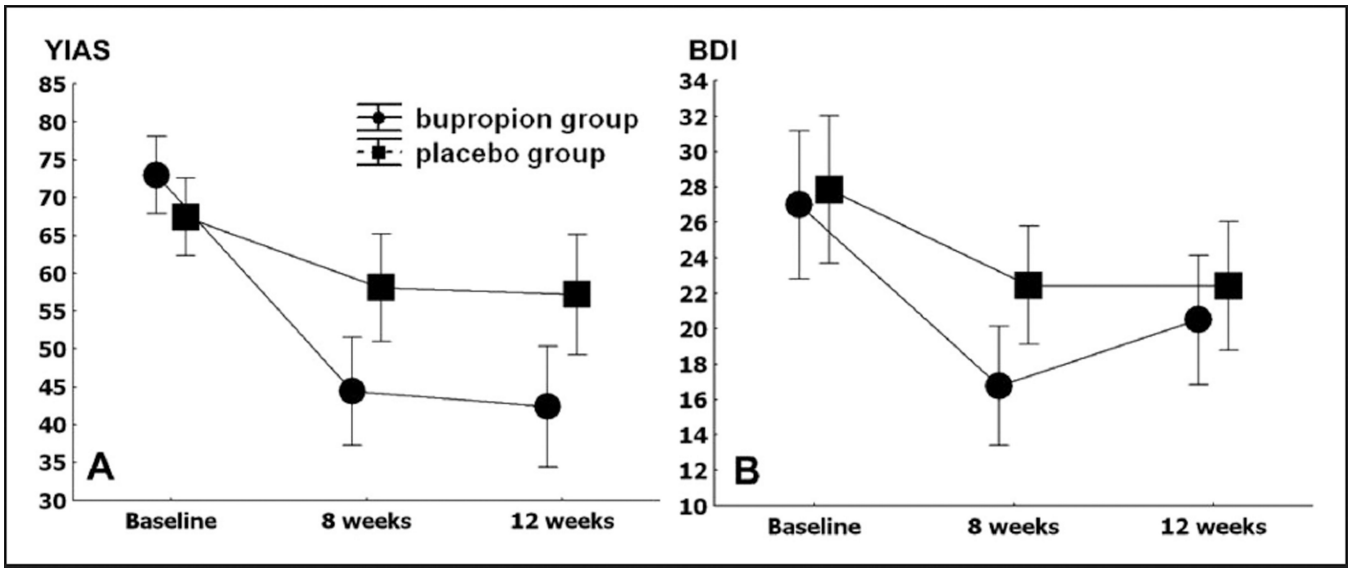

Figure 1.

Changes of online game usage and mood at baseline, eight weeks, and 12 weeks. YIAS: Young's Internet Addiction Scale, BDI: Beck Depression Inventory.

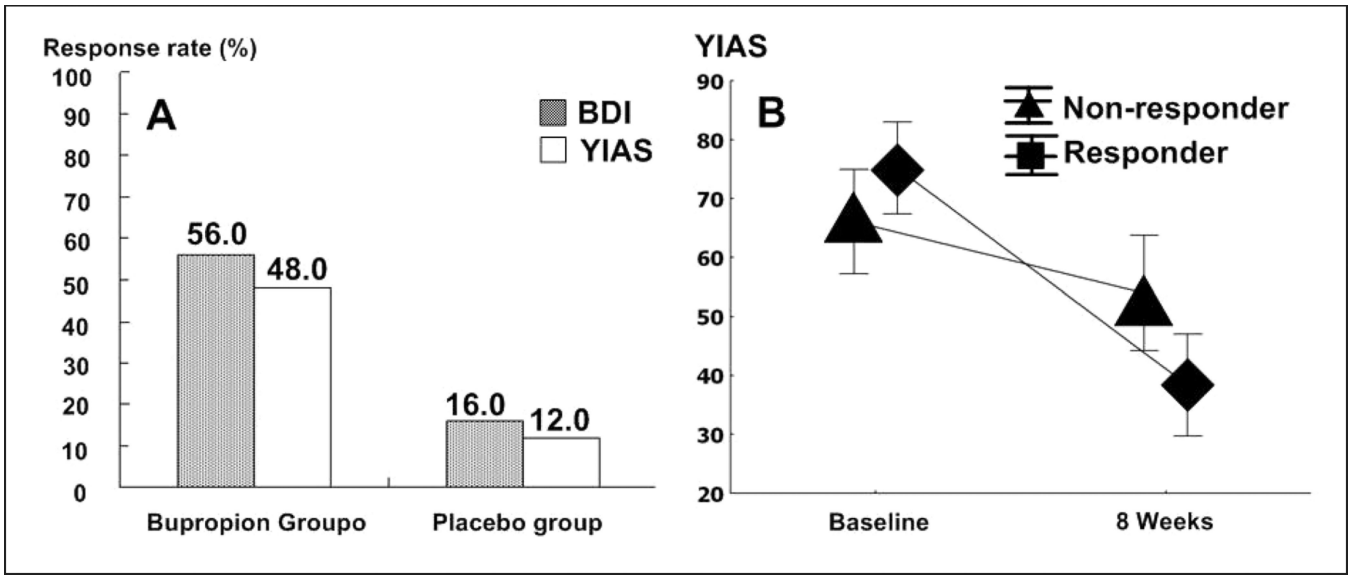

Figure 2.

Response rates (BDI and YIAS). (A) Response rates, Beck Depression Inventory Scale (BDI), bupropion group (56%) *vs*. placebo group (48%), $\chi^2 = 34.7$, $p < 0.01$; Young Internet Addiction Scale (YIAS), bupropion group (48%) *vs*. placebo group (12%), $\chi^2 = 30.9$, $p < 0.01$. (B) The change of YIAS scores between responders and non-responders; responders: patients with post-treatment BDI scores of less than 30% of baseline scores, $F = 9.96$, $p < 0.01$.

Table 1

Baseline demographic and clinical characteristics of study subjects.

Characteristics	Bupropion group (*n* = 29)	Placebo group (*n* = 28)	Statistics
Age, mean ± SD, years	21.2 ± 8.0 (13–42)	19.1 ± 6.2 (13–39)	$z = 1.12$, $p = 0.27$
Education, years	11.9 ± 3.2	11.1 ± 3.0	$z = 0.99$, $p = 0.32$
Alcohol drinking			
Drink	12	9	$\chi^2 = 0.52$, $p = 0.47$
None	17	19	
Smoking			
Smoke	9	11	$\chi^2 = 0.43$, $p = 0.51$
None	20	17	
Marital status			
Single	25	24	$\chi^2 = 0.54$, $p = 0.77$
Married	2	3	
Divorced	2	1	
Occupational status			
Students	14	17	$\chi^2 = 1.91$, $p = 0.60$
Stop school	4	5	
Employed	5	3	
Unemployed	6	3	
Game genre			
RPG	12	15	$\chi^2 = 1.59$, $p = 0.66$
FPS	12	8	
RTS	3	4	
Gambling	2	1	

RPG: role playing game, FPS: first person shooting games, RTS: real-time strategy, gambling: online gambling.

Table 2

Ratings of online game usage and mood at baseline, 8 weeks, and 12 weeks.

	Baseline (57)		8 weeks' medication (50)		4-week follow-up (45)	
Scales	**Bupropion (*n* = 29)**	**Placebo (*n* = 28)**	**Bupropion (*n* = 25)**	**Placebo (*n* = 25)**	**Bupropion (*n* = 22)**	**Placebo (*n* = 23)**
YIAS	71.5 ± 13.7	68.5 ± 10.7	45.2 ± 17.3	59.2 ± 14.6	42.4 ± 21.6	57.2 ± 14.8
G-time	47.3 ± 9.2	44.3 ± 8.2	21.1 ± 10.6	29.8 ± 10.0	21.9 ± 11.0	29.2 ± 9.9
BDI	27.6 ± 6.7	27.5 ± 10.5	17.7 ± 7.2	22.8 ± 8.1	20.5 ± 9.2	22.4 ± 7.7
CGI-S	3.7 ± 0.8	3.6 ± 0.8	1.7 ± 0.7	2.5 ± 0.8	2.0 ± 1.1	2.5 ± 0.9

YIAS: Young's Internet Addiction Scale, CGI-S: Clinical Global Impression-Severity scale, BDI: Beck Depression Inventory, G-time: time of online game playing (hours per week).