

ASSOCIATION BETWEEN ONLINE SOCIAL NETWORKING AND DEPRESSION IN HIGH SCHOOL STUDENTS: BEHAVIORAL PHYSIOLOGY VIEWPOINT

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SUMMARY

Background: Frequent use of Facebook and other social networks is thought to be associated with certain behavioral changes, and some authors have expressed concerns about its possible detrimental effect on mental health. In this work, we investigated the relationship between social networking and depression indicators in adolescent population.

Subjects and methods: Total of 160 high school students were interviewed using an anonymous, structured questionnaire and Beck Depression Inventory – second edition (BDI-II-II). Apart from BDI-II-II, students were asked to provide the data for height and weight, gender, average daily time spent on social networking sites, average time spent watching TV, and sleep duration in a 24-hour period.

Results: Average BDI-II-II score was 8.19 (SD=5.86). Average daily time spent on social networking was 1.86h (SD=2.08h), and average time spent watching TV was 2.44 h (SD=1.74h). Average body mass index of participants was 21.84 (SD=3.55) and average sleep duration was 7.37 (SD=1.82). BDI-II-II score indicated minimal depression in 104 students, mild depression in 46 students, and moderate depression in 10 students. Statistically significant positive correlation ($p < 0.05$, $R = 0.15$) was found between BDI-II-II score and the time spent on social networking.

Conclusions: Our results indicate that online social networking is related to depression. Additional research is required to determine the possible causal nature of this relationship.

Key words: depression - social network – Facebook - BDI-II-II - high school students

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INTRODUCTION

Depression is one of the most frequent psychiatric mood disorders in both developed and low-income countries. Major depression affects approximately 16% of the general population one or more times during their lives (Lee et al 2010, Kessler et al 2005). Depression is a significant risk factor for highly prevalent cardiovascular disorders, and has a substantial impact on suicide incidence. Also, this disorder is one of the main causes for the inability to work and thus affects the economic situation of the individual, his family, as well as the society in general (Wancata & Friedrich, 2011, Lépine et al. 2011).

During the past decade, there have been many epidemiological studies focusing on the relationship between screen viewing and various behavioral disorders. On several occasions, television exposure was related to aggressive and anti-social behavior (Johnson et al 2002, Mitrofan et al. 2009) and sedentary way of life has been associated with depression in adult population (Teychenne et al. 2010). Computer use and

television viewing have also been linked to anxiety and/or depressive symptoms (de Wit et al. 2011).

The relationship between social networking and behavioral disorders remains unclear. Since their creation less than 10 years ago, services such as Facebook, Twitter and MySpace have recently become highly popular among both children and adults. It is estimated that in 2011, Facebook alone had more than 500 million active users. As a result, these networks have a huge impact on modern way of life, including the change in inter-personal communication and interaction.

Because social networking phenomenon is relatively new, very few research studies so far have been focused on its impact on health. Facebook use has been associated with changes in one's self-esteem (Gonzales et al. 2011), and some authors expressed concerns about its possible detrimental effect to mental health, especially those issues related to the quality of social interactions (Rajani et al. 2011).

Having in mind the findings and opinions of other authors, we considered of scientific importance to investigate the relationship between social networking and depression indicators in adolescent population.

SUBJECTS AND METHODS

Subjects

An observational, population-based, cross-sectional epidemiologic study was carried out during 2011, at a high school in the city of Pozarevac, Central Serbia. The study sample was determined based on 95% confidence interval for the municipality of Pozarevac high school student population. Total of 160 students (100% of those invited) agreed to participate in the study, and were interviewed using an anonymous, structured questionnaire and the Beck Depression Inventory – second edition (BDI-II-II).

Average age of the participant was 18.02 years (SD=0.29 years). 51 (31.9%) students were male (average age was 18.0, SD=0.2) and 109 (68.1%) students were female (average age was 18.03 years, SD=0.32). There was no statistically significant difference in age between the two genders ($t=0.5674$, $p>0.05$).

Methods

BDI-II-II is a 21-question multiple-choice self-report inventory (Beck et al. 1996), in which each answer is given a score between 0 and 3. After the test is finished, the total score is interpreted as follows: 0–9 minimal depression, 10–18 mild depression, 19–29 moderate depression and 30–63 severe depression.

Students were asked to provide the data for height and weight, gender, average daily time spent on social networking sites, average time spent on watching TV, and sleep duration in a 24-hour period. This part of the study protocol is described in our previous study (Pantic et al. 2011). All subjects have been informed about the objective of the study. The study protocol was in accordance with the guidelines of the Helsinki Declaration 1975, revised in 1983, and the guidelines of Ethical Committee of The School of Medicine, University of Belgrade.

Statistical analysis

Statistical analysis was done using GraphPad statistical software (GraphPad Software, Inc. La Jolla, CA), SPSS v 10.1 (SPSS Inc., Chicago, IL), and Origin Pro statistical software. Descriptive statistics were

calculated and reported as means and standard deviations. Value $p<0.05$ was considered statistically significant.

RESULTS

Average BDI-II score was 8.19 (SD=5.86). Average daily time spent on social networking was 1.86h (SD=2.08h), and average time spent watching TV was 2.44 h (SD=1.74h). Average body mass index of participants was 21.84 (SD=3.55) and average sleep duration was 7.37 (SD=1.82).

BDI-II score indicated minimal depression in 104 students, mild depression in 46 students, and moderate depression in 10 students (Figure 1).

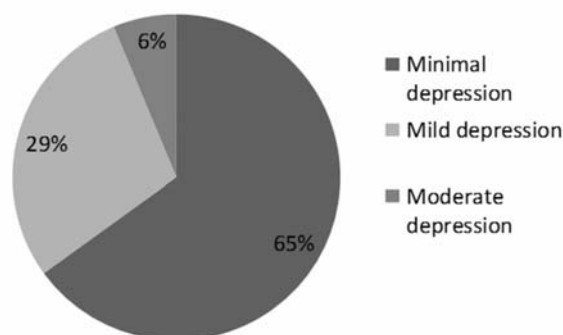


Figure 1. BDI-II score interpretation in high school student sample

Statistically significant positive correlation ($R=0.15$, $p<0.05$) was found between BDI-II score and the time spent on social networking. The BDI-II score increased as the time spent on social networks increased and vice versa.

No statistically significant correlation was detected between TV viewing and BDI-II score, as well as between BMI and BDI-II ($R=0.026$, $p>0.05$; $R=-0.05$, $p>0.05$).

Males had statistically significantly higher BMI than females ($t=5.45$, $p<0.01$). No statistically significant difference was noted between males and females in TV viewing, social networking, sleep duration and BDI-II score ($p>0.05$). Average BMI, TV viewing time, social networking time, sleep duration and BDI-II score are shown in table 1.

Table 1. Average BMI, TV viewing time, social networking time, sleep duration and BDI-II score in high school students (** $p<0.01$)

	Males	Females	Total
BMI	23.89±3.33**	20.88±3.23**	21.84±3.55
Time spent on TV viewing	2.85±1.88	2.38±2.06	2.44±1.74
Time spent on social networks	2.01±2.53	1.81±1.86	1.86±2.08
Sleep duration	7.51±1.77	7.31±1.86	7.37±1.82
BDI-II score	7.45±5.51	8.52±6.05	8.19±5.86

DISCUSSION

There are several ways of detecting and measuring depressive symptoms both in patients and in general population. Several questionnaires have been developed, including Hospital Anxiety and Depression Scale (HADS), Patient Health Questionnaire (PAQ), and Beck Depression Inventory – second edition (BDI-II). BDI-II is thought to be a valid, sensitive, reliable and affordable mean of detecting and evaluating depression symptoms both in epidemiological studies, and in clinical setting (Carnevale 2011, Veerman et al. 2009, Steer et al. 1999).

There is already certain evidence that Facebook usage is related to the self-esteem of an individual (Gonzales et al. 2011). According to the study in question, attention to one's profile (vs. others' profiles), profile editing and other activities might have a positive effect on self-esteem (Gonzales et al. 2011). However, the authors state that these results would be contradictory to the accepted Objective Self-Awareness (OSA) theory that implies that exposure to stimuli such as mirror, photo, and autobiographical data could lead to increased lower self-esteem as a result of increased awareness of oneself's internal and social standards (Gonzales et al. 2011, Duval et al. 1972, Ickes et al. 1973, Heine et al. 2008). It goes without saying that changes in self-esteem of an individual would have an impact on eventual signs and symptoms of depression.

Another important factor that we have to consider is the impact of screen viewing on obesity. According to some authors, there is a reciprocal link between depression and obesity (Johnson et al 2002), which on the other hand develops as a result of sedentary way of life. However, in our sample, very few subjects had body mass index higher than 25 and were considered overweight. Moreover, the causal relationship between screen viewing and body mass has not yet been confirmed. Both in this and in our previous study, no correlation was found between screen viewing and BMI (Pantic et al. 2011). This leads to conclusion that there must be some other mechanism by which social networking use makes impact on mood status.

There is enough evidence to assume that, among adolescents, physical activity is inversely associated with depression (Hong et al. 2009). This could be one of the possible explanations for the relationship we found in our study. High level of online social networking would naturally lead to less time for outdoor physical activities. In a recent study, it was reported that physical activity and screen viewing are associated with clinical depression risk in older female population (Lucas et al. 2011). During 10 years of follow-up (1996-2006), it was found that screen viewing was positively and physical activity was negatively related to the risk for depression (Lucas M et al. 2011). Although these results were obtained from older women population (who are relatively inactive in terms of social networking),

nevertheless, they may be comparable with the findings of our study.

One of the main limitations of our study was a relatively small sample. Although it was large enough for valid statistical analysis and representative enough for the conclusions about the study population in question, still, it would be interesting to see the results of a similar investigation designed to reflect the adolescent population of the entire country, or even region. Also, we should always have in mind the fact that simple correlation cannot be considered as a proof of causality. In order to test the causal relationship between the two variables, many possible confounding factors have to be investigated. In our study, a number of possible confounding factors, such as age, sex, television viewing and body mass index have been taken into account. However, it might be of scientific importance for future study to also consider additional factors, such as physical activity and socioeconomic status.

CONCLUSION

Our results indicate that the time spent on social networking in high school students is related to the risk for depression determined by BDI-II. Although additional research is needed to demonstrate the causal relationship between social networks and depression, these findings may become a basis for further research in the fields of adolescent behavioral physiology and psychiatry.

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REFERENCES

1. Beck AT, Steer RA, Ball R & Ranieri W: Comparison of Beck Depression Inventories -IA and -II in psychiatric outpatients. *J Pers Assess* 1996; 67:588-97.
2. Carnevale T: An integrative review of adolescent depression screening instruments: applicability for use by school nurses. *J Child Adolesc Psychiatr Nurs* 2011; 24:51-7.
3. de Wit L, van Straten A, Lamers F, Cuijpers P & Penninx B: Are sedentary television watching and computer use behaviors associated with anxiety and depressive disorders? *Psychiatry Res* 2011; 186:239-43
4. Duval S & Wicklund RA: *A theory of objective self awareness*. Academic Press, New York, 1972.
5. Gonzales AL & Hancock JT: Mirror, mirror on my Facebook wall: effects of exposure to Facebook on self-esteem. *Cyberpsychol Behav Soc Netw* 2011; 14:79-83.

6. Heine SJ, Takemoto T, Moskalkenko S, Lasaleta J & Henrich J: Mirrors in the head: cultural variation in objective self-awareness. *Pers Soc Psychol Bull* 2008; 34:879-87.
7. Hong X, Li J, Xu F, Tse LA, Liang Y, Wang Z, Yu IT & Griffiths S: Physical activity inversely associated with the presence of depression among urban adolescents in regional China. *BMC Public Health* 2009; 9:148.
8. Ickes WJ, Wicklund RA & Ferris CB: Objective self-awareness and self-esteem. *J Exp Soc Psychol* 1973; 9:202–19.
9. Johnson JG, Cohen P, Smailes EM, Kasen S & Brook JS: Television viewing and aggressive behavior during adolescence and adulthood. *Science* 2002; 295:2468-71.
10. Kessler RC, Berglund P, Demler O, Jin R, Merikangas KR & Walters EE: Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the National Comorbidity Survey Replication. *Arch Gen Psychiatry* 2005; 62:593-602.
11. Lee S, Jeong J, Kwak Y & Park SK: Depression research: where are we now? *Mol Brain* 2010; 3: 8.
12. Lépine JP & Briley M: The increasing burden of depression. *Neuropsychiatr Dis Treat* 2011; 7:3-7.
13. Lucas M, Mekary R, Pan A, Mirzaei F, O'Reilly EJ, Willett WC, Koenen K, Okereke OI & Ascherio A: Relation Between Clinical Depression Risk and Physical Activity and Time Spent Watching Television in Older Women: A 10-Year Prospective Follow-up Study. *Am J Epidemiol* 2011; 174:1017-27.
14. Mitrofan O, Paul M & Spencer N: Is aggression in children with behavioural and emotional difficulties associated with television viewing and video game playing? A systematic review. *Child Care Health Dev* 2009; 35:5-15.
15. Pantic I, Malbasa M, Ristic S, Turjacanin D, Medenica S, Paunovic J & Pantic S: Screen viewing, BMI, cigarette smoking and sleep duration in Belgrade University student population: results of an observational, cross-sectional study. *Rev Med Chil* 2011; 139:896-901.
16. Rajani R, Berman DS & Rozanski A: Social networks--are they good for your health? The era of Facebook and Twitter. *QJM* 2011 doi: 10.1093/qjmed/hcr078.
17. Steer RA, Cavalieri TA, Leonard DM & Beck AT: Use of the Beck Depression Inventory for Primary Care to screen for major depression disorders. *Gen Hosp Psychiatry* 1999; 21:106-11
18. Teychenne M, Ball K & Salmon J: Sedentary behavior and depression among adults: a review. *Int J Behav Med* 2010; 17:246-54.
19. Veerman JL, Dowrick C, Ayuso-Mateos JL, Dunn G & Barendregt JJ: Population prevalence of depression and mean Beck Depression Inventory score. *Br J Psychiatry* 2009; 195:516-9.
20. Wancata J & Friedrich F: Depression: A diagnosis aptly used? *Psychiatr Danub* 2011; 23: 406-411.

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