https://doi.org/10.22365/jpsych.2022.098 / Psychiatriki 2023, 34:13–20

Research article

Internet gaming disorder, exercise and attention deficit hyperactivity disorder: The role of depression, anxiety and stress

Christina Masklavanou,[1] Kalliopi Triantafyllou,[1] Thomas Paparrigopoulos,[1] Vana Sypsa,[2] Artemios Pehlivanidis[1]

[1]*First Department of Psychiatry, National and Kapodistrian University of Athens, Eginition Hospital, Athens*
[2]*Department of Hygiene, Epidemiology and Medical Statistics, Medical School, National and Kapodistrian University of Athens, Athens, Greece*

ARTICLE HISTORY: Received 5 July 2022/Revised 4 October 2022/Published Online 24 November 2022

ABSTRACT

One of the issues that have risen in the past few decades due to excessive use of technological advances is internet gaming disorder (IGD). Past research has concluded that there is a negative association between IGD and exercise as well as a positive association between IGD and attention deficit hyperactivity disorder (ADHD). However, the existing studies on these subjects are scarce. Furthermore, researchers have showcased that symptoms of depression, anxiety, and stress are positively associated with IGD and ADHD but negatively associated with exercise. Consequently, maybe these symptoms mediate the relationships between IGD, exercise, and ADHD. The purpose of the present study is to investigate the relationship between IGD and exercise as well as between IGD and ADHD. A correlational study was conducted on 515 adults through Google forms. The Internet Gaming Disorder Scale–Short-Form was used to detect IGD symptoms, the Leisure-Time Exercise Questionnaire was utilized so as to evaluate participants' –leisure-time exercise habits, and the Barkley Adult ADHD Rating Scale was used to assess ADHD symptoms. Furthermore, the Depression, Anxiety, and Stress Scale-21 was utilized to evaluate symptoms of depression, anxiety, and stress. It was found that there is a negative correlation between IGD symptoms and leisure time exercise as well as a positive correlation between IGD symptoms and ADHD symptoms. Moreover, when taking all the variables that were examined into consideration, it was indicated that inattention symptoms and impulsivity symptoms were significantly associated with IGD symptoms whereas symptoms of depression were partially and significantly mediating the association between IGD symptoms and Attention deficit as well as the association between IGD symptoms and Impulsivity. The findings of the current study suggest that people who deal with IGD symptoms tend to exercise less in their free time. Additionally, people with more IGD symptoms display not only more ADHD symptoms, symptoms of inattention and impulsivity specifically, but also more symptoms of depression. Therefore, clinicians should evaluate the possible coexistence of such symptoms when treating people with IGD, in order to prevent as well as treat more efficiently IGD and its consequences.

KEYWORDS: Internet gaming disorder, attention deficit hyperactivity disorder, exercise, depression, anxiety.

Introduction

Internet gaming is an activity that has grown popular in the last few years along with new technological achievements. In Europe, around 50% of people aged 6 to 64 play video games.[1] However, when people have difficulty maintaining a balance whilst using new technologies, serious mental and physical health problems could arise. internet gaming disorder (IGD) which affects roughly 3% of the global population is one of those.[2] In DSM-5, IGD is included in the category "Conditions for further study", hence at present, it is not officially recognized as a disor-

Corresponding author: Christina Masklavanou, First Department of Psychiatry, School of Medicine, National and Kapodistrian University of Athens, Eginition Hospital, 72–74 Vas. Sofias Ave., GR-115 28 Athens, Greece • e-mail: christinamasklavanou@outlook.com

der.[3] The recommended criteria include preoccupation with gaming, tolerance, withdrawal symptoms, and inability to reduce gaming. Symptoms also include giving up or losing interest in previously enjoyed activities due to gaming, continuing gaming despite problems, deceiving people regarding the amount of time spent gaming, using gaming as a relief from negative feelings, as well as jeopardizing or losing a job or a relationship due to gaming. A diagnosis would require five or more criteria to be present for over a year.[3] Gaming Disorder was also recently recognized by the World Health Organization and similar criteria were proposed.[4]

Internet gaming being a sedentary activity could be a good candidate as a counterpart correlate of exercise. A longitudinal study concluded that there is a reciprocal relationship between exercise and IGD,[5] whilst a study regarding the efficacy of various interventions for IGD found that the intervention that included exercise was more effective.[6]

IGD, which is characterized by behavioral problems and impulsive behavior, could also be related to attention-deficit/hyperactivity disorder (ADHD).[7] Various studies show that ADHD symptom severity correlates with higher levels of IGD symptoms.[8–11] Regarding the relationship between the two conditions, a systematic review concluded that it is still unclear and that it needs to be further studied.[8]

Concerning the relationship between exercise, ADHD, and IGD, there are few studies that examine the potential variables mediating their relationship.[11,12] However, symptoms of depression, anxiety, and stress have been previously correlated with IGD symptoms, as well as with ADHD symptoms and exercise. Regarding IGD, in particular, it was found that more severe IGD symptoms correlated with increased symptoms of depression, stress, and anxiety, as well as generalized anxiety disorder symptoms.[13–16] Moreover, research has shown that high anxiety levels were a risk factor for IGD symptoms.[17] A longitudinal study that examined the direction of the relationship between IGD symptoms and symptoms of depression concluded that more severe symptoms of internet gaming at the beginning of the study or their following increase correlated with increased symptoms of depression two years after.[18]

Furthermore, symptoms of depression, anxiety, and stress have been found to be negatively correlated with exercise in both clinical and general populations.[19–21] This relationship seems to be bidirectional, meaning that people with high levels of symptoms of depression, anxiety, and stress were less likely to exercise, whereas people that exercised more were less likely to have such symptoms.[22,23] Nevertheless, other researchers found that exercise and symptoms of depression, anxiety, and stress were not related.[24,25]

Finally, symptoms of depression, anxiety, and stress were also correlated with ADHD symptoms. It has been shown that such symptoms correlated positively with ADHD symptoms in both clinical and non-clinical samples.[26–29] Also, ADHD symptoms have been found to increase the risk of future depression,[30,31] although some studies did not demonstrate any correlation between such symptoms and ADHD symptoms.[32]

The purpose of the present study was to examine: (a) the relationship between IGD symptoms and leisure-time exercise, and (b) the relationship between IGD symptoms and ADHD symptoms. Another purpose was to examine whether symptoms of depression, anxiety, and stress mediate the above-mentioned relationships. It was hypothesized that there will be a negative correlation between IGD symptoms and exercise, and a positive correlation between IGD symptoms and ADHD symptoms. Furthermore, it was hypothesized that symptoms of depression, anxiety, and stress will mediate these relationships.

Material and Method

Sample

Participants were Greek-speaking adults over 18. A total of 517 people showed interest in the study; two people did not consent and therefore withdrew from the study (N=515; men: 443, women: 70, non-binary: 2). Age range was 18–50 years; the mean age was 26.8 years (SD=±7.6).

Procedure

The study was an online cross-sectional study and was conducted from September 2021 to February 2022. It was based on a mixture of convenience and snowball sampling. The information sheet, as well as the questionnaires, were online Google forms and were posted by the researcher on various groups regarding internet gaming on Facebook.com. Those interested in participating in the study had first to read the information sheet and then fill in the consent form; if over 18 years, they could have access to the questionnaires. The study was anonymous, and the participants did not have to disclose any personal data.

Measures

Demographic characteristics questionnaire

This questionnaire, which was developed for the purpose of the current study, includes questions about gender, age, residence, education, marital status, and work status.

Internet Gaming Disorder Scale-Short-Form

The Internet Gaming Disorder Scale-Short-Form is a brief psychometric tool that was based on the DSM-5 proposed criteria for IGD.33 This non-diagnostic IGD instrument assesses the severity of online and offline gaming symptoms and their consequences during a 12-month period. The nine items of the scale are rated on a 5-point Likert scale (1 "Never" to 5 "Very often"). The total score is obtained by summing up all the answers (score range from 9 to 45), with higher scores indicating higher levels of IGD symptoms.[33] A Greek version of the scale was utilized, which resulted from the back translation by C.M., K.T. and T.P. The alpha coefficient was 0.83 in the current study.

Leisure-Time Exercise Questionnaire

This questionnaire assesses habits regarding leisure-time exercise for the past week.[34,35] It consists of three questions and each one addresses a different kind of exercise: strenuous exercise, moderate exercise, and mild/light exercise. The alpha coefficient was 0.50 in the current study.

Barkley Adult ADHD Rating Scale

The scale is based on the DSM-4 criteria for ADHD and consists of 18 questions concerning ADHD symptoms over the past six months. The answers are given on a 4-point Likert scale (range: 0 "Never or Rarely" to 3 "Quite often"); a score ≥2 indicates the presence of a symptom.[36] For the needs of the present study, the questions regarding hyperactivity and impulsivity were divided into two subscales: the hyperactivity subscale with five questions and the impulsivity subscale with four questions. The subscales that were finally used for the statistical analyses were the following: attention deficit (0 to 9 points), hyperactivity (0 to 5 points), and impulsivity (0 to 4 points), as used in previous studies.[37] The suggested cut-off scores for each subscale were not taken into consideration and the scale was treated as dimensional and not categorical since the assessed traits don't provide a diagnosis.[37] The alpha coefficient was 0.95 in the current study.

Depression, Anxiety, and Stress Scale-21, DASS-21

A short version of the 42-item scale was used to evaluate the negative affective conditions of depression, anxiety, and stress.[38,39] It consists of 21 four-point Likert questions (range: 0 "Applied to me to some degree, or some of the time" to 3 "Applied to me very much, or most of the time"). The scale consists of three subscales: depression, anxiety, and stress subscales. The alpha coefficient was 0.95 in the current study.

Statistical analyses

All statistical analyses were performed with IBM SPSS 26.0. A Kolmogorov-Smirnov test of inferential normality was conducted in order to determine whether the data were normally distributed or not. The data for all scales were found to be normally distributed. Pearson r was used to check correlations between leisure-time exercise and IGD symptoms, as well as between ADHD symptoms and IGD symptoms. In order to check the mediating role of depression in the association between ADHD symptoms and IGD symptoms, a hierarchical linear regression analysis was conducted. In the first step, ADHD symptoms were included and in the second step, the depression scale was added to the model. Sobel test was used to evaluate the significance of depression's mediating role.

Results

The sociodemographic characteristics of the sample are shown in table 1. The majority of the participants lived in Athens, were university graduates or students, and were not married.

Table 1. Sociodemographic characteristics of the sample.

	Characteristic	n	(%)
Total sample		515	100
Gender	Male	443	86
	Female	70	13.6
	Non-binary	2	0.4
Residence	Athens	262	50.9
	Thessaloniki	62	12
	City (over 200.000 residents)	25	4.9
	Town (50.000-200.000)	99	19.2
	Village (up to 50.000)	67	13
Educational level	Compulsory	4	0.8
	High school	63	12.2
	Post-secondary education	87	16.9
	University	276	53.6
	Master's degree	85	16.5
Family status	Not married	395	76.7
	Married	69	13.4
	Cohabitation	47	9.1
	Divorced	3	0.6
	Widower	1	0.2
Employment	Unemployed	42	8.2
	Employed in public sector	34	6.6
	Employed in private sector	163	31.7
	Self-employed	60	11.7
	Pensioner	2	0.4
	Housekeeper	2	0.4
	Student	212	41.2

Pearson correlations showed that there was a weak negative correlation between IGD symptoms and leisure-time exercise, whereas there was a moderate positive correlation between IGD symptoms and ADHD symptoms. Also, there was a moderate positive correlation between IGD symptoms and attention deficit symptoms, and hyperactivity symptoms, whereas there was a weak positive correlation between IGD symptoms and impulsivity symptoms. Moreover, Pearson correlations showed that there was a moderate positive correlation between symptoms of depression, anxiety, and stress and IGD symptoms and a strong positive correlation between symptoms of depression, anxiety, and stress,s and ADHD symptoms. However, there was a weak negative correlation between depression and anxiety symptoms and leisure-time exercise, as it has been summarized in table 2.

Furthermore, when hierarchical linear regression was conducted it was found that, at 1st step, attention deficit and impulsivity were significantly positively and independently associated with IGD symptoms (table 3). In the 2nd step, when depression was added in the model, attention deficit and impulsivity remained significantly associated with IGD symptoms, also, depression was found to be significantly and positively associated with IGD symptoms. Thus, depression was partially mediating the association between IGD and ADHD symptoms. More specifically, after the Sobel test, it was found that depression was partially and significantly mediating the association between IGD symptoms and Attention deficit ($p<0.001$) as well as the association between IGD symptoms and Impulsivity ($p<0.001$).

Discussion

In the past few decades, IGD has gained the interest of the scientific community as it needs to be clarified as a diagnosis. In the present study, it was found that there is a negative, albeit weak correlation between IGD symptoms and leisure-time exercise. This is in line with previous studies that have shown that there is a negative correlation between exercise and addictions to new technologies.[40,41]

Furthermore, it was found that there is a moderate positive correlation between IGD symptoms and ADHD symptoms, which corroborates existing studies.[8–11,42] It is also worth noting that there was a moderate positive correlation between IGD symptoms attention deficit symptoms and hyperactivity symptoms. This is in line with previous researchers that have found that when examining inattention and hyperactivity symptoms, there is a stronger relationship between inattention symptoms and symptoms of internet addiction.[42] Hence,

Table 2. Correlations between IGD and Leisure-time exercise, ADHD symptoms, Attention deficit, Hyperactivity, Impulsivity, Means, and Standard Deviation.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	Mean	SD
1. IGD	1									18.71	6.41
2. Leisure-time exercise	–0.11*	1								38.73	27.54
3. ADHD symptoms	0.43**	–0.06	1							2.53	3.35
4. Attention deficit	0.41**	–0.08*	0.93**	1						1.29	1.89
5. Hyperactivity	0.35**	–0.04	0.83**	0.64**	1					0.76	1.13
6. Impulsivity	0.29**	–0.01	0.74**	0.54**	0.48**	1				0.48	0.90
7. Depression	0.38**	–0.09*	0.56**	0.53**	0.55**	0.29**	1			10.61	11.14
8. Anxiety	0.36**	–0.11**	0.60**	0.53**	0.59**	0.39**	0.69**	1		6.33	7.94
9. Stress	0.34**	–0.07	0.64**	0.56**	0.62**	0.44**	0.75**	0.76**	1	10.42	9.84

IGD: Internet gaming disorder, ADHD: attention deficit hyperactivity disorder, *p<0.05, **p<0.001

Table 3. Hierarchical regression analysis with IGD as dependent variable.

Model	Independent variables	Unstandardized B	S.E.	Standardized Beta	t	p
1st step	Attention deficit	1.23	0.16	0.36	7.60	<0.001
F(2,512)=54,90; p<.001; R^2=.17	Impulsivity	0.67	0.34	0.10	1.99	0.047
2nd step	Attention deficit	0.82	0.18	0.24	4.58	<0.001
F(3,511)=46.12; p<.001; R^2=.21	Impulsivity	0.67	0.33	0.09	2.03	0.043
	Depression	0.13	0.03	0.23	4.87	<0.001

IGD: Internet gaming disorder, S.E.: Standard error

maybe inattention is part of ADHD that could explain its relationship with addictions to new technologies whilst hyperactivity could explain its relationship with IGD in particular. Moreover, it was found that there was a weak positive correlation between IGD symptoms and impulsivity symptoms, which is in contrast with previous research that has shown a negative correlation between impulsive elements and dysfunctional internet behavior.[43] Maybe impulsive elements are only positively correlated with IGD symptoms and not with addictions to new technologies in general. People with ADHD often exhibit behavioral inhibition deficits and need an immediate reward.[44,45] Thus, they may have trouble controlling their gaming behaviors making them a high-risk group for IGD. Furthermore, gaming may become a way of dealing with negative emotions.[46]

Additionally, symptoms of depression, anxiety, and stress were positively correlated with IGD and ADHD symptoms, which is in line with previous studies.[13–16,26–29] It is worth noting that there was a weak negative correlation between depression and anxiety symptoms and leisure-time exercise, which corroborates existing studies.[19–21] However, no correlation was found between stress symptoms and leisure-time exercise, which contrasts with previous researchers.[21] This differentiation could be attributed to the sample characteristics, since our sample was non-clinical.

Also, in our sample it was found that only attention deficit and impulsivity symptoms were significantly positively and independently associated to IGD symptoms, whereas hyperactivity was not. This is in line with previous findings that emphasize the importance of impulsivity symptoms in differentiating between adults with an ADHD diagnosis and adults with a comorbid condition.[47] Regarding our findings about attention deficit and impulsivity, they are in line with the conclusions reached by previous studies, which showed that both inattention and hyperactivity symptoms had significant positive correlations with internet addiction symptoms.[45] However, there was a stronger relationship between attention deficit symptoms and internet addiction. Thus, symptoms of inattention may explain the relationship between ADHD and internet addiction, and between ADHD and IGD by extrapolation.

Regarding the mediating role of symptoms of depression, anxiety and stress it was found that only depression was partially and significantly mediating the association between IGD symptoms and attention deficit as well as the association between IGD symptoms and impulsivity, which corroborates the findings of existing studies.[13,14,16] This finding is in contrast with studies showing that generalized anxiety disorder, anxiety levels as well as levels of perceived stress are correlated with IGD and internet addiction symptoms.[15,16,48] This differentiation may be attributed to the sample characteristics, i.e., clinical vs. non-clinical samples (non-clinical sample exhibiting low levels of anxiety and stress) and gender representation (in the present study, albeit women were under-represented, they reported higher levels of anxiety and stress).

A number of limitations should be taken into account when interpreting the findings of this study. First, the cross-sectional methodology employed does not allow conclusions about causality. Prospective or experimental studies are required to determine the direction of the relationship between IGD symptoms and ADHD symptoms. Second, the convenience sampling and limited representation of women in the study do not allow generalization of the findings. Further samples, with more female participants are required. Third, self-report tools were used to assess ADHD symptoms. Nevertheless, these tools have been used to detect ADHD and have good psychometric properties.[36,37] Fourth, the Leisure-Time Exercise Questionnaire had a quite low Cronbach's alpha value, which means a low degree of internal consistency of the scale. However, low Cronbach's alpha values are not uncommon when a scale consists of very few items.[49] Furthermore, the scale has been used in various studies with community samples.[50] Finally, data regarding leisure-time exercise were collected when COVID-19 measures were still effective and, hence, people's physical exercise was impacted.

Overall, our study illustrates the relationship between symptoms of IGD and attention deficits, depression, and impulsivity symptoms. Mental health care professionals should be aware that people with increased levels of IGD may also demonstrate low levels of leisure-time exercise, and tailor treatment accordingly.

References

1. ISFE. *Societal & Cultural Impact*. (Cited 10 December 2021). Available from: https://www.isfe.eu/game-industry/societal-cultural-impact/
2. Stevens M WR, Dorstyn D, Delfabbro P H, King D L. Global prevalence of gaming disorder: A systematic review and meta-analysis. *Aust N Z J Psychiatry* 2020, 55:553–568, doi: 10.1177/0004867420962851
3. American Psychiatric Association. *Diagnostic and statistical manual of mental disorders*. 5th ed. American Psychiatric Publishing, Arlington, VA, 2013
4. World Health Organization. Mental health. (Cited 10 December 2021). Available from https://www.who.int/health-topics/mental-health#tab=tab_1
5. Henchoz Y, Studer J, Deline S, N'Goran A A, Baggio S, Gmel G. Video gaming disorder and sport and exercise in emerging adulthood:

A longitudinal study. *Behav Med* 2014, 42:105–111, doi: 10.1080/08964289.2014.965127

6. Hong J S, Kima S M, Kanga K D, Hana D H, Kimb J S, Hwanga H et al. Effect of physical exercise intervention on mood and frontal alpha asymmetry in internet gaming disorder. *Ment Health Phys Act* 2020, 18:1–8, doi: 10.1016/j.mhpa.2020.100318
7. Gentile D A, Swing E L, Lim C G, Khoo A. Video game playing, attention problems, and impulsiveness: Evidence of bidirectional causality. *Psychol Pop Media Cult* 2012, 1:62–70, doi: 10.1037/a0026969
8. Dullur P, Krishnan V, Diaz A M. A systematic review on the intersection of attention-deficit hyperactivity disorder and gaming disorder. *J Psychiatr Res* 2021, 133:212–222, doi: 10.1016/j.jpsychires.2020.12.026
9. Evren C, Evren B, Dalbudak E, Topcu M, Kutlu N. Relationships of Internet addiction and Internet gaming disorder symptom severities with probable attention deficit/hyperactivity disorder, aggression and negative affect among university students. *Atten Defic Hyperact Disord* 2019, 11:413–421, doi: 10.1007/s12402-019-00305-8
10. Paulus F W, Sinzig J, Mayer H, Weber M, Von Gontard A. Computer gaming disorder and ADHD in young children - a population-based study. *Int J Ment Health Addict* 2017, 16:1193–1207, doi: 10.1007/s11469-017-9841-0
11. Stavropoulos V, Adams BLM, Beard CL, Dumblea E, Trawleya S, Gomezd R et al. Associations between attention deficit hyperactivity and internet gaming disorder symptoms: Is there consistency across types of symptoms, gender and countries? *Addict Behav Rep* 2019, 9:1–10, doi: 10.1016/j.abrep.2018.100158
12. Vally Z. Symptoms of Internet Gaming Disorder, Inattention, and Impulsivity: a Cross-Sectional Study Conducted in the United Arab Emirates. *Psychiatr Q* 2021, 92:301-310, doi: 10.1007/s11126-020-09799-2
13. Bonnairea C, Baptista D. Internet gaming disorder in male and female young adults: The role of alexithymia, depression, anxiety and gaming type. *Psychiatry Res* 2019, 272:521–530, doi: 10.1016/j.psychres.2018.12.158
14. Brunborg GS, Mentzoni RA, Frøyland LR. Is video gaming, or video game addiction, associated with depression, academic achievement, heavy episodic drinking, or conduct problems? *J Behav Addict* 2014, 3:27–32, doi: 10.1556/JBA.3.2014.002
15. Wang CY, Wu YC, Su CH, Lin PC, Ko CH, Yen J Y. Association between internet gaming disorder and generalized anxiety disorder. *J Behav Addict* 2017, 6:564–571, doi: 10.1556/2006.6.2017.088
16. Yen JY, Lin HC, Chou WP, Liu TL, Ko CH. Associations among resilience, stress, depression, and internet gaming disorder in young adults. *Int J Environ Res Public Health* 2019, 16:2–11, doi: 10.3390/ijerph16173181
17. Rho MJ, Lee H, Lee TH, Cho H, Jung DJ, Kim DJ et al. Risk factors for internet gaming disorder: psychological factors and internet gaming characteristics. *Int J Environ Res Public Health* 2017, 15:1–11, doi: 10.3390/ijerph15010040
18. Liau KA, Choo H, Li D, Gentile DA, Sim T, Khoo A. Pathological video-gaming among youth: A prospective study examining dynamic protective factors. *Addict Res Theory* 2015, 23:301–308, doi: 10.3109/16066359.2014.987759
19. Aylett E, Small N, Bower P. Exercise in the treatment of clinical anxiety in general practice – a systematic review and meta-analysis. *BMC Health Rerv Res* 2018, 18:1–18, doi: 10.1186/s12913-018-3313-5
20. Rebar A L, Stanton R, Geard D, Short C, Duncan M J, Vandelanotte C. A meta-meta-analysis of the effect of physical activity on depression and anxiety in non-clinical adult populations. *Health Psychol Rev* 2015, 9:366–378, doi: 10.1080/17437199.2015.1022901
21. Stubbs B, Vancampfort D, Rosenbaum S, Firth J, Cosco T, Veronese N et al. An examination of the anxiolytic effects of exercise for people with anxiety and stress-related disorders: A meta-analysis. *Psychiatry Res* 2017, 249:102–108, doi: 10.1016/j.psychres.2016.12.020
22. Hiles SA, Lamers F, Milaneschi Y, Penninx BWJH. Sit, step, sweat: Longitudinal associations between physical activity patterns, anxiety and depression. *Psychol Med* 2017, 47:1466–1477, doi: 10.1017/S003329171600354
23. Stults-Kolehmainen MA, Sinha R. The effects of stress on physical activity and exercise. *Sports Med* 2013, 44:81–121, doi: 10.1007/s40279-013-0090-5
24. Johnston SA, Roskowski C, He Z, Kong L, Chen W. Effects of team sports on anxiety, depression, perceived stress, and sleep quality in college students. *J Am Coll Health* 2020, 9:1–7, doi: 10.1080/07448481.2019.1707836
25. Krogh J, Hjorthøj C, Speyer H, Gluud C, Nordentoft M. Exercise for patients with major depression: A systematic review with meta-analysis and trial sequential analysis. *BMJ Open* 2017, 7:1–20, doi: 10.1136/bmjopen-2016-014820
26. Babinski DE, Waschbusch DA, Waxmonsky JG. Sex and pubertal status moderate the association between ADHD and depression symptoms: an examination from preadolescence through late adolescence. *J Clin Psychiatry* 2019, 80:1–8, doi: 10.4088/JCP.18m12548
27. Mochrie KD, Whited MC, Cellucci T, Freeman T, Corson AT. ADHD, depression, and substance abuse risk among beginning college students. *J Am Coll Health* 2018, 68:6–10, doi: 10.1080/07448481.2018.1515754
28. Mohammadi MR, Zarafshan H, Khaleghi A, Ahmadi N, Hooshyari Z, Mostafavi SA et al. Prevalence of ADHD and its comorbidities in a population-based sample. *J Atten Disord* 2019, 25:1058–1067, doi: 10.1177/1087054719886372
29. Nankoo MMA, Palermo R, Bell JA, Pestell CM. Examining the rate of self-reported ADHD-related traits and endorsement of depression, anxiety, stress, and autistic-like traits in Australian university students. *J Atten Disord* 2018, 23:869–886, doi: 10.1177/1087054718758901
30. Meinzer MC, Chronis-Tuscano A. ADHD and the development of depression: commentary on the prevalence, proposed mechanisms, and promising interventions. *Curr Dev Disord Rep* 2017, 4:1–4, doi: 10.1007/s40474-017-0106-1
31. Powell V, Riglin L, Hammerton G, Eyre O, Martin J, Anney R et al. What explains the link between childhood ADHD and adolescent depression? Investigating the role of peer relationships and academic attainment. *Eur Child Adolesc Psychiatry* 2020, 29:1581–1591, doi: 10.1007/s00787-019-01463-l
32. Anderson J, Bolden J. *The role of executive functions in depression and attention-deficit/hyperactivity disorder (ADHD) symptomatology*. Honors thesis project, University of Tennessee, 2018. Trace: Tennessee Research and Creative Exchange. Available from https://trace.tennessee.edu/utk_chanhonoproj/2199
33. Pontes H M, Griffiths M D. Measuring DSM-5 internet gaming disorder: Development and validation of a short psychometric scale. *Comput Human Behav* 2015, 45:137–143, doi: 10.1016/j.chb.2014.12.006
34. Godin G, Shephard R J. A simple method to assess exercise behavior in the community. *Can J Appl Sport Sci* 1985, 10:141–146, PMID: 4053261
35. Zafeiridou M P, Sarafi V D, Vlachopoulos S P. The mediating role of exercise identity in the relationship of exercise motivational regulations with strenuous, moderate and mild exercise. *J Sports Med Phys Fitness* 2004, 54:816–827, PMID: 25350039
36. Barkley RA. *Barkley Adult ADHD Rating Scale-IV* (*BAARS-IV*). The Guilford Press, 2011
37. Pehlivanidis A, Papanikolaou K, Korobili K, Kalantzi E, Mantas V, Pappa D et al. Trait-based dimensions discriminating adults with Attention

Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorder (ASD) and, co-occurring ADHD/ASD. *Brain Sci* 2021, 11:1–15, doi: 10.3390/brainsci11010018

38. Lovibond SH, Lovibond PF. *Manual for the Depression Anxiety & Stress Scales*. 2nd ed. Psychology Foundation, Sydney, 1995
39. Lyrakos G N, Arvaniti C, Smyrnioti M, Kostopanagiotou G. Translation and validation study of the depression anxiety stress scale in the Greek general population and in a psychiatric patient's sample. *Eur Psychiatry* 2011, 26:1731, doi: 10.1016/S0924-9338(11)73435-6
40. Aycan A, Üzüm H. The effects of sports participation on internet addiction of high school students. *J Hum Sci* 2020, 17:1022–1033, doi: 10.14687/jhs.v17i4.6051
41. Haripriya S, Samuel SE, Megha M. Correlation between smartphone addiction, sleep quality and physical activity among young adults. *J Clin Diagn Res* 2019, 13:5–9, doi: 10.7860/JCDR/2019/42168.13212
42. Panagiotidi M, Overton P. The relationship between internet addiction, attention deficit hyperactivity symptoms and online activities in adults. *Compr Psychiatry* 2018, 87:7–11, doi: 10.1016/j.comppsych.2018.08.004
43. Tsiolka E, Bergiannaki ID, Margariti M, Malliori M, Papageorgiou C. Dysfunctional internet behaviour symptoms in association with personality traits. *Psychiatriki* 2017, 28:211–218, doi: 10.22365/jpsych.2017.283.211
44. Albajara Sáenz A, Septier M, van Schuerbeek P, Baijot S, Deconinck N, Defresne P et al. ADHD and ASD: Distinct brain patterns of inhibition-related activation? *Transl Psychiatry* 2020, 10:1–10, doi: 10.1038/s41398-020-0707-z
45. Yen JY, Yen CF, Chen CS, Tang TC, Ko CH. The association between adult ADHD symptoms and internet addiction among college students: The gender difference. *Cyberpsychol Behav* 2009, 12:187–191, doi: 10.1089/cpb.2008.0113
46. Enagandula R, Singh S, Adgaonkar GW, Subramanyam AA, Kamath RM. Study of Internet addiction in children with attention-deficit hyperactivity disorder and normal control. *Ind Psychiatry J* 2018, 27:110–114, doi: 10.4103/ipj.ipj_47_17
47. Pehlivanidis A, Papanikolaou K, Spyropoulou A C, Papadimitriou G N. Comorbid attention-deficit/hyperactivity disorder in adult psychiatric outpatients with depressive or anxiety disorders. *Int J Psychiatry Clin Pract* 2014, 18:265–271, doi: 10.3109/13651501.2014.941878
48. Soulioti E, Stavropoulos V, Christidi S, Papastefanou Y, Roussos P. The relationship of internet addiction with anxiety and depressive symptomatology. *Psychiatriki* 2018, 29:160–171, doi: 10.22365/jpsych.2018.292.160
49. Streiner DL. Starting at the Beginning: An Introduction to Coefficient Alpha and Internal Consistency. *J Pers Assess* 2003, 80:99-103, doi: 10.1207/S15327752JPA8001_18
50. Amireault S, Godin G. The Godin-Shephard leisure-time physical activity questionnaire: validity evidence supporting its use for classifying healthy adults into active and insufficiently active categories. *Percept Mot Skills* 2015, 120:604–622, doi: 10.2466/03.27.PMS.120v19x7

Ερευνητική εργασία

Διαταραχή διαδικτυακού παιχνιδιού, σωματική άσκηση και διαταραχή ελλειμματικής προσοχής και υπερκινητικότητας: Ο ρόλος της κατάθλιψης, του άγχους και του στρες

Χριστίνα Μασκλαβάνου,[1] Καλλιόπη Τριανταφύλλου,[1] Θωμάς Παπαρρηγόπουλος,[1] Βάνα Σύψα,[2] Αρτέμιος Πεχλιβανίδης[1]

[1]*Α΄ Ψυχιατρική Κλινική, Εθνικό και Καποδιστριακό Πανεπιστήμιο Αθηνών, Αιγινήτειο Νοσοκομείο,*

[2]*Τμήμα Υγιεινής, Επιδημιολογίας και Ιατρικής Στατιστικής, Ιατρική Σχολή, Εθνικό και Καποδιστριακό Πανεπιστήμιο Αθηνών, Αθήνα*

ΙΣΤΟΡΙΚΟ ΑΡΘΡΟΥ: Παραλήφθηκε 5 Ιουλίου 2022/Αναθεωρήθηκε 4 Οκτωβρίου 2022/Δημοσιεύθηκε Διαδικτυακά 24 Νοεμβρίου 2022

ΠΕΡΙΛΗΨΗ

Ένα από τα ζητήματα που έχουν προκύψει τις τελευταίες δεκαετίες λόγω της υπερβολικής χρήσης των τεχνολογικών επιτευγμάτων είναι η διαταραχή διαδικτυακού παιχνιδιού (ΔΔΠ). Από την υπάρχουσα βιβλιογραφία προκύπτει πως υπάρχει αρνητική συσχέτιση της ΔΔΠ με τη σωματική άσκηση και θετική συσχέτιση της ΔΔΠ με τη διαταραχή ελλειμματικής προσοχής και υπερκινητικότητας (ΔΕΠΥ). Εντούτοις, οι σχετικές υπάρχουσες μελέτες είναι ελάχιστες. Επίσης, προηγούμενοι ερευνητές κατέδειξαν πως τα συμπτώματα κατάθλιψης, άγχους και στρες παρουσιάζουν θετική συσχέτιση με τη ΔΔΠ και τη ΔΕΠΥ και αρνητική συσχέτιση με τη σωματική άσκηση. Επομένως, ίσως τα εν λόγω συμπτώματα διαμεσολαβούν στις σχέσεις μεταξύ ΔΔΠ, σωματικής άσκησης και ΔΕΠΥ. Ο στόχος της παρούσας μελέτης είναι να διερευνήσει τις σχέσεις μεταξύ ΔΔΠ σωματικής άσκησης και ΔΕΠΥ. Πραγματοποιήθηκε συγχρονική μελέτη σε δείγμα 515 ενηλίκων μέσω Google forms. Για την ανίχνευση συμπτωμάτων ΔΔΠ χρησιμοποιήθηκε η Κλίμακα διαταραχής διαδικτυακού παιχνιδιού-Σύντομη μορφή, για την αξιολόγηση της σωματικής άσκησης αξιοποιήθηκε το Ερωτηματολόγιο σωματικής άσκησης ελεύθερου χρόνου, ενώ για την αξιολόγηση συμπτωμάτων ΔΕΠΥ έγινε χρήση της Κλίμακας αξιολόγησης ΔΕΠΥ ενηλίκων του Barkley. Για την εξέταση των συμπτωμάτων κατάθλιψης, άγχους και στρες χρησιμοποιήθηκε η Κλίμακα κατάθλιψης, άγχους και στρες-21. Βρέθηκε πως υπάρχει αρνητική συσχέτιση μεταξύ των συμπτωμάτων ΔΔΠ και της σωματικής άσκησης στον ελεύθερο χρόνο και θετική συσχέτιση μεταξύ των προαναφερθέντων συμπτωμάτων και των συμπτωμάτων ΔΕΠΥ. Επίσης, όταν λαμβάνονταν υπόψη όλες οι υπό εξέταση μεταβλητές, βρέθηκε πως τα συμπτώματα έλλειψης προσοχής και τα συμπτώματα παρορμητικότητας συσχετίζονταν θετικά με την εμφάνιση συμπτωμάτων ΔΔΠ, ενώ τα συμπτώματα κατάθλιψης διαμεσολαβούσαν τόσο στις συσχετίσεις μεταξύ συμπτωμάτων ΔΔΠ και έλλειψης προσοχής όσο και στις συσχετίσεις μεταξύ συμπτωμάτων ΔΔΠ και παρορμητικότητας. Η παρούσα μελέτη αποτελεί προσπάθεια βαθύτερης κατανόησης της ΔΔΠ και των παραγόντων που σχετίζονται με αυτή. Τα ευρήματα καταδεικνύουν πως τα άτομα με συμπτώματα ΔΔΠ τείνουν να ασχολούνται λιγότερο με τη σωματική άσκηση στον ελεύθερο χρόνο τους. Ακόμη, τα άτομα με αυξημένη συμπτωματολογία ΔΔΠ εμφανίζουν περισσότερα συμπτώματα ΔΕΠΥ, έλλειψης προσοχής και παρορμητικότητας, αλλά και κατάθλιψης. Επομένως, οι επαγγελματίες ψυχικής υγείας πρέπει να εξετάζουν την συνύπαρξη τέτοιων συμπτωμάτων όταν περιθάλπουν άτομα με ΔΔΠ, ώστε να προλαμβάνουν αλλά και να αντιμετωπίζουν πιο αποτελεσματικά τη ΔΔΠ και τις επιπτώσεις της.

ΛΕΞΕΙΣ ΕΥΡΕΤΗΡΙΟΥ: Διαταραχή διαδικτυακού παιχνιδιού, διαταραχή ελλειμματικής προσοχής και υπερκινητικότητας, σωματική άσκηση, κατάθλιψη, άγχος.

Συγγραφέας επικοινωνίας: Χριστίνα Μασκλαβάνου, Α΄ Ψυχιατρική Κλινική, Ιατρική Σχολή, Εθνικό και Καποδιστριακό Πανεπιστήμιο Αθηνών, Αιγινήτειο Νοσοκομείο, Λεωφ. Βασ. Σοφίας 72–74, 115 28 Αθήνα, Διεύθυνση e-mail: christinamasklavanou@outlook.com