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CORRELATES OF ONLINE DEPENDENCE DURING THE COVID-19 PANDEMIC

CORRELATOS DA DEPENDÊNCIA ONLINE DURANTE A PANDEMIA COVID-19

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Abstract: Several variables were associated with online dependence, but it is unclear to what extent they are independently associated. We examined the following statistical predictors of online dependence: food addiction, poor sleep quality, absence of physical activity, negative family interactions, positive family interactions, and age, in a sample of Portuguese adolescents and young adults during the COVID-19 pandemic. The sample consisted of 311 participants (190 females and 121 males), aged 14-21 years, who completed an online questionnaire as part of the project "Geração Cordão". The instruments included the Internet Addiction Test, the Yale Food Addiction Scale, the Athens Insomnia Scale, the Family Assessment Device - General Function, and a measure of frequency of physical exercise. In simple correlations, greater online dependence, greater food addiction, worse sleep quality and negative family interactions were intercorrelated. In a multiple regression, online dependence was independently and significantly associated with food addiction, poorer sleep quality, younger age, more negative family interactions, and more positive family interactions. Males and females did not differ in online dependence. Lack of physical activity was unrelated to online dependence. These findings obtained during the COVID-19 pandemic are consistent with those obtained in normal circumstances. Caution is required in interpreting the regression model as it was obtained under abnormal social circumstances. In future studies, it will be interesting to clarify the causal direction of these variables, or if unmeasured variables mediate the associations (e.g., deficits in self-regulation might underlie online dependence and food addiction).
Keywords: Online dependence; Family interactions; Food addiction; Sleep; COVID-19

Resumo: Várias variáveis têm sido associadas à dependência online, embora não seja claro de que forma estão independentemente associadas. Examinaram-se os seguintes preditores estatísticos de dependência online: dependência alimentar, fraca qualidade do sono, ausência de actividade física, interacções familiares negativas, interacções familiares positivas e idade, numa amostra de adolescentes e jovens adultos Portugueses durante a pandemia COVID-19. A amostra foi constituída por 311 participantes (190 do sexo feminino 121 do sexo masculino) com idades compreendidas entre os 14 e os 21 anos, os quais completaram um questionário online como parte do projecto "Geração Cordão". Os instrumentos utilizados incluíram: *Internet Addiction Test*, *Yale Food Addiction Scale*, *Athens Insomnia Scale*, *Family Assessment Device - General Function* e uma medida de frequência da actividade física. Nas correlações simples, maior dependência online, maior dependência alimentar, pior qualidade de sono e interacções familiares negativas correlacionaram-se entre si. Numa regressão múltipla, a dependência online associou-se de forma significativa e independente com dependência alimentar, pior qualidade de sono, idade mais jovem, mais interacções familiares negativas e mais interacções familiares positivas. Não houve diferenças entre rapazes e raparigas na dependência online. Não se encontraram relações entre falta de actividade física e dependência online. Estes dados obtidos durante a pandemia COVID-19 são consistentes com outros obtidos em

circunstâncias normais. Aconselha-se alguma cautela na interpretação do modelo de regressão, visto ter sido obtido em circunstâncias sociais fora do normal. Em estudos futuros, seria interessante clarificar a direcção causal destas variáveis ou se variáveis não medidas medeiam as associações (e.g. os déficits de auto-regulação podem estar subjacentes à dependência online e à dependência alimentar).
Palavras-Chave: Dependência online; Interacções familiares; Dependência alimentar; Sono; COVID-19

Online dependence can be defined as an excessive and uncontrolled use of certain online applications resulting in interferences with social relationships and in daily life activities, such as school, academic or professional activities. Online dependence triggers withdrawal-like adverse reactions (e.g., anxiety, aggressiveness, anger, etc.), when there is no possibility to access desired online apps (Yellowlees & Marks, 2007).

Several factors appear to be associated with online dependence, but it is unclear to what extent the associations are independent. Thus, the aim of the present study is to explore a model of statistical predictors of online dependence in Portuguese adolescents and young adults during the COVID-19 pandemic. Variables expected to be associated with online dependence include food addiction, poor sleep quality, absence of physical activity and negative family interactions.

Food addiction refers to the excessive and uncontrolled consumption of food (usually processed, such as saturated sugars with high calorie content) with addiction-like characteristics (Gearhardt et al., 2011). Preliminary research has shown that food addiction is associated with measures of online dependence, such smartphone addiction (Domoff et al., 2020), social media addiction (Panno et al., 2020), and internet addiction (Martins & Pimenta, 2019; Yildirim et al., 2018). Congruently, research has shown that higher consumption of unhealthy foods correlates with longer exposure to screens (Marsh et al., 2013), and online dependence was associated with obesity in children and adolescents (Bozkurt et al., 2018).

Individuals very dependent of Internet apps may have inadequate sleep duration due to time spent online, although it cannot be excluded that, in certain cases, sleep problems or some associated conditions may lead to online dependence. In the research of Zhang et al. (2017), young people who were diagnosed as online addicts showed poorer sleep quality. Additionally, Salfi et al. (2021) showed that, in the context of the COVID-19 pandemic, adolescents' increased exposure to screens before bedtime was associated with increases in sleep disorders, including worsening insomnia symptoms, more reduced sleep time, increased time to fall asleep, and difficulties waking up.

Online dependence has also been associated with absence of regular exercise (Hassan et al., 2020) and with less time walking (Alaca, 2020), perhaps due to the time spent online, or because lack of motivation for exercise may favour a preference for sedentary activities, such as online ones. However, there are studies showing no associations between online dependence and lack of physical activity (Dang et al., 2018).

Research also shows associations of greater online dependence with more negative family interactions and fewer positive family interactions; for example, in studies with adolescents, online dependence was found to correlate with less affective engagement in family interactions (Pace et al., 2014), as well as more conflictual and dysfunctional family environments (Wu et al., 2016).

To summarize, the present study seeks to replicate, in a sample of Portuguese adolescents and young adults during the COVID-19 pandemic, the association between greater online dependence and 1) greater food addiction, 2) poorer sleep quality, 3) absence of physical exercise, 4) more negative family interactions, 5) fewer positive family interactions. It is then explored the extent to which online dependence is independently associated with these variables.

METHODS

Participants and procedure

The study sample consisted of 311 participants (61,1% females, 38,9% males). Table 1 presents the demographic characteristics of the sample. Table 2 presents the characteristics of new technology usage. The participants completed an online questionnaire through Google Forms, which was part of the project Geração Cordão. The study received approval of the local Ethics Committee and of the Ministry of Education of Portugal. Researchers contacted a school in the municipality of Torres Vedras, near Lisbon, where teachers passed the survey to their students, after parents of minor students having provided consent.

Table 1. Characterization of the sample ($N = 311$)

	***N* (%) or Mean (*SD*)**
Age (years)	16.8 (1.21)
Sex	
Females	190 (61.1%)
Males	121 (38.9%)
Educational qualifications	
Attending primary/middle school	5 (1.6%)
Attending high school	306 (98,4%)
Area of residence	
Urban	52 (16.7%)
Rural	259 (83.3%)
Parenting style	
Without imposition of rules/boundaries	43 (13.8%)
With negotiation of rules/boundaries	205 (65.9%)
With rigid imposition of obedience and authority	45 (14.5%)
With low levels of control, affection and understanding	18 (5.8%)
Physical Activity (extracurricular)	
Yes	131 (42.1%)
No	180 (57.9%)

Measures

Online dependence was measured using the Portuguese version of the Internet Addiction Test (IAT) (Young, 1998; Pontes et al., 2014). This instrument consists of 20 items with a six-point Likert scale (0-Not applicable; 1-Rarely; 2-Ocasionally; 3-Many times; 4-Frequently; 5-Always). The higher the score obtained, the higher the level of dependence. Normal use ranges between 0-30 points; mild dependence between 31-49 points; moderate between 50-79 points; severe between 80-100 points (Young, 2011).

Food Addiction was measured by the Yale Food Addiction Scale (P-YFAS (Gearhardt et al., 2009; Torres et al., 2017). The questionnaire is composed of 24 items rated on a five-point scale (e.g., "I notice that when I start eating certain foods, I end up eating much more than I had planned").

Sleep quality was assessed by the Athens Insomnia Scale (AIS) (Bastien et al., 2001). This scale was developed taking into consideration the various diagnostic criteria for insomnia. It is composed of eight items. The first three assess difficulty in falling asleep, waking up often during the night and waking up earlier than expected. The next two items assess the quantity and quality of sleep and the

last three assess the feeling of well-being throughout the day, physical and mental functioning during the day, and the level of sleepiness during the daytime period.

Table 2. Online behaviours

	N (%) or Mean (SD)
Age of first Internet Access	9.86 years (2.48)
How many times a day do you use your mobile phone/smartphone?	
I do not have a mobile phone/smartphone	1 (.3%)
1-10 times	37 (11.9%)
11-20 times	58 (18.6%)
21-30 times	55 (17.7%)
More than 31 times	160 (51.4%)
Do you usually have meals or snacks while using your computer or mobile phone?	
Yes	204 (65.6%)
Do you use your mobile phone before going to sleep?	
Yes	296 (95.2%)

Quality of family interactions was measured by the Family Assessment Device (FAD) - General Function (Epstein et al., 1983). This subscale is composed of twelve items. Half of the items assess positive interactions (e.g., "In times of crisis we can count on each other when we need support") and the other half assess negative interactions (e.g., "We can't talk to each other about the sadness we feel"). Responses are obtained through a 4-point Likert scale ranging from 1 ("Strongly Disagree") to 4 ("Strongly Agree").

Physical activity was assessed by asking participants if they engaged in regular physical exercise outside school activities, and if yes, how frequently. We used a dichotomous variable expressing lack of physical exercise (= 0) vs. practice of physical exercise (= 1), as well as a continuous variable expressing exercise frequency.

RESULTS

Regarding the levels of online dependence according to the IAT scale (Young, 2011), the largest percentage of the sample can be found in the normal level, but about 40% present some level of clinically significant dependence (see Table 3).

Table 3. Percentages of online dependence levels based on the Internet Addiction Test.

Normal level	Mild level	Moderate level	Severe level
60.4%	11.63%	20.19%	7.78%

Table 4 presents the intercorrelations between the variables of interest. Greater online dependence correlated with greater food addiction, more sleep disorders, and more negative family interactions, but not with physical activity (dichotomously measured). Additionally, online dependence was uncorrelated with physical activity as continuously measured (r = -.06, p = .279). As seen in Table 4, significant intercorrelations were found between food addiction, sleep problems and negative family interactions.

Table 4. Correlations between the variables under study.

	1	2	3	4	5	6	7	8
1. Age	-							
2. Sex[1]	.08	-						
3. Online Dependence	-.19*	-.06	-					
4. Food Addiction	-.01	-.14*	.42***	-				
5. Physical Activity[2]	.07	.19**	-0,07	.004	-			
6. Sleep Disorders	-.14*	-.21**	.37***	.44***	-.04	-		
7. Family Interactions (Positive)	-.12*	-.14*	.11	-.02	.01	-.01	-	
8. Family Interactions (Negative)	-.09	-.09	.39***	.36***	-.03	.49**	-.05	-

Note: * $p < .05$; ** $p < .01$; *** $p < .001$; [1]Sex: Female = 1; Male = 2; [2]Physical Activity: 0 = No; 1 = Yes

Table 5 shows a multiple regression where online dependence is the dependent variable. The independent variables are age, sex, food addiction, sleep disorders, physical activity (dichotomously measured), positive family interactions and negative family interactions. The results show that online dependence is independently associated with more food addiction, more negative family interactions, more positive family interactions, more sleep disorders, and younger age. Physical activity and sex were not independent predictors. Greater food addiction and more negative family interactions were the strongest predictors of online dependence. Replacing physical activity dichotomously measured by physical activity continuously measured in the independent variables did not change the model meaningfully.

Table 5. Multiple regression with statistical predictors of online dependence.

	β (*p*)	*R*
Food addiction	.29 (> .001)	.55
Sleep disorders	.13 (.028)	
Negative family interactions	.22 (> .001)	
Positive family interactions	.12 (.017)	
Age	-.14 (.005)	
Sex[1]	.07 (.165)	
Physical Activity[2]	-.07 (.168)	

Note: [1]Sex: Female = 1; Male = 2; [2]Physical Activity: 0 = No; 1 = Yes= 2

DISCUSSION

We found that greater online dependence correlates independently with greater food addiction, poorer sleep quality, more negative family interactions, younger age, and unexpectedly (albeit weakly) with positive family interactions in a group of Portuguese adolescents and young adults during the COVID-19 pandemic.

The correlation between online dependence and food addiction is in line with other studies (Domoff et al., 2020; Martins & Pimenta, 2019; Panno et al., 2020; Yildirim et al., 2018), including during the COVID-19 lockdown (Panno et al., 2020). This association might be explained at least partly by deficits in self-regulation (Domoff et al., 2020); that is, individuals with lack of self-regulation attempt to regulate their mood by means of two commonly available activities: eating and using online apps. In fact, many other external regulators (other than substances) might be used for this purpose; these include television viewing, shopping, pornography viewing, gambling (Costa & Brody, 2013; Malat et al., 2010). The need to use these strategies to cope with negative mood likely sustains the behavioural addictions. As research suggests, during the COVID-19 lockdowns,

overeating and engagement in online activities increased conjointly as means to cope with lockdown-related dysphoria (Pandya & Lodha, 2021; Panno et al., 2020).

It was also found that greater online dependence correlated with poorer sleep quality and negative family interactions, as expected on the basis of previous studies. However, these variables did not explain entirely the association between online dependence and food addiction.

Lack of physical activity was not a significant predictor of online dependence. Previous studies show that the association between lack of physical activity and online dependence is inconsistent with some studies failing to find such associations (Dang et al., 2018).

In summary, the results show that online dependence is independently associated with food addiction, sleep quality, negative family interactions, and younger age.

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AUTHOR CONTRIBUTIONS

Inês Borges: Data curation, Formal analysis, Investigation, Methodology, Visualization, Writing – Original draft
Ivone Patrão: Supervision, Writing – Review and editing, Project administration, Methodology
Isabel Leal: Supervision, Writing – Review and editing, Methodology
Rui Miguel Costa: Writing – Review and editing, Formal analysis, Visualization, Methodology

REFERENCES

Alaca, N. (2020). The impact of internet addiction on depression, physical activity level and trigger point sensitivity in Turkish University students. *Journal of Back and Musculoskeletal Rehabilitation, 33*, 623-630. https://doi.org/10.3233/BMR-171045

Bastien, C., Vallières, A., & Morin, C. (2001). Validation of the Insomnia Severity Index as an outcome measure for insomnia research. *Sleep Medicine*, 2(4), 297-307. https://doi.org/10.1016/S1389-9457(00)00065-4

Bozkurt, H., Ozer, S., Sahin, S., & Sonmezgoz, E. (2018). Internet use patterns and internet addiction in children and adolescents with obesity. *Pediatric Obesity*, *13*(5), 301–306. https://doi.org/10.1111/ijpo.12216

Costa, R. M., & Brody, S. (2013). Immature psychological defense mechanisms are associated with greater personal importance of junk food, alcohol, and television. *Psychiatry Research, 209*, 535-539. https://doi.org/10.1016/j.psychres.2013.06.035

Dang, A. K., Nathan, N., Le, Q. N. H., Nguyen, L. H., Nguyen, H. L. T., Nguyen, C. T., Do, H. P., Nguyen, T. H. T., Tran, T. T., Nguyen, T. A., Tran, B. X., Latkin, C. A., Zhang, M. W. B., & Ho, R. C. M. (2018). Associations between internet addiction and physical activity among Vietnamese youths and adolescents. *Children and Youth Services Review, 93*, 36–40. https://doi.org/10.1016/j.childyouth.2018.06.030

Domoff, S. E., Sutherland, E. Q., Yokum, S., & Gearhardt, A. N. (2020). Adolescents' addictive phone use: associations with eating behaviors and adiposity. *International Journal of Environmental Research and Public Health*, *17*(8), 2861. https://doi.org/10.3390/ijerph17082861

Epstein, N. B., Baldwin, L. M., & Bishop, D. S. (1983). The McMaster family assessment device, *Journal of Marital and Family Therapy*, *9*(2), 171-180. https://doi.org/10.1111/j.1752-0606.1983.tb01497.x

Gearhardt, A., Corbin, W., & Brownell, K. (2009). Preliminary validation of the Yale Food Addiction Scale. *Appetite,* 52(2), 430-436. https://doi.org/10.1016/j.appet.2008.12.003

Gearhardt A. N., Davis C., Kuschner R., & Brownell, K. D. (2011). The addiction potential of hyperpalatable foods. *Current Drug Abuse Reviews, 4*(3), 140-145. https://doi.org/10.2174/1874473711104030140

Hassan, T., Alam, M. M., Wahab, A., & Hawlader, M. D. (2020). Prevalence and associated factors of internet addiction among young adults in Bangladesh. *Journal of the Egyptian Public Health Association*, *95*(3). https://doi.org/10.1186/s42506-019-0032-7

Laconi, S., Tricard, N., & Chabrol, H. (2015). Differences between specific and generalized problematic Internet uses according to gender, age, time spent online and psychopathological symptoms. *Computers in Human Behavior*, *48*, 236–244. https://doi.org/10.1016/j.chb.2015.02.006

Malat, J., Collins, J., Dhayanandhan, B., Carullo, F., & Turner, N. E. (2010). Addictive behaviors in comorbid addiction and mental illness: preliminary results from a self-report questionnaire. *Journal of Addiction Medicine*, *4*(1), 38–46. https://doi.org/10.1097/ADM.0b013e3181ac2086

Marsh, S., Ni Mhurchu, C., & Maddison, R. (2013). The non-advertising effects of screen-based sedentary activities on acute eating behaviours in children, adolescents, and young adults. A systematic review. *Appetite*, *71*, 259–273. https://doi.org/10.1016/j.appet.2013.08.017

Martins, I., & Pimenta, F. (2019). *DICA (Dependências na Internet e Comportamento Alimentar): Dependências na Internet e a dependência de comida numa amostra de adolescentes*. [Dissertação de mestrado ISPA - Instituto Universitário de Ciências Psicológicas, Sociais e da Vida]. Repositório do ISPA: http://hdl.handle.net/10400.12/7167

Pace, U., Zappulla, C., Guzzo, G., Di Maggio, R., Laudani, C., & Cacioppo, M. (2014). Internet addiction, temperament, and the moderator role of family emotional involvement. *International Journal of Mental Health and Addiction, 12*(1), 52–63. https://doi.org/10.1007/s11469-013-9468-8

Pandya, A., & Lodha, P. (2021). Social connectedness, excessive screen time during COVID-19 and mental health: A Review of current evidence. *Frontiers in Human Dynamics, 3,* https://doi.org/10.3389/fhumd.2021.684137

Panno, A., Carbone, G. A., Massullo, C., Farina, B., & Imperatori, C. (2020). COVID-19 related distress is associated with alcohol problems, social media and food addiction symptoms: insights from the Italian experience during the lockdown. *Frontiers in Psychiatry, 11*, 577135. https://doi.org/10.3389/fpsyt.2020.577135

Pontes, H., Patrão, I., & Griffiths, M. (2014). Portuguese validation of the Internet Addiction Test: An empirical study. *Journal of Behavioral Addictions*, *3*(2), 107-114. https://doi.org/10.1556/JBA.3.2014.2.4

Rundle, A. G., Park, Y., Herbstman, J. B., Kinsey, E. W., & Wang, Y. C. (2020). COVID-19 related school closings and risk of weight gain among children. *Obesity, 28*(6), 1008–1009. https://doi.org/10.1002/oby.22813

Salfi, F., Amicucci, G., Corigliano, D., D'Atri, A., Viselli, L., Tempesta, D., & Ferrara, M. (2021). Changes of evening exposure to electronic devices during the COVID-19 lockdown affect the time course of sleep disturbances. *Sleep, 44*(9), zsab080. https://doi.org/10.1093/sleep/zsab080

Tserkovnikovaa, N., Shchipanovaa, D., Uskovaa, B., Puzyrev, V., & Fedotovskih O. (2016). Psychological aspects of internet addiction of teenagers. *International Journal of Environmental & Science Education*, *16*(11), 8846-8857.

Torres, S., Camacho, M., Costa, P., Ribeiro, G., Santos, O., Vieira, F. M., Brandão, I., Sampaio, D., & Oliveira-Maia, A. J. (2017). Psychometric properties of the Portuguese version of the Yale Food Addiction Scale. *Eating and weight disorders: EWD, 22*(2), 259–267. https://doi.org/10.1007/s40519-016-0349-6

Wu, C.S.T., Wong, H.T., Yu, K.F., Fok, K. W., Yeung, S. M., Lam, C. H., & Liu, K. M. (2016). Parenting approaches, family functionality, and internet addiction among Hong Kong adolescents. *BMC Pediatrics, 16,* 130 https://doi.org/10.1186/s12887-016-0666-y

Yellowlees, P. M., & Marks, S. (2007). Problematic internet use or internet addiction? *Computers in Human Behavior*, *23*(3), 1477-1453. https://doi.org/10.1016/j.chb.2005.05.004

Yildirim, M. S., Sevincer, G. M., Kandeger, A., & Afacan, C. (2018). Investigation of the relationship between risk of Internet addiction, food addiction, and self-esteem in high school students. *The Journal of Psychiatry and Neurological Sciences*, 31, 187-194. https://doi.org/10.5350/DAJPN2018310206

Young, K. S. (1998). *Caught in the Net: How to recognize the signs of Internet addiction and a winning strategy for recovery*. John Wiley & Sons, Inc.

Young, K. S. (2011). Clinical assessment of internet-addicted clients. In K. Young & C. Abreu (Eds.), *Internet Addiction: A Handbook and Guide to Evaluation and Treatment* (pp. 19- 34). John Wiley & Sons.

Zhang, M., Tran, B. X., Huong, L. T., Hinh, N. D., Nguyen, H., Tho, T. D., Latkin, C., & Ho, R. (2017). Internet addiction and sleep quality among Vietnamese youths. *Asian journal of psychiatry*, 28, 15–20. https://doi.org/10.1016/j.ajp.2017.03.025