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Severity of behavioral addiction symptoms among young adults using non-prescribed sedatives/hypnotics

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ABSTRACT

Introduction: Young adulthood is considered a critical period in terms of non-medical use of sedatives/hypnotics (NMUSH) as well as different types of behavioral addictions (BAs). However, the relationship between these behaviors has received scarce attention among young adult samples. Therefore, the aim of the present study was to investigate the association between NMUSH and symptoms of distinct BAs among young adults.
Materials and methods: Analyses were conducted based on the data of two large sample studies (including a representative sample) carried out with young adult samples. The following BAs were assessed: problematic internet use, problematic video gaming, problematic social media use, problem gambling, exercise addiction, eating disorders, compulsive buying behavior, problematic mobile phone use, work addiction, and hair pulling. Symptoms of distinct BAs were analyzed in three groups formed based on the NMUSH: non-users, lifetime users, and current users.
Results: The symptoms of problematic internet use, problematic social media use, problem gambling, exercise addiction, eating disorders, compulsive buying behavior and work addiction were significantly more severe among lifetime and/or current non-medical sedative and hypnotic users, compared to the non-user participants. The symptoms of problematic mobile phone use were the most severe in the non-user group.
Conclusions: The results suggest co-occurrence between NMUSH and distinct BAs among young adults. These findings draw attention to the need for preventive interventions for this high-risk population.

1. Introduction

Using prescription drugs without medical prescription, in larger doses, for longer periods and/or for different purposes than prescribed is an increasing public health concern carrying a number of potential harmful consequences such as substance use disorder, overdose, suicidal behavior, poor quality of life and/or physical health issues (European Monitoring Centre for Drugs and Drug Addiction, 2020; Votaw et al., 2019). Sedatives and hypnotics (especially benzodiazepines) are among the most commonly prescribed psychiatric drugs with a wide range of clinical uses that include the treatment of anxiety, insomnia, epilepsy, and alcohol withdrawal (European Monitoring Centre for Drugs and

Abbreviations: BLS, Budapest Longitudinal Study; PGA, Psychological and Genetic Factors of Addictive Behaviors Study; NMUSH, non-medical use of sedatives/hypnotics; BA, behavioral addiction; NUs, non-users; LUs, lifetime users; CUs, current users; PIUQ, Problematic Internet Use Questionnaire; IGDT-10, Ten-Item Internet Gaming Disorder Test; IGD, internet gaming disorder; POGQ, Problematic Online Gaming Questionnaire; PGSI, Problem Gambling Severity Index; DSM-IV-MR-J, Diagnostic Statistical Manual-IV-Adapted for Juveniles; EAI, Exercise Addiction Inventory; RCBS, Richmond Compulsive Buying Scale; PMPUQ-SV, Problematic Mobile Phone Use Questionnaire; BWAS, Bergen Work Addiction Scale; MGH-HPS, Massachusetts General Hospital Hairpulling Scale.

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Drug Addiction, 2021; Substance Abuse and Mental Health Services Administration, 2020). This group of medicines is also among most commonly prescribed drugs which are used non-medically. Therefore, the non-medical use of sedatives and hypnotics (NMUSH) has received increasing focus in recent years in the scientific literature. However, its risk factors and correlates are still unexplored due to the multifactorial nature of this phenomenon.

For instance, different occurrences and correlates of non-medical prescription drug use have been reported across age cohorts and distinct populations. Several studies suggest that elderly people, women or high-risk opioid users are at the greatest risk of NMUSH (Votaw et al., 2019). Nonetheless, nationally representative data from the U.S. indicates that the highest prevalence of past-year NMUSH was among young adults aged between 18 and 34 years based on the results of data collections in 2015 and 2019 (Schepis et al., 2018; Substance Abuse and Mental Health Services Administration, 2020). These results concur with a study carried out among representative adult samples in five European countries (France, Germany, Italy, Spain, UK) which reported a greater proportion of adults aged 34 or younger among lifetime non-medical sedative and hypnotic users (Hockenhull et al., 2021). In Hungary, based on the 2019 Survey on Addiction Problems in Hungary carried out with a representative adult sample, the past year prevalence of NMUSH was 2.9% (Péter et al., 2021) and among young adults aged between 25 and 35 years, the past year prevalence of NMUSH was above average (3.8%). Consequently, young adults are considered at-risk for NMUSH.

Previous research has reported a wide array of sociodemographic variables which may contribute to NMUSH among young adult populations (e.g. white race, lower family income, lower level of education, sexual minority, lower level of religiosity) (Dagirmanjian et al., 2017; Klare et al., 2020; McCabe, 2005; Schepis et al., 2018). In addition to the sociodemographic factors, NMUSH is related to physical and mental health status. As reported by Schepis et al. (2018), self-reported poor health and past year hospitalization are associated with increased odds of NMUSH among young adults. Recent research has also suggested a relationship between NMUSH and major depression, anxiety, treatment history, psychological distress, and suicidal ideation (Grant et al., 2020; Mateu-Gelabert et al., 2017; Schepis et al., 2018; Zullig & Divin, 2012). Furthermore, personality traits such as anxiety sensitivity, impulsivity, and compulsivity as well as the low self-esteem are considered to be predictors for NMUSH among college students (Chinneck et al., 2018; Grant et al., 2020).

The co-occurrence between NMUSH and other substance-related addictive behaviors in this high-risk population has been also investigated. A study by McCabe et al. (2005) highlighted that young adults who used non-medical sedatives/hypnotics were more likely to report cigarette smoking and binge drinking, as well as use of cocaine, ecstasy, prescription stimulants, and prescription opioid analgesics. These results support those of Grant et al. (2020) who reported a strong association between NMUSH, and higher levels of problematic alcohol and illicit substance use with approximately two-thirds of those who reported current NMUSH meeting the criteria for alcohol or drug use disorder. Nevertheless, as reported by Busto Miramontes et al. (2019), later onset of alcohol consumption constitutes a protective factor against NMUSH.

Behaviors as well as substances that harm the individual and/or the individual's social environment physically, mentally and/or socially can be considered potentially addictive (Santangelo et al., 2022). Moreover, Griffiths (2005) has argued that all genuine behavioral and substance addictions can be defined by six common characteristics (i.e., withdrawal, conflict, tolerance, salience, mood medication, and relapse). Addictive behaviors related to the behavior itself (i.e., behavioral addictions) have received increasing attention in recent decades (Sixto-Costoya et al. 2021). Young adulthood is also considered to be a critical period in terms of the development of different types of behavioral addictions (BAs) (e.g. problem gambling, problematic internet use, problematic video gaming, problematic social media use, and eating disorders) (Castrén et al., 2013; Huang & Boyer, 2007; Islam et al., 2020; Lipson & Sonneville, 2017; Nagata et al., 2018; Tang et al., 2018).

However, the relationship between NMUSH and BAs has received scarce attention among this population. Fernández-Aliseda et al. (2020) suggested an association between compulsive internet use and sedative consumption among Spanish adolescents. Moreover, Ganson et al. (2021) reported that eating disorders were strongly associated with benzodiazepine use among college students. In general, the comorbidity between different types of addictions is high due to common genetic and/or psychological background and risk factors (Kotyuk et al., 2019). Nevertheless, both NMUSH and specific BAs have only received growing attention during the past decade. Therefore, much fewer data are available related to these phenomena and their risk factors or comorbidities. However, as addictive behaviors are common among young adults, they can be considered as a high-risk population in terms of addictions. Understanding more comprehensively the relationship between BAs and NMUSH would likely improve the effectiveness of preventive interventions for this age group. Therefore, the objective of the present study was to investigate the association between NMUSH and different BAs among young adults by exploring the severity of BA symptoms among non-medical prescription sedative/hypnotic user and non-user groups.

2. Materials and methods

2.1. Participants and procedure

Analyses were conducted based on the data of two large sample studies carried out on Hungarian populations aged between 18 and 34 years, defined as young adults by the European Monitoring Centre for Drugs and Drug Addiction (2002). One of the samples was age representative. Both studies were approved by the Scientific and Research Ethics Committee of the Medical Research Council (ETT TUKEB).

2.1.1. BLS study

The Budapest Longitudinal Study (BLS) is a representative young adult sample study of Budapest youth aged between 18 and 34 years assessing the prevalence and characteristics of substance use and BAs. In the present study, data from the first data collection wave (in 2019) was used. The size of the final weighted sample by layer categories was 3890 participants (48.4% male [n = 1883]; mean age = 27.06 years [SD = 4.76]). A mixed method approach comprising both face-to-face and self-administered questionnaires were used during the data collection. Questions related to substance use including NMUSH relied on the revised Epidemiological Model Questionnaire (EMQ) of the European Monitoring Centre for Drugs and Drug Addiction (European Monitoring Centre for Drugs and Drug Addiction, 2002; Karjalainen, 2018).

2.1.2. PGA study

The aim of the Psychological and Genetic Factors of Addictive Behaviors (PGA) Study was to take a multidisciplinary approach and test possible psychological and genetic factors in different types of substance use and BAs. The study was carried out among a large sample of young adult population from several Hungarian education facilities. The total sample comprised 3003 participants (42.6% male [n = 1280]; mean age = 21 years [SD = 2.8]). A detailed introduction to the procedure and substance use assessment have been published elsewhere (Kotyuk et al., 2019).

2.2. Measures

In both studies, three NMUSH groups were categorized based on usage: (i) non-users (NUs; participants who had never used sedatives/hypnotics non-medically), (ii) lifetime users (LUs; participants who reported NMUSH during their lifetime, but not in the past 30 days) and (iii) current users (CUs; participants who reported NMUSH in the past

30 days). In both the BLS and PGA Study, BAs which are common among young adults, were included in the analyses. These behaviors can be characterized by recurrent, persistent thoughts and need to perform a behavior to (i) reduce distress, (ii) reduce anxiety prior to performing the behavior, and (iii) provide relief and reward during and/or following the behavior (Grant et al., 2010). Therefore, the following behaviors were examined:

2.2.1. Problematic internet use

The Problematic Internet Use Questionnaire (PIUQ) is a self-report screening instrument containing three subscales: obsession, neglect and control disorder (Demetrovics et al., 2008). Problematic internet use was assessed using the (i) 9-item version of PIUQ (Demetrovics et al., 2008; Koronczai et al., 2011) which had excellent internal consistency (Cronbach's $\alpha = 0.93$) in the BLS sample, and (ii) 6-item PIUQ (Demetrovics et al., 2016) which had adequate internal consistency (Cronbach's $\alpha = 0.75$) in the PGA sample.

2.2.2. Problematic video gaming

In the BLS, problematic video gaming was assessed using the Ten-Item Internet Gaming Disorder Test (IGDT-10) (Király et al., 2017; Király et al., 2019). The IGDT-10 assesses past-year problematic video gaming, operationalized as "internet gaming disorder" (IGD) with items comprising the DSM-5 diagnostic criteria of IGD (American Psychiatric Association, 2013). The internal consistency in the BLS sample was very good (Cronbach's $\alpha = 0.899$). In the PGA Study, the 12-item version of the Problematic Online Gaming Questionnaire (POGQ) (Demetrovics et al., 2012; Pápay et al., 2013) was used. The POGQ assesses problematic online gaming and comprises six factors: preoccupation, overuse, immersion, social isolation, interpersonal conflicts, and withdrawal. The internal consistency in the PGA sample was excellent (Cronbach's $\alpha = 0.92$).

2.2.3. Problematic social media use

In both studies, problematic social media use was assessed using the Bergen Social Media Addiction Scale (BSMAS) (Andreassen et al., 2012b; Bányai et al., 2017). The BSMAS is a 6-item instrument for assessing the risk of problematic nature of social media use over the past 12 months. The internal consistency was excellent in the BLS sample (Cronbach's $\alpha = 0.91$) and very good in the PGA sample (Cronbach's $\alpha = 0.82$).

2.2.4. Problem gambling

In the BLS, the 9-item Problem Gambling Severity Index (PGSI) (Hungarian version: Gyollai et al., 2013) was used to assess the severity of gambling over the past 12 months. The internal consistency was excellent (Cronbach's $\alpha = 0.92$). In the PGA study, problem gambling was assessed using the nine-item Diagnostic Statistical Manual-IV-Adapted for Juveniles (DSM-IV-MR-J) (Fisher, 2000). The DSM-IV-J is based on the adult diagnostic criteria for pathological gambling adapted to assess past year gambling among adolescents. The internal consistency was adequate in the PGA sample (Cronbach's $\alpha = 0.79$).

2.2.5. Exercise addiction

In both studies, exercise addiction was assessed using the Exercise Addiction Inventory (EAI) (Demetrovics & Kurimay, 2008; Griffiths et al., 2005; Mónok et al., 2012; Terry et al., 2004). The EAI is a 6-item psychometric instrument developed to identify individuals affected by, or at risk of exercise addiction. The internal consistency was excellent in the BLS sample (Cronbach's $\alpha = 0.93$) and adequate in the PGA sample (Cronbach's $\alpha = 0.78$).

2.2.6. Eating disorders

In both studies, eating disorders were assessed using the SCOFF Questionnaire (Morgan et al., 1999). The SCOFF is a brief, 5-item screening instrument used to detect the likelihood of an eating disorder (anorexia nervosa and/or bulimia nervosa). Internal consistency was adequate in the BLS sample (Cronbach's $\alpha = 0.73$), but low in the PGA sample (Cronbach's $\alpha = 0.46$).

2.2.7. Compulsive buying behavior

In the BLS, compulsive buying behavior was assessed using the Richmond Compulsive Buying Scale (RCBS) (Maraz et al., 2015; Ridgway et al., 2008). The RCBS comprises six items, loading on two factors (obsessive–compulsive buying and impulsive buying). The internal consistency was excellent (Cronbach's $\alpha = 0.94$). Compulsive buying behavior was not assessed in the PGA.

2.2.8. Problematic mobile phone use

In the BLS, problematic mobile phone use was assessed using the dependence subscale of Problematic Mobile Phone Use Questionnaire (PMPUQ-SV) (Lopez-Fernandez et al., 2018). The 15-item PMPUQ-SV has three subscales (dangerous use, prohibited use, and dependence), each comprising 5 items. The internal consistency for the dependence subscale was very good (Cronbach's $\alpha = 0.88$). Problematic mobile phone use was not assessed in the PGA.

2.2.9. Work addiction

In the BLS, work addiction was assessed using the Bergen Work Addiction Scale (BWAS) (Andreassen et al., 2012a; Orosz et al., 2016). The BWAS is a 7-item instrument developed to assess the risk of work addiction. The internal consistency was very good (Cronbach's $\alpha = 0.87$). Work addiction was not assessed in the PGA.

2.2.10. Problematic hair pulling

In the PGA Study, problematic hair pulling was assessed using the Massachusetts General Hospital Hairpulling Scale (MGH-HPS) (Keuthen et al., 2014). The 7-item MGH-HPS assesses urges to pull, actual pulling, perceived control, and associated distress over the past 7 days. The internal consistency was excellent (Cronbach's $\alpha = 0.94$). Problematic hair pulling was not assessed in the BLS.

2.3. Statistical analysis

IBM SPSS 24 was used for statistical analysis (IBM Corp, 2016). Four behavioral addictions were examined in only one of the included studies (i.e., compulsive buying behavior, problematic mobile phone use, work addictions, and hair pulling), while problematic video gaming and problem gambling were operationalized in different ways across the two studies (see above in *Measures*). Therefore, analyses were conducted separately. Due to the different number of the participants and non-normal distribution in each group (Kolmogorov-Smirnov Goodness-of-Fit Test: $p < 0.05$), non-parametric tests were used. Kruskal-Wallis and Mann-Whitney tests were conducted to explore the severity of BA symptoms in the three groups. Statistical significance was considered if $p < 0.05$ for the Kruskal-Wallis test, and $p < 0.017$ for the Mann-Whitney test, after Bonferroni correction.

3. Results

In the BLS, 97.9% of participants (n = 3713) were assigned to the NU group, 0.6% to the LU group (n = 23) and 1.5% to the CU group (n = 57). In the PGA Study, 92.3% of participants were assigned to the NU group (n = 2746), 6% to the LU group (n = 178) and 1.7% to the CU group (n = 52).

Table 1 shows the medians and mean ranks of scales assessing the severity of BA symptoms in the three groups. For means, standard deviations, skewness, and kurtosis for each psychometric scale, see the Supplementary Material. Compared to NUs, the severity of problematic internet use symptoms was significantly higher among both LUs (Mann-Whitney test: $p = 0.013$) and CUs (Mann-Whitney test: $p < 0.001$) in the BLS sample. The severity of problematic social media symptoms was

Table 1
Medians and mean ranks of scales measuring the severity of distinct behavioral addiction symptoms in the three groups formed based on non-medical prescription sedative/hypnotic use.

Behavioral addiction	*Group*	BLS (N = 3890)					PGA (N = 3003)				
		n	*Median*	*Mean rank*	*H-value*	*Sig. (p-value)*	*n*	*Median*	*Mean rank*	*H-value*	*Sig. (p-value)*
Problematic internet use	NU	3531	9.00	1790.06	**38.435**	**< 0.001**	2716	9.00	1464.32	2.624	0.269
	LU	19	11.90	2341.39			175	10.00	1565.62		
	CU	50	13.22	2570.52			51	10.00	1531.09		
Problematic video gaming	NU	3657	0.00	1869.38	6.280	0.043	2608	12.00	1417.41	2.191	0.334
	LU	23	0.00	1932.43			168	12.00	1388.28		
	CU	54	0.00	1920.29			49	12.00	1262.85		
Problematic social media use	NU	3539	6.00	1797.89	**34.757**	**< 0.001**	1594	8.00	846.34	**16.435**	**< 0.001**
	LU	21	8.00	2298.83			100	9.00	972.43		
	CU	54	9.18	2515.97			21	12.00	1197.90		
Problem gambling	NU	3652	0.00	1862.26	**57.971**	**< 0.001**	2704	0.00	1459.25	**7.718**	**0.021**
	LU	23	0.00	2082.63			177	0.00	1572.25		
	CU	57	0.00	2313.68			51	0.00	1483.79		
Exercise addiction	NU	3654	0.00	1864.70	**25.814**	**< 0.001**	2704	12.00	1473.00	**6.886**	**0.032**
	LU	23	0.00	1960.30			177	10.00	1327.60		
	CU	57	0.00	2338.69			52	13.50	1629.67		
Eating disorders	NU	3587	0.00	1824.53	**75.518**	**< 0.001**	2716	0.00	1448.61	**35.441**	**< 0.001**
	LU	22	1.00	2684.00			177	0.00	1750.26		
	CU	56	0.00	2404.15			52	1.00	1803.01		
Compulsive buying behavior	NU	3655	0.00	1866.16	**9.142**	**0.011**	–				
	LU	23	0.00	1914.37							
	CU	56	0.00	2169.63							
Problematic mobile phone use	NU	3634	15.00	1872.20	**13.940**	**0.001**	–				
	LU	23	13.00	1457.63							
	CU	57	13.00	1405.89							
Work addiction	NU	3663	2.00	1862.00	**44.969**	**< 0.001**	–				
	LU	23	1.38	1853.59							
	CU	57	8.00	2786.54							
Hair pulling	NU	–					1500	0.00	806.08	0.579	0.749
	LU						94	0.00	822.41		
	CU						20	0.00	843.75		

BLS: Budapest Longitudinal Study; PGA: Psychological and Genetic Factors of Addictive Behaviors Study;
NU-non-users; LU: lifetime users; CU: current users;
Values in bold indicate statistically significant results.

significantly higher among the CUs compared to NUs among both the BLS (Mann-Whitney test: $p < 0.001$) and PGA (Mann-Whitney test: $p = 0.001$) samples. In the PGA sample, the severity of problematic social media use symptoms was also significantly higher among the LUs compared to the NUs (Mann-Whitney test: $p = 0.013$).

Compared to the NUs, the severity of problem gambling symptoms was significantly higher among CUs in the BLS sample (Mann-Whitney test: $p < 0.001$) and among LUs in the PGA sample (Mann-Whitney test: $p = 0.006$). Regarding exercise addition, the severity of symptoms was significantly higher among the CUs compared to the NUs in the BLS sample (Mann-Whitney test: $p < 0.001$). Although the Kruskal-Wallis test showed significant difference in the severity of exercise addiction symptoms in the three groups in the PGA sample, the Mann-Whitney test after the Bonferroni correction showed no significant differences between groups. However, it should be noted that a similar pattern is shown in the two samples (i.e., the most severe symptoms were found among CUs). Therefore, non-significant post hoc tests in the PGA sample may also be caused by using a conservative statistical test.

Compared to the NUs in both the BLS and PGA samples, the severity of eating disorder symptoms was significantly higher among LUs (Mann-Whitney test in BLS: $p < 0.001$; PGA: $p < 0.001$) as well as among CUs (Mann-Whitney test in BLS: $p < 0.001$; PGA: $p = 0.001$). The severity of compulsive buying behavior symptoms was also significantly higher among CUs, compared to the NUs (Mann-Whitney test: $p < 0.001$). However, regarding problematic mobile phone use, the NUs showed significantly more severe symptoms, compared to the CUs (Mann-Whitney test: $p = 0.001$). Furthermore, the severity of work addiction symptoms was significantly higher among CUs compared to both NUs (Mann-Whitney test: $p < 0.001$) and LUs (Mann-Whitney test: $p = 0.001$). No significant differences were found between groups in regard of the severity of problematic internet use in PGA sample, the severity of problematic video gaming symptoms in both samples, and the severity of hair pulling in the PGA sample.

4. Discussion

Several correlates of non-medical prescription drug use among young adults have been reported in the scientific literature (Busto Miramontes et al., 2019; Chinneck et al., 2018; Grant et al., 2020; McCabe, 2005; Schepis et al., 2018). However, to the best of the present authors' knowledge, the present study is the first which comprehensively demonstrated the association between NMUSH and several types of BAs in this population.

Sedatives and hypnotics are typically used for the short-term treatment of anxiety or insomnia (World Health Organization, 2019), therefore, self-medication (anxiety, sleep disorders) or coping with negative affect are the most common motives for NMUSH (Boyd et al., 2006; Center for Behavioural Health Statistics and Quality, 2018; Votaw et al., 2019). Previous studies have suggested a co-occurrence of problematic internet use, problematic social media use, problem gambling, work addiction, exercise addiction or compulsive buying and with symptoms of anxiety or depression (Andreassen et al., 2015; Carli et al., 2013; Hussain, Wegmann, Yang, & Montag, 2020; Ioannidis et al., 2018; Liu & Ma, 2019; Serrano-Fernández, Boada-Grau, Boada-Cuerva, & Vigil-Colet, 2021; Starcevic & Khazaal, 2017; Weinstein, Maayan, & Weinstein, 2015) as well as poor sleep quality, especially in terms of internet gaming disorder and problematic social media use (Lin et al., 2021; Wong et al., 2020). In regard to work addiction, Dutheil et al. (2020) found twice as many individuals with depressive symptoms, lower sleep quality, greater perceived stress and lower well-being

among those at high risk of work addiction. Sohn et al. (2021) reported that problematic mobile phone use was also associated with poor sleep quality. However, 39% of the young adults similarly aged to the samples in the present study (18–30 years) reported smartphone addiction in the UK. The commonness of this behavior among young adults can overwrite the differences alongside NMUSH as also seen in the results of the present study. Moreover, psychological constructs such as anxiety, depression or sleep disturbances show associations with the behavioral addictions examined in the present study, and these constructs may therefore play mediating roles between NMUSH and BAs. Fan et al. (2020) reported the indirect effect of depressive symptoms on problematic internet use via non-medical sedative use.

However, it should be noted that causality between these behaviors has yet to be established. BAs may function as an escape mechanism for negative affect (Wegmann et al., 2017; Yen et al., 2019). However, BAs may also cause depression, anxiety or sleep disturbances leading to NMUSH, which in turn could aggravate the severity of BA and vice versa (Starcevic & Khazaal, 2017). The further investigation of the mediating effects between NMUSH and BAs could help to better understand the relationship between these phenomena among young adults, especially because early onset of non-medical prescription drug use is associated with the development of lifetime prescription drug dependence (McCabe et al., 2007). Moreover, the early age of onset of BAs is a predictor for greater severity and worse psychopathological state (Valero-Solís et al., 2018). Therefore, adequate preventive interventions are essential in this high-risk population.

Some limitations of the present study should be noted. As mentioned above, the analysis of cross-sectional data does not allow the determining of causal pathways between NMUSH and the examined BAs. In addition, more detailed and higher levels of statistical analyses examining mediating and moderating factors are needed to provide a more accurate picture of the nature of these relationships. It should be noted that some of the examined behaviors were included to analyses because they can be described by the characteristics of addictions. However, the fact that some of these behaviors are more accurately viewed as obsessive–compulsive disorders (e.g., hair pulling) (American Psychiatric Association, 2013) rather than addictions may be a potential cause of some non-significant findings in this context. Furthermore, self-administered questionnaires were used during the data collection, therefore, memory and social desirability bias should be also taken into account as well as several differences between two examined samples (e.g., regarding some assessments) which could have led to different results in some cases, for instance, regarding problematic internet use. Mean age was also lower among individuals in the PGA sample. Therefore, the difference in results may be because internet use becomes problematic in later ages of young adulthood.

Considering these differences, representative studies are needed among young adults to confirm the findings of the present study. Finally, the BLS and PGA Study investigated the non-medical use of sedatives and hypnotics. However, examination of further types of non-medical prescription drug use such as opioid pain relievers or stimulants would also be useful to examine in the future to better understand the relationship between non-medical prescription drug use and BAs.

5. Conclusion

Early recognition of both BAs and NMUSH among young adults may be vital in the prevention of addictions, especially because of the co-occurrence of these behaviors. In addition, due to the similarities between substance-related and behavioral addictions, a general predisposition for addictions should be taken into account, which may simultaneously manifest in non-medical prescription drug use, BAs or other types of substance use. However, further studies are needed to understand the relationship between addictive behaviors including NMUSH in this high-risk population.

Author Agreement

This manuscript contains original material and no other publication has been written from the current dataset. The paper has not been submitted to any other journal, and has not been published elsewhere. The final version and submission of the manuscript has been approved by the authors and the indicated authorship order is also accepted.

Contributors

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Declaration of Competing Interest

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Data availability

Data will be made available on reasonable request.

Appendix A. Supplementary material

Supplementary data to this article can be found online at https://doi.org/10.1016/j.abrep.2023.100485.

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