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ORIGINAL ARTICLE

Work Addiction and Stimulant Use: Latent Profile Analysis in a Representative Population Study

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Abstract

Individuals with work addiction (WA) are characterized by low self-esteem, high obsessiveness, and impulsiveness; they are overloaded with tasks and show sleep problems. These characteristics suggest that workaholics might be prone to use psychostimulant substances; however, this relationship has never been investigated. The present study aimed to explore the prevalence of psychostimulant use among individuals with WA in a representative sample ($N = 3076$). Lifetime, last year, and last month prevalence of licit and illicit stimulant use were explored. Bergen Work Addiction Scale and the 18-item version of the Brief Symptom Inventory were applied for assessing WA and psychopathological symptoms. Addictive workers showed significantly higher prevalence of smoking, energy drink consumption, amphetamine, NPS, and cocaine use than non-addictive workers. Moreover, they also reported more psychopathological symptoms. Since addictive workers have a higher vulnerability to potentially risky stimulant use, workplace mental health programs should address screening and prevention of WA.

Keywords Work addiction · Workaholism · Stimulant use · Nicotine · Caffeine · Amphetamine

During the last decades, there has been an increasing scientific interest in work addiction. Although recent debates (Atroszko et al., 2019; Griffiths et al., 2018) pointed out that work addiction is associated with numerous negative social and psychological terms (e.g., work-life-conflict, mental and physical health issues, or burnout), the myth of work addiction as a "positive addiction" (Brown, 1993) or "mixed-blessings" addiction (Glasser, 1976) still exists. There is still very poor knowledge about the psychoactive substance use habits of individuals with work addiction; however, their personality, mental problems, and lifestyle suggest an elevated level of psychoactive substance use. Although a few studies have

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examined the relationship between work addiction and alcohol use (Salanova et al., 2016), the psychoactive stimulant use, especially nicotine, and illicit drug use of workaholics have never been investigated. The present study aimed to explore the prevalence of psychostimulant use among individuals with work addiction compared to non-problematic workers.

Work Addiction

Non-substance addictions or so-called behavioral addictions are disorders that share similar characteristics as substance-related addictions: salience of the behavior in one's emotions and thoughts, application of the behavior for mood modification, increasing amount of the behavior (tolerance), withdrawal symptoms, intrapsychic and interpersonal conflict caused by the behavior, and relapse in spite of control attempts (Rosenberg & Curtiss Feder, 2014). Although work addiction has not been officially recognized as a mental disorder either by DSM-5 (American Psychiatric Association, 2013) or the ICD–11 (World Health Organization, 2019), it is generally considered an addictive disorder (Griffiths et al., 2018). Even so, according to the bio-psychosocial framework model of addictions provided by Griffiths (2005), work addiction checks the boxes of the abovementioned six core addiction components (Griffiths & Karanika-Murray, 2012). In addition, in the report of Porter & Kakabadse (2006), the behavior should be interpreted as a behavioral addiction, as it involves relief, comfort, or stimulation when the behavior is performed. However, work addiction has also been viewed as a behavior pattern (Scott et al., 1997), an attitude toward work (Spence & Robbins, 1992), a behavioral tendency (Mudrack & Naughton, 2001), or a syndrome (Aziz & Zickar, 2006). In grey literature, some use the term "productivity addiction" as a synonym for work addiction, but these terms have different meanings. Work addiction is specifically focused on work-related tasks, while obsessive productivity can involve a broader range of activities oriented towards achieving a particular outcome.

Work addiction is described as an uncontrolled involvement in work while consequently neglecting and/or negatively affecting other areas of life, such as health, social relations, personal well-being, and other activities (Oates, 1971; Porter, 1996; Robinson, 2007; Scott et al., 1997; Sussman, 2012). Individuals with work addiction basically devote more time to work than being with other people or to other activities (Mudrack & Naughton, 2001; Ng et al., 2007). In addition, Robinson (2007) elaborates as to why overwork is this century's cocaine, in account of the relationship with work being the central connection of the workaholic's life, which is similar to the connection users experience with cocaine. The obsessive–compulsive nature of work addiction was also conceptualized as the tendency to work excessively hard in a compulsive way while experiencing reluctance to disengage from work (McMillan et al., 2001), also having an obsessive internal drive that cannot be resisted (Mudrack, 2004; Ng et al., 2007; Porter, 1996), and a relief after the behavior (Porter & Kakabadse, 2006). In this vein, Scott et al. (1997) found that individuals affected by work addiction spend a lot of time with work activities, and are mentally preoccupied with work as they think of it while they are not in their workplace and exceed what is expected from them at work because of internal, rather than external motivational factors (Porter, 1996; van Beek et al., 2012).

Psychoactive Stimulant Use

The most used psychoactive substances are psychostimulants, and they have the capacity to stimulate the nervous system (Favrod-Coune & Broers, 2010). Stimulants, such as caffeine, nicotine, amphetamine-type stimulants (ATS), cocaine, and the new psychoactive stimulants (NPS), are widely used psychoactive drugs in the world (European Monitoring Centre for Drugs and Drug Addiction, 2022; United Nations Office on Drugs and Crime, n.d.). Overall they elevate mood and increase alertness and arousal while speeding up the signals into the brain (Favrod-Coune & Broers, 2010). It is very clear that motives of using certain drugs are linked to the effects that the respective drug offers. Hence, understanding more about the motives is regarded to be essential for the development of drug harm prevention and treatment strategies (Adams et al., 2003). Several studies showed that the following motives for psychostimulant use are the most frequently mentioned ones: increasing energy, sexual enhancement, social connection, coping with stressors, dealing with family or work difficulties, focused work productivity, enhancing performance either at work and in education, or breaking up household monotony (Addison et al., 2021; Boeri et al., 2009; Díaz et al., 2005; Favrod-Coune & Broers, 2010; Lende et al., 2007; O'Donnell et al., 2019). The predictors of nonmedical use (NMU) of prescription stimulants are very similar (Faraone et al., 2020). The most frequent reasons for NMU of stimulants are being productive and the desire to enhance academic or work performance (Cassidy et al., 2015).

According to Kettner et al. (2019), the motivations for the use of classical (CPS) or novel psychoactive substances (NPS) are the same; however, they are different in percentage reported. The main motivations for using stimulants are to broaden consciousness, to enhance activity, for the spiritual experience, and to experience nature (Kettner et al., 2019). In a recent study on the motivation factors of NPS use, it was found that seeking pleasure, mind exploration, being connected to others, or out of curiosity, but also external motives such as price, accessibility, or the specific effects were the most important reasons to use (Simonis et al., 2020).

Many studies have been conducted to explore the effects and motivations behind specific stimulant use. For instance, caffeine stimulates the central nervous system, the cortex, the medulla, and the spinal cord if the dosage is high. Mild cortex stimulation results in more clear thinking and less fatigue (Bolton & Null, 1981). The stimulating activity of caffeine in the central nervous system can cause sleep deprivation (Roehrs & Roth, 2008). Caffeine has also been shown to improve attention (Rogers & Dernoncourt, 1998) and improve cognition when the dose usage is low to moderate (McLellan et al., 2016).

Among reasons for smoking nicotine, it is found that tension reduction or relaxation was reported by 46.5% of participants of the study (El-Sherbiny & Elsary, 2022). In another study, according to the sequential model, there was a strong indirect impact of distress tolerance on nicotine dependence via the motivations of habit and tension relief (Niezabitowska et al., 2022). Smoking has been reflected by a more impulsive delayed reward discounting (Amlung & MacKillop, 2014), which represents a form of impulsivity that is highly relevant in addictive behaviors. Emphasizing the self-medication or stress management motives in the background of smoking, it is well documented that individuals with mental disorders, such as anxiety, depression, obsessive–compulsive disorder, and phobia, show an approximately twofold higher prevalence of smoking than healthy individuals (Akbari et al., 2022; Smith et al., 2014).

Several changes in the gray and white matter occur to amphetamine and methamphetamine users (Harro, 2015). Amphetamine as a stimulant has a history of treating ADHD

and narcolepsy patients (Berman et al., 2009). Moderate oral doses of amphetamine in healthy adults—with no psychiatric diagnosis—enhance attention and positive mood up to 150 min after administrated (de Wit et al., 2002). In addition, amphetamine improves the overall level of detection/vigilance (Koelega, 1993). Some of the subsequent effects of this drug include loss of appetite, insomnia, and nervousness (National Toxicology Program, 2005), also depression and anxiety (Hall et al., 1996). Almost one-fifth of the users reported that they used methamphetamine to be able to stay awake, while under one-sixth of them used it for being able to work more, replace another drug, lose weight, escape their problems, or enhance sexual life (Lende et al., 2007). Users of methamphetamine reported also that the quality of their work improved when they first began using this substance (Boeri et al., 2009). Cocaine is known to be a mood and energy enhancer. Other effects of cocaine include increased energy, sociability, and euphoria, and it decreases the need for sleep and appetite (Favrod-Coune & Broers, 2010). Less fatigue was also reported four hours after cocaine was used than after placebo was administered (Stillman et al., 1993).

Characteristics of Work Addiction and Their Possible Relations to Stimulant Use

Robinson (1996) compiled a set of ten cues to identify work addiction. These are the following: staying busy, needing control, perfectionism, social conflict, work binges, leisure boredom, memory brownouts, impatience and irritability, self-inadequacy, and self-neglect. These cues do stay in line with recent data from personality studies, such as the results of a recent meta-analysis (Kun et al., 2020a, 2020b) which indicated that perfectionism, negative affectivity, global self-esteem, and performance-based self-esteem had the strongest and most robust associations as personality risk factors of work addiction. Studies applying the Big Five model to explore the relation of personality dimensions to work addiction emphasize that neuroticism predicts some aspects of workaholism (Clark et al., 2010), and it is related positively to the drive to work (Andreassen et al., 2010; Burke et al., 2006). Other aspects of personality, such as narcissism, Type A personality, and difficulty to delegate, were also predictors of work addiction (Clark et al., 2010, 2016).

A large-scale study pointed out that work addiction showed significant positive correlations with the symptoms of ADHD, OCD, anxiety, and depression (Andreassen et al., 2016). These mental symptoms explained 17% of the variance of work addiction, and among them, ADHD and anxiety contributed the most to the variance (Andreassen et al., 2016). The proposed impulsive nature of work addiction (Mudrack, 2004; Ng et al., 2007; Porter, 1996) supports as to why individuals with ADHD are more prone to show the signs of work addiction. This nature of impulsivity has also been supported by other studies; for instance, Carnes et al. (2005) found that 28% of individuals affected by sex addiction showed compulsive working symptoms. Regarding this, Sussman (2012) argued that workaholism might provide a means of sensation seeking/excitement for some people, in addition to self-nurturance.

Additionally, there are stress, sleep, and fatigue issues among individuals in work addiction. Lichtenstein et al. (2019) found that those with high risk of work addiction reported significantly higher mean of perceived stress and poorer quality of life compared to the low-risk group. Workaholics experience more work-related fatigue (Querstret & Cropley,

2012) and these people are more susceptible to subjective sleep insufficiency, excessive daytime tiredness at work, difficulties waking up in the morning, and feeling tired while waking up in the morning (Kubota et al., 2010).

As mentioned above, individuals with work addiction show to have unfulfilled basic psychological needs and low self-worth (Andreassen et al., 2010). In addition, they report to have more frequent social problems, depression, and anxiety symptoms (Serrano-Fernández et al., 2021), whereas increasing strength and confidence and an overall improvement of mood that facilitates performance at work and social bonding were also among motivations found for methamphetamine use (Lasco, 2014). Moreover, individuals with work addiction show more symptoms of ADHD, and are diagnosed with it more frequently, whereas psychostimulants such as amphetamine-based or methylphenidate-based products are commonly used among ADHD-diagnosed individuals (Andreassen et al., 2016; Berman et al., 2009; Ng et al., 2007).

As per nicotine, based on clinical observations, Durand-Moreau et al. (2018) noticed a pattern of individuals with work addiction having problems with high tobacco consumption. In addition, nicotine dependence is related to perceived work strain, and it could be attributed to the assumed arousal provoking effect of nicotine that increases the need for relief or for minimizing the negative feelings from work strain (John et al., 2006). Lastly, three of the mental health issues mentioned before (depression, anxiety, and stress) correlate significantly with smoking duration and nicotine dependence level (El-Sherbiny & Elsary, 2022). Lastly, energy drinks contain high amount of caffeine (Reissig et al., 2009). The use of these drinks is found to be motivated by specific goals, such as good grades (Ianni & Lafreniere, 2014), energy boost, reduced fatigue, taste, and better performance (Khan, 2019).

Aims of the Study

Based on the main characteristics of individuals affected by work addiction (i.e., low self-worth, high perfectionism, strong need to perform better, constant urgency to work more intensively, and sleeping and anxiety problems), we expect that these persons tend to use specific substances to compensate their inner states and to achieve better. In this vein, stimulant use can be conceptualized as a *self-medication process* (Khantzian, 1997). Individuals affected by work addiction, who exhibit characteristics such as low self-esteem and difficulties in social relationships, may turn to stimulant use to manage these problems. Similarly, the stimulant use of workaholics can be an example of the *alleviation of dysphoria hypothesis* (Birchwood et al., 1993). Psychostimulants can generally help these individuals decrease or avoid negative emotional states, as they may have higher negative affectivity. In addition, excessive work may serve as a *compensatory mechanism*, as has been assumed for Internet addiction: negative emotional states can increase motivation to use the Internet to decrease negative feelings and escape from problems (Kardefelt-Winther, 2014). Similarly, work can also serve as a compensatory mechanism, and psychostimulants can help individuals remain active and productive.

Therefore, we expect that a higher level of work addiction symptoms is associated with a higher level of psychostimulant use. To our best knowledge, this association has never been studied for illicit stimulants before (although the use of other substances, such as alcohol or caffeine consumption, has been investigated among workaholic individuals (Salanova et al., 2016)). To examine the question, we have analyzed the data of a

large-scale, representative population study. Our aims were threefold: (1) to differentiate between homogenous worker groups on an empirical basis using a reliable and valid measure, the Bergen Work Addiction Scale (Andreassen et al., 2012) and their items as indicators; (2) to investigate the associations between work addiction and different types of psychostimulant use by comparing latent profiles of workers; and (3) to compare these latent profiles of workers on psychological symptoms. Based on the existing literature (Andreassen et al., 2016; Kun et al., 2020a, 2020b; Serrano-Fernández et al., 2021), we expected that a latent profile characterized by work addiction shows more psychological problems than healthy workers. Therefore, we assumed that obsessive workers are described by more frequent stimulant use and more signs of psychological issues. We formulated the following hypotheses:

H1: Individuals at high risk of work addiction show elevated level of legal stimulant use (such as caffeine, nicotine, and energy drink use) than the low-risk individuals.
H2: Individuals at high risk of work addiction show elevated level of illegal, classic stimulant use (such as ecstasy, amphetamine, cocaine, and crack) than the low-risk individuals.
H3: Individuals at high risk of work addiction show elevated level of illegal, novel stimulant use (NPS) than the low-risk individuals.
H4: Individuals at high risk of work addiction show higher level of psychopathological symptoms than the low-risk individuals.

Methods

Participants and Procedure

The data of our cross-sectional study was based on the first data collection wave (in Spring and Summer of 2019) of the Budapest Longitudinal Study (BLS). BLS is a large, ongoing project that investigates the development, maintenance, and risk factors of several different substance-related and behavioral addictions. In the current study, we focused only on psychostimulant substance use and work addiction; the other data regarding addictive disorders were not analyzed. The target population was the young adult population of Budapest, the capital city of Hungary. In order to have a representative sample in terms of the district of residence and age, we used a random and stratified sampling method. The sample was selected using a one-stage random sampling procedure stratified by age groups (18–24 and 25–34, i.e., born between 1984–1993 and 1994–2000) and districts. The target group of the initial sample was the young adult population aged 18–34 years old with a valid Budapest address (321,974 persons) according to the register of the Deputy State Secretariat for Data Registers of the Ministry of the Interior as of 1 January 2019. To make up for the sample loss, a replacement sample was selected according to the same principles as the main sample, with three times the number of items compared to the main sample, matched by stratification criteria and gender. The sample was invited in writing to participate in the research before the start of the data collection and to develop the commitment of the participants by setting up a research website where participants could find out more about the research and by providing a motivational gift (voucher and a mug with the research logo) to all respondents. All the participants were visited in their households

by professional interviewers who had received prior training. In case of unsuccessful contact, interviewers had to visit the valid addresses three times, at three different times of the day. If the persons refused to respond or dropped out for other reasons (e.g., long-term absence or inability to attend), a replacement sample was used to make up for the sample loss, matched to the dropped-out sample persons by sex and stratum category. To correct for sample dropouts, element count matrix weighting by stratum category was applied, whereby the distribution of the net sample by age group (2 categories) and district (23 categories) was matched to the distribution of the population. Matrix weighting groups the sample based on predefined criteria, with each matrix element representing the number of individuals with a specific property. Attributes can be defined on the manifold and mapped to determine the expected number of individuals in each cell. Matching values in the matrices indicate the weight of individuals with selected attributes. The minimum weight is 0.849 and the maximum weight is 1.430, which means that the weights fall within a range of 0.581. This indicates that the applied weighting has restored the population proportions in the sample without causing any significant interference in the database. More details on weighting are given in the following supplementary file: https://osf.io/jnsp7/?view_only=17730f0ebca04316ba9f2504bdd99dd6

We used face-to-face method of data collection combined with self-report measures and informed consent was obtained before the procedure. The total sample size was $N = 3890$ but only those participants were included in our analysis who worked at least 40 working hours a week ($N = 3076$; female = 50.3%). Participants were aged between 18 and 34 years ($M = 27.82$ years, $SD = 4.34$). Regarding the level of education, 56 had primary school degrees (1.8%), 697 had vocational degrees (22.7%), 1816 had high-school degrees (59.1%), and 502 had higher-education degrees (16.3%). The average hours the participants worked per week was $M = 42.29$ ($SD = 4.30$). The study was conducted following the Helsinki Declaration and the ethical permission was issued by the institutional Research Ethics Committee.

Measures

Stimulant Use

Prevalence of the following psychoactive stimulants were assessed: caffeine (coffee and energy drinks), nicotine (smoking cigarettes and e-cigarettes), ecstasy, amphetamine, cocaine, crack, and new psychoactive stimulants (NPS). To assess the frequency of caffeine use, we applied the following variables: number of cups of coffee consumed during a weekday/weekend day in the last 30 days. We used the same variables for energy drinks too, namely the number of cans of energy drinks consumed during a weekday/weekend day in the last 30 days. For measuring the prevalence of smoking, we used the following variables: current smoking, lifetime prevalence (LTP) of smoking, and LTP of regular smoking. We applied the same three variables for e-smoking as well. Regarding illicit stimulant use, we applied the following variables for all the illicit substances: lifetime prevalence (LTP), last year prevalence (LYP), and last month prevalence (LMP) of the specific substance use. All the variables for smoking and illicit stimulant use habits were dichotomous categorical variables; namely, the

participants could choose between the answers "yes" or "no" (e.g., Did you use ecstasy during the last year?).

Work Addiction

We applied the widely used Bergen Work Addiction Scale for assessing the risk of work addiction (Andreassen et al., 2012; Orosz et al., 2016). This self-report scale was developed based on the components model of addiction (Griffiths, 2005) and it comprises seven items for assessing the seven core components of work addiction: salience, tolerance, mood modification, relapse, withdrawal, conflict, and problems. Participants used a 5-point scale (0="never," 4="always") to answer each question. The instrument was found to be highly reliable in this sample (Cronbach's α=0.87).

Psychopathological Symptoms

The short, 18-item version of the Brief Symptom Inventory (BSI-18; Derogatis & Fitzpatrick, 2004) was utilized for measuring psychopathological symptoms. The BSI-18 is a self-report instrument including 27 items that assesses the symptoms of depression, anxiety, obsessive-compulsivity, interpersonal sensitivity, and hostility. Participants used a 5-point scale (1="not at all," 5="extremely") to answer each question. The internal consistency of the scale was excellent in the present sample (Cronbach's α=0.97).

Statistical Analyses

SPSS Statistics 26.0 software (IBM Corp. Released, 2019) and Mplus 8.0 software (Muthén & Muthen, 2017) were applied in our analyses. Before the analyses, all the data had been weighted for assuring generalizability to the whole population. First, we performed a latent profile analysis (LPA) (Lanza et al., 2003) to explore homogenous subgroups of working individuals based on their possible symptoms of work addiction. The seven items of the BWAS were used as continuous variables. The optimal number of latent profiles have been identified by increasing the numbers of latent profiles. We started with the most parsimonious model of only one latent profile, and then we tested the models with two, three, four, etc., profiles. This process ends when the model fit indices are less satisfactory than that of the previous model. To confirm the best fitting model, we applied the results of the following fit indices: Bayesian information criteria (BIC) and sample size adjusted BIC (SSA-BIC), Akaike information criteria (AIC), and the index of entropy. Regarding BIC, SSA-BIC, and AIC, lower values showed a better fitting model, and as for entropy, a higher score shows a better categorization accuracy. We also used the Lo-Mendel-Rubin adjusted likelihood ratio test for identifying the best model fit. After we performed the LPA, all the participants were categorized into each of the latent profiles in a categorical variable. Latent profiles were compared in their smoking, illicit substance use habits, their gender ratio (by using $\chi 2$ statistics), caffeine and energy drink consumption, psychopathological symptoms, rumination, age, and working hours (by using BCH method) (Asparouhov & Muthen, 2014).

Results

Preliminary Analyses

Descriptive statistics and bivariate Pearson correlations between psychoactive stimulant use, work addiction, and psychopathological symptoms are presented in Table 1. The risk of work addiction had significant, positive, and weak correlations with current smoking, lifetime prevalence of smoking and e-smoking, and lifetime prevalence of regular smoking. However, caffeine consumption did not show any significant correlation with work addiction. Regarding illicit stimulant use, we found significant, positive, and weak correlations between lifetime and last year prevalence of all the substance used except ecstasy, and work addiction. At the same time, last month prevalence of cocaine, crack, and NPS use also showed significant, positive, and weak correlation with work addiction. Psychopathological symptoms had significant, positive, and moderate correlation with work addiction, and these mental problems showed significant and positive but weak associations with all the variables of illicit stimulant use. Regarding licit stimulant use, the number of energy drinks consumed on an average weekend day and all the smoking variables (except lifetime prevalence of e-smoking) had positive and weak correlation with psychopathological symptoms.

Latent Profile Analysis

Latent profile analysis (LPA) was performed to classify participants based on their scores on the seven items of BWAS. We estimated models with 1–4 profiles and their model fits were tested. Table 2 shows the fit indices of these latent profile models. We found that AIC, BIC, and sample size-adjusted-BIC rates decreased in each step. Although this decrease was found in the fourth step as well, the LMRT rate of the 4-profile solution did not show a better fit than the 3-profile solution had. Therefore, we retained the 3-profile solution for further analysis.

The characteristics of the three profiles are presented in Fig. 1. Participants classified in profile 1 (“Non-problematic workers”; $N = 2238$; 70.92%) had very low scores on all the BWAS items; therefore, they do not show any symptoms of work addiction. Participants representing profile 2 (“Excessive workers”; $N = 609$; 19.29%) showed elevated but only moderate level of salience, tolerance, relapse, withdrawal, and conflict. This class comprises those individuals who, although they have higher scores on BWAS items compared to the low severity group (referred to as “Non-problematic workers”), exhibit fewer symptoms than the most severe group, as illustrated in Fig. 1. These people do not use work for mood modification purposes (e.g., escaping from problems), and they do not have health issues caused by overwork, as they scored very low on items measuring “Mood modification” (3) and “Problems” (7) components of work addiction. Finally, participants assigned to profile 3 (“Addictive workers”; $N = 309$; 9.79%) showed the highest scores of all the items of the BWAS. They have similar patterns on tolerance and relapse items as the “Excessive workers” have, so the representatives of these two profiles work intensively and they have issues with the huge amount of work. However, “Addictive workers” use work for mood modification more intensively, and they have the most problems with withdrawal symptoms and they experience the highest amount of intrapersonal and interpersonal conflicts and health problems because of overwork.

Table 1 Descriptive statistics and bivariate Pearson correlations between licit and illicit stimulant use, working hours, work addiction, and psychopathological symptoms

	Range	*M* (*SD*) or *N* (%) of "yes"	Age	*M* of working hours	BWAS	BSI–18
N of cups of coffee on an average weekday	0–10	1.33 (1.30)	**.257****	**.163****	–.017	–.018
N of cups of coffee on an average weekend day	0–10	1.28 (1.28)	**.253****	**.158****	–.033	–.024
N of energy drinks on an average weekday	0–10	0.65 (1.71)	**–.090****	–.006	.029	.013
N of energy drinks on an average weekend day	0–10	0.76 (1.90)	**–.131****	–.014	.014	**.043***
Current smoking	0–1	1,355 (34.8)	**.066****	**.139****	**.048****	**.096****
LTP smoking	0–1	1,850 (47.5)	**.079****	**.118****	**.083****	**.103****
LTP regular smoking	0–1	1,262 (32.4)	**.093****	**.159****	**.040***	**.084****
Current e–smoking	0–1	82 (2.1)	–.025	–.002	**.050****	**.042***
LTP e–smoking	0–1	523 (13.4)	.000	**.088****	**.081****	**.108****
LTP regular e–smoking	0–1	36 (0.9)	–.021	–.017	–.001	.009
LTP ecstasy use	0–1	194 (5.0)	–.012	.010	.022	**.072****
LYP ecstasy use	0–1	65 (1.7)	–.024	.005	.003	**.103****
LMP ecstasy use	0–1	42 (1.1)	–.025	–.007	.012	**.092****
LTP amphetamine use	0–1	97 (2.5)	.031	–.005	**.062****	**.089****
LYP amphetamine use	0–1	30 (0.8)	–.002	.017	**.063****	**.103****
LMP amphetamine use	0–1	15 (0.4)	–.026	.009	.034	**.091****
LTP cocaine use	0–1	58 (1.5)	.022	–.003	**.114****	**.117****
LYP cocaine use	0–1	9 (0.2)	**.042****	0–002	**.090****	**.091****
LMP cocaine use	0–1	5 (0.1)	.006	.016	**.081****	**.072****
LTP NPS use	0–1	70 (1.8)	**.336****	.005	**.040***	**.083****
LYP NPS use	0–1	17 (0.4)	.002	.004	**.073****	**.109****
LMP NPS use	0–1	13 (0.3)	–.007	–.005	**.071****	**.118****
Age	18–34	27.82 (4.34)	–			
Working hours	40–70	42.29 (4.30)	**.336****	–		
BWAS	0–4	4.51 (5.15)	**.095****	.026	–	
BSI–18	1–5	24.25 (10.42)	.021	**.059****	**.509****	–

N, number; *LTP*, lifetime prevalence; *LYP*, last year prevalence; *LMP*, last month prevalence; *NPS*, new psychoactive stimulants; *BWAS*, Bergen Work Addiction Scale; *BSI–18*, 18 item version of the Brief Symptom Inventory; dichotomous variables regarding stimulant use status (0 = no; 1 = yes; 0 = never used; 1 = used); *$p < .05$; **$p < 0.01$. Significant correlations are bold

The Relationship Between Latent Profiles, Psychoactive Stimulant Use, and Psychopathological Symptoms

We compared the three latent profiles on their psychoactive stimulant use habits, and the results of the pairwise comparisons of the profiles are shown in Table 3. There were no significant differences between the three profiles on the numbers of energy drinks consumed on an average weekend day, the LTP of regular e-smoking, LMP of amphetamine and cocaine use, and any of the prevalence variables of ecstasy use. In case of LYP and LMP of crack use, χ^2 statistics could not be performed because zero of the participants used the specific substance in at least two of the profiles. However, we found significant differences between the work addiction profiles on all the other variables assessing stimulant use. Contrary to our assumption, addictive workers drink significantly less amount of coffee than non-problematic workers. Nevertheless, addictive workers drink significantly more energy drinks on a regular weekday than excessive workers do. Regarding nicotine use, a greater proportion of addictive workers are current smokers, have been regular smokers or smoked any cigarette in their lifetime than non-problematic workers or excessive workers. We found the same significant differences in both current e-smoking and lifetime prevalence of e-smoking too. Finally, it was found that LTP and LYP of cocaine and NPS use and LTP of crack use were significantly higher among addictive workers than other worker types. The same results emerged for the LTP and LYP of amphetamine use too.

In accordance with our expectations, significant differences have been found in the level of psychopathological symptoms among the three profiles. Addictive workers showed the most symptoms, followed by excessive workers, while non-problematic workers had the least psychological problems. Regarding the basic socio-demographic and work-related variables, the three profiles did not differ neither in gender ratio nor in the average working hours a week. However, the average age of the excessive workers and addictive workers are significantly higher than non-problematic workers' age.

Discussion

Despite the growing body of research investigating possible risk factors, comorbidities, and harmful consequences of work addiction (Atroszko et al., 2019), there is still a distinctive lack of empirical knowledge about the substance use habits of individuals with work addiction. However, an elevated level of substance use might be assumed considering specific aspects of their personality and lifestyle. A few studies have examined the relationship between work addiction and alcohol use (Salanova et al., 2016), yet, according to our knowledge, this is the first study investigating psychoactive stimulant use, especially illicit drug use of work addicts. The present study distinctly confirmed a greater level of psychostimulant use among individuals with higher risk of work addiction compared to healthy workers.

Based on our results, three latent profiles were established in the study. The three latent profiles reflect the problematic nature of one's relationship with work, in line with former studies indicating possible comorbidities as well as negative mental health consequences of work addiction (Atroszko et al., 2020), clearly differentiate between the different levels of other psychopathological symptoms. Results also support the previous findings that addictive workers, excessive workers, and non-problematic workers do not differ substantially regarding gender and the number of working hours (Clark et al., 2016; Griffiths et al.,

Table 2 Fit indices of the latent profile analysis models using the continuous items of the BWAS

Model	AIC	BIC	SSA–BIC	Entropy	LMRT	*p*
1–profile model	61,424.42	61,509.22	61,464.73			
2–profile model	52,985.38	53,118.63	53,048.73	0.941	8325.87	< .001
3–profile model	50,565.55	50,747.26	50,651.93	0.937	2398.62	.0214
4–profile model	48,499.39	48,729.56	48,608.82	0.975	2050.34	.3053

BWAS, Bergen Work Addiction Scale; *AIC*, Akaike information criteria; *BIC*, Bayesian information criteria; *SSA–BIC*, sample size adjusted BIC; *LMRT*, Lo–Mendel–Rubin adjusted likelihood ratio test

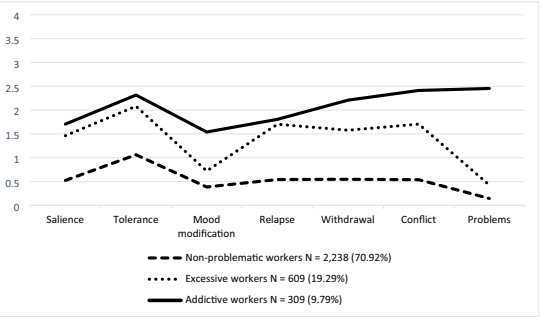

Fig. 1 Latent profiles based on the continuous items of the Bergen Work Addiction Scale

2018). Addictive workers and excessive workers differ, however, in the aspects, of whether individuals use work for mood modification purposes and if overwork results in negative mental and physical health consequences. Aligned with the components model of addictions, substantial differences between excessive workers and individuals with work addiction lay in these components (Griffiths & Karanika-Murray, 2012).

Regarding psychoactive stimulants, differences in consumption are generally reflected by the three risk profiles with higher consumption being more characteristic of the higher risk profile. Caffeine, in its most widely consumed natural form, coffee, and another popular, but synthetic form, energy drinks, however, showed different results when compared across profiles. Contrary to the expectations, higher coffee consumption was not characteristic of the addictive workers group, while addictive workers drink significantly more energy drinks on a regular weekday than excessive workers do. These contradictory results might stem from the fact that energy drinks are a more concentrated and effective way of caffeine intake that is usually directly related to performing a specific task or an aim like working late or reaching a specific level of alertness or physical activity (Durrant, 2002; Ianni & Lafreniere, 2014). Our results suggest that addictive workers prefer a more effective and targeted way of caffeine intake and the relationship between drinking energy drinks and problematic work is highlighted by the elevated consumption on weekdays contrary to weekend days. Another possible interpretation is that coffee consumption might have another function for employees: to have a break during work shift, or to socialize with

Table 3 Comparison of the latent profiles of stimulant drug use and psychological variables

	"Non-problematic workers" $N = 2,238$ (70.92%)	"Excessive workers" $N = 609$ (19.29%)	"Addictive workers" $N = 309$ (9.79%)	$\chi 2$ (p)
N of cups of coffee on an average weekday, *M* (*SE*)	1.46 (0.03)[a]	1.41 (0.06)[a,b]	1.24 (0.08)[b]	**6.30 (.043)**
N of cups of coffee on an average weekend day, *M* (*SE*)	1.41 (0.03)[a]	1.32 (0.06)[a,b]	1.18 (0.09)[b]	**7.60 (.022)**
N of energy drinks on an average weekday, *M* (*SE*)	0.65 (0.04)[a,b]	0.53 (0.08)[a]	0.89 (0.12)[b]	**6.63 (.038)**
N of energy drinks on an average weekend day, *M* (*SE*)	0.76 (0.04)[a]	0.65 (0.08)[a]	0.94 (0.12)[a]	3.85 (.146)
Current smoking, *N* (%)	824 (36.8)	237 (38.8)	140 (45.3)	**8.70 (.013)**
LTP smoking, *N* (%)	1081 (48.3)	342 (56.0)	177 (57.2)	**17.29 (<.001)**
LTP regular smoking, *N* (%)	794 (35.5)	224 (36.7)	137 (44.3)	**9.13 (.010)**
Current e-smoking, *N* (%)	40 (1.8)	15 (2.4)	12 (3.9)	**6.24 (.044)**
LTP e-smoking, *N* (%)	302 (13.5)	101 (16.6)	75 (24.3)	**25.26 (<.001)**
LTP regular e-smoking, *N* (%)	20 (0.90)	5 (0.80)	2 (0.70)	0.19 (.911)
LTP ecstasy use, *N* (%)	110 (4.9)	23 (3.8)	22 (7.1)	4.83 (.089)
LYP ecstasy use, *N* (%)	40 (1.8)	10 (1.7)	8 (2.6)	5.64 (.062)
LMP ecstasy use, *N* (%)	25 (1.1)	8 (1.3)	5 (1.6)	4.17 (.124)
LTP amphetamine use, *N* (%)	38 (1.7)	14 (2.3)	17 (5.4)	**17.84 (<.001)**
LYP amphetamine use, *N* (%)	13 (0.6)	4 (0.7)	8 (2.6)	**14.48 (.001)**
LMP amphetamine use, *N* (%)	7 (0.3)	3 (0.5)	3 (1.0)	3.53 (.172)
LTP cocaine use, *N* (%)	16 (0.7)	7 (1.1)	20 (6.4)	**64.42 (<.001)**
LYP cocaine use, *N* (%)$^{+}$	0 (0.0)	1 (0.2)	5 (1.6)	**6.65 (.010)**
LMP cocaine use, *N* (%)$^{+}$	0 (0.0)	1 (0.2)	3 (1.0)	**3.06 (.114)**
LTP crack use, *N* (%)$^{+}$	4 (0.2)	0 (0.0)	7 (2.2)	**25.72 (<.001)**
LYP crack use, *N* (%)$^{++}$	0 (0.0)	0 (0.0)	4 (1.3)	-
LMP crack use, *N* (%)$^{++}$	0 (0.0)	0 (0.0)	2 (0.6)	-
LTP NPS use, *N* (%)	38 (1.7)	11 (1.8)	12 (3.8)	**7.03 (.030)**
LYP NPS use, *N* (%)	4 (0.2)	2 (0.3)	7 (2.2)	**24.80 (<.001)**

Table 3 (continued)

	"Non-problematic workers" $N = 2,238$ (70.92%)	"Excessive workers" $N = 609$ (19.29%)	"Addictive workers" $N = 309$ (9.79%)	$\chi 2$ (p)
LMP NPS use, *N* (%)	2 (0.1)	1 (0.2)	6 (1.9)	**27.59 (<.001)**
Age, *M* (*SE*)	27.62 (0.09)	28.18 (0.18)[a]	28.37 (0.25)[a]	**12.95 (.002)**
Gender, N of males (%)	1106 (49.4)	320 (52.5)	149 (48.2)	**1.91 (0.38)**
Average working hours a week, *M* (*SE*)	43.03 (0.17)[a]	42.69 (0.31)[a]	43.54 (0.54)[a]	1.99 (0.37)
BSI-18, *M* (*SE*)	21.23 (0.14)	28.55 (0.54)	38.50 (0.94)	**484.02 (<.001)**

LTP, lifetime prevalence; *LYP*, last year prevalence; *LMP*, last month prevalence; *NPS*, new psychoactive stimulants; *BSI-18*, 18 item version of the Brief Symptom Inventory. $\chi 2$ statistics were performed for dichotomous variables regarding stimulant use status (0 = no; 1 = yes; 0 = never used; 1 = used) and sex (1 = male, 2 = female). Regarding continuous variables, BCH method was performed for pairwise comparisons, and we used Wald test for test statistic. Same letter (a, b) shows those means that are not significantly different ($p < .05$). Significant statistics are bold

[+]Only those profiles were compared that have at least one participant used the specific substance

[++]χ^2 statistics could not be performed because zero of the participants used the specific substance in at least two of the profiles

the colleagues (Rodrigues et al., 2021). Therefore, more frequent coffee consumption can be associated with less intensive work.

Besides caffeine, another legal stimulant, nicotine, is used to a greater extent by addictive workers. The reasons behind elevated level of tobacco use might be twofold. Once, smoking, and other means of tobacco use increases general arousal, contributes to better alertness and positively influences mood, thus might contribute to more effective work. On the other hand, smoking is well known for its stress reduction function, especially when consumed regularly. Hence, higher work-related stress and negative affectivity can be accounted for higher tobacco use, as a maladaptive way of coping and active stress management. Results with current and LTP of e-smoking showed a similar pattern demonstrating that traditional smoking and e-smoking share similar characteristics.

Confirming our initial assumptions, both LTP and LYP of the most popular traditional illicit stimulant substances, cocaine and amphetamines, and new psychoactive stimulants, and LTP of crack use were significantly higher among addictive workers than other worker types. Individuals with work addiction often suffer from stress, sleep, and fatigue issues (Querstret & Cropley, 2012), experience daytime tiredness at work, and have difficulties waking up in the morning (Kubota et al., 2010), while illicit stimulants, like cocaine, crack, new psychoactive stimulants, and prescription stimulants can regulate these unpleasant states. ATS increase alertness, facilitate the ability to concentrate, allow working for a longer period without resting or sleeping, and also enhance mood and self-esteem. The above desired effects are in line with the intensified efforts at work and aims of higher productivity of addictive workers.

ATS users reported various reasons for the initiation and continuation of use across different studies (O'Donnell et al., 2019), many of which underline a strong association between substance use, work-related factors, and work addiction. ATS are often used to stay awake, to being able to work more, replace another drug, lose weight, escape their problems, or enhance sexual life (Lende et al., 2007), and for functional reasons, like enhancement of energy and/or performance at work, and to stay focused during stressful times (Addison et al., 2021). Moreover, users also reported that the quality of their work improved when they first began using methamphetamine (Boeri et al., 2009). The relationship between ATS use and objective quality of work, however, requires further investigation.

In a small-scale study investigating NMU of prescription stimulants in a group of surgeons, who, due to high work stress, multiple shifts, and work related strain, reported similar symptoms as work addicts, e.g., exhaustion, fatigue, and sleep problems, high prevalence of CE use was found (Franke et al., 2013). Interestingly, participants reported similar effects and side-effects of the substances used for cognitive enhancement (CE) or mood enhancement (ME), at least regarding prescription drugs, such as methylphenidate, amphetamine tablets (e.g., Adderall), atomoxetine, modafinil, antidementive drugs, and antidepressants.

Regarding factors other than cognitive enhancement, e.g., personality dimensions, users of cognitive enhancers (CEs) may show higher levels of trait impulsivity and novelty seeking, combined with lower levels of social reward dependence and cognitive empathy, a personality profile being shared with illegal stimulant users (Maier et al., 2015) and partly shared with individuals with work addiction.

It is also a question for further studies how ADHD, which according to previous studies is a frequent co-occurring disorder with work addiction (Andreassen et al., 2016), is related to the elevated level of stimulant use (apart from adequately used prescription stimulants) found in addictive workers. More empirical data is needed to understand whether the use of

illicit amphetamines and NMU of prescription psychostimulants can be attributed to a self-medication attempt to improve work performance for people with ADHD. Alternatively, it is important to investigate wether higher amphetamine use is primarily a result of higher impulsivity among workaholicss, or if it is associated with work addiction itself (Sussman, 2012), which might serve as a means of sensation seeking or excitement for individuals experiencing both conditions.

Nevertheless, besides CE, ME, the avoidance of negative emotional states is also a plausible explanation for the elevated level of ATS use of individuals at high risk of work addiction, as indicated by our study. According to previous studies, these individuals demonstrate unfulfilled basic psychological needs and low self-worth (Andreassen et al., 2010). They also tend to experience more frequent social problems, symptoms of depression and anxiety (Serrano-Fernández et al., 2021), as well as symptoms of burnout. In contrast, the use of ATS is believed to enhance confidence and self-efficacy, improve mood ,and facilitate social bonding (Franke et al., 2013; Lasco, 2014). Hence, prolonged work-related stress and poor stress-management are contributing factors to work addiction, while work addiction results in additional stress that negatively affects health and functioning in life and can also lead to higher psychostimulant use.

Our results of higher LTP and LYP of new psychoactive stimulants (NPS) in the addictive workers profile correspond with the higher impulsivity and sensation seeking (Mudrack & Naughton, 2001; Ng et al., 2007; Porter & Kakabadse, 2006) of obsessive workers as majority of studies investigating the motivation factors of NPS use highlighted similar factors, such as seeking pleasure, mind exploration, being connected to others, and curiosity, but also external motives such as price, accessibility, or specific effects/intensively high were the most important reasons to use (Benschop et al., 2020; Simonis et al., 2020; Soussan & Kjellgren, 2016). At the same time, others argue that motivations for the use of classical (CPS) or novel psychoactive substances (NPS) are the same; however, they are different in percentage reported (Kettner et al., 2019).

In relation to ATS and work addiction, it would worth having a closer look at the characteristic effects of specific stimulants as well. While some predominantly increase activity and alertness, others induce a modification of state of consciousness and a spiritual experience, and have an entheogenic effect. These various effects might also define the motives and patterns of use of ATS in work addiction. Undoubtedly, revealing the motives of addictive behaviors and substance use contributes to better understanding of the behaviors and to predict the severity of addiction. Coping motives, used for mood modification or avoidance of negative feelings are usually associated with more problematic behavior (Cooper et al., 2016; Király et al., 2015). Understanding motives is especially relevant here where a risky behavior, substance use, is utilized for fueling another problematic behavior, addictive work, which has far-reaching consequences for prevention and treatment.

Although our study is a large-scale representative survey, several limitations should be considered. First, our sample represents only young adults residing in a Central-European metropolis; therefore, other studies performed on even wider samples would be needed to draw a more general conclusion. Second, consumption of stimulants with the aim of CE or ME include a wide range of substances, from which tobacco, caffeine, amphetamine, cocaine, crack, and certain types of NPS constitute only a subset besides other smart drugs. Investigation of the whole range of legal and illegal cognitive enhancers in individuals with work addiction on a representative sample is yet to be performed. Third, the topic of substance use habits, especially illicit substance use is very sensitive. It is possible that the participants did not answer the questions honestly that might influence our results. Fourth, we applied self-report questionnaires for measuring the risk of work addiction and psychopathological symptoms, and some characteristics of self-rating (e.g., high social desirability, low self-knowledge, memory distortions) might cause bias in the results. Fifth, although the current study was part

of a longitudinal project, we analyzed only the data of the first wave. Therefore, the cross-sectional design of our current analyses does not allow us to interpret the temporal or causal connections between the variables.

Conclusion

To sum up, our results shed light on the vulnerability of addictive workers regarding a potential risky stimulant use. Although the cross-sectional design of the study does not allow drawing any causal conclusions, it is conceivable that individuals with work addiction use more stimulants to utilize their psychoactive effects in their busy and stressful lifestyle. On the one hand, psychoactive stimulants increase their energy and activity, and on the other hand, these substances help them to feel more self-confident and self-satisfied. Though our results show that the prevalence of stimulant use is higher among addictive workers than excessive or non-problematic workers, future studies should focus more on the exploration of *motives* of addictive workers for using psychoactive substances. At the same time, medical stimulants (e.g., Ritalin, Adderall) and other pharmacological enhancers (i.e., "smart drugs" or "nootropics") should be examined in the context of work addiction because these substances are frequently used and misused to increase concentration, motivation, accuracy, productivity, alertness, creativity, and performance (Cassidy et al., 2015; Napoletano et al., 2020). In addition, the inclusion of socio-demographic and work-related factors such as marital status, type of work, occupation, position, salary, and their mediating role in the relationship between work addiction and stimulant use may be an important future research direction.

Our study provides practical implications too. Since work addiction associates with more frequent smoking, energy drink consumption, and illicit stimulant use, prevention of work addiction would be very important in organizational settings. Workplace mental health programs should focus on the screening of work addiction and help the employees to find more adaptive stress-management techniques and to avoid overload.

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Data Availability The data that support the findings of this study are available from the corresponding author, [B.K.], upon reasonable request.

Declarations

Ethics Approval and Consent to Participate All procedures performed in the study involving human participants were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. This article does not contain any studies with animals performed by any of the authors.

Informed Consent Informed consent was obtained from all individual participants included in the study.

Conflict of Interest The authors declare no competing interests.

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