

# Comprehensive examination of the patterns, correlates, and motivations for benzodiazepine use

Ph.D. Thesis

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# I. Introduction

Benzodiazepines (BZDs) are among most frequently prescribed medications due to their wide therapeutic range, however, they also have high addictive potential. Therefore, using BZDs non-medically as well as BZD dependence have become an increasing public health concern in recent years.

Various studies have been published regarding this phenomenon, however, there is little data available in the scientific literature about the worldwide prevalence of BZD use due to the difficulties in monitoring the consumption (including NMU) and the different therapeutic practices between countries, therefore, in addition to patient appearances, the prevalence of BZD use (including NMU) can be estimated by population surveys in the general population. Furthermore, several correlates and risk factors (e.g. impulsivity, further substance use, psychiatric symptoms) are documented across distinct populations, however, some of the potential correlates such as behavioral addictions or the role of religiosity in BZD use are still unexplored due to the multifactorial nature of this behavior. For the same reason, the comprehensive summary of the motivations for BZD use as well as the existence of a standardized tool for assessing the motivations behind BZD use is missing.

Nevertheless, understanding these phenomena more comprehensively (including their correlates, risk and protective factors, motivations) could be crucial in establishing efficient prevention and interventions programs.

Therefore, the main aims of the studies introduced in the present thesis were:

1. To reveal the prevalence of sedative/hypnotic use and NMU in the Hungarian adult population (Study 1).
2. To examine the relationship between NMU of sedatives/hypnotics and the symptoms of broad spectrum of addictive behaviors among young adults (Study 2).
3. To explore the link between religiosity and NMU of sedatives/hypnotics in the Hungarian adult population and in a young adult sample of Budapest (Study 3).
4. To comprehensively explore the motivations for BZD use as a first step to design a standardized tool for assessing the motivations behind BZD use (Study 4).
5. To develop an assessment by identifying the factor structure of the previously collected motives (in Study 4) as well as to support the construct validity of our questionnaire in a community and in a clinical sample (Study 5).

## II. Background

Benzodiazepines (BZDs) are primarily recognized for their sedative–hypnotic, anxiolytic, anticonvulsant, and muscle-relaxant effects (Edinoff et al., 2021; Sanabria et al., 2021), therefore, they have become one of the most frequently prescribed medications due to their wide therapeutic range. However, the newest guidelines including the guideline of the World Health Organization (WHO) primarily recommended BZDs for emergency management of acute and severe anxiety symptoms, but only for a short time (3–7 days) (World Health Organization, 2023). The reason for these new recommendations is that research from recent years suggest that BZDs have high addictive potential, therefore, they carry a risk of non-medical use (NMU) and/or dependence.

The European Monitoring Centre for Drugs and Drug Addiction (EMCDDA) (now known as the European Union Drugs Agency, EUDA) refers to NMU as the use of a drug for self-medication, recreational or enhancement purposes, with or without a medical prescription but outside of the accepted medical guidelines (European Monitoring Centre for Drugs and Drug Addiction, 2021). Nevertheless, Karjalainen (2018) has suggested to define NMU as the use of BZDs without medical prescription, in larger doses, for longer periods of time than recommended and/or for different purposes than prescribed (e.g. for recreational purposes). As for the BZD dependence, among substance-related disorders, sedative, hypnotic, or anxiolytic use disorder or dependence is included both in the 5<sup>th</sup> edition of Diagnostic and Statistical Manual of Mental Disorders (DSM-5) (American Psychiatric Association, 2013) as well as in the 11<sup>th</sup> revision of the WHO's International Classification of Diseases and Related Health Problems (ICD-11) (World Health Organization, 2019).

Monitoring the epidemiology of BZD use and NMU is complicated by the different therapeutic practices between countries such as the number of new BZDs on the illicit drug markets (European Monitoring Centre for Drugs and Drug Addiction, 2021), therefore, in addition to patient appearances, the prevalence of BZD use (including NMU) can be estimated by general population surveys. However, in the general adult population of Hungary, the occurrence of non-medical BZD use is unknown. Nevertheless, using BZDs non-medically as well as BZD dependence have become an increasing public health concern in recent years, therefore, understanding these phenomena more comprehensively (including their prevalence, correlates, risk and protective factors, motivations) across different populations of Hungary could be crucial in efficient prevention and interventions programs.

Several personality traits (e.g. impulsivity, adventure and sensation seeking) associated with BZD use are also well-documented risk factors for addictive behaviors in general (Chinneck et al., 2018; Hamdan et al., 2018; Jamt et al., 2020; Stewart et al., 2021). However, these traits are related to psychiatric problems and/or disorders (including further addictions), therefore, it is difficult to separate the personality factors, and psychiatric disorders during the examination of correlates and risk factors for BZD use. Nevertheless, the investigation of the association between non-medical BZD use and behavioral addictions has received scarce attention, therefore, several risk factors and correlates are still unexplored due to the multifactorial nature of this phenomenon.

In addition, little is known about the protective factors. Life satisfaction, positive emotions, future orientation, secure attachment and gratitude as well as the religiosity were documented as significant protective factors preventing addictive behaviors (Dermatis & Galanter, 2016; Livne et al., 2021; Shoshani et al., 2024; Yeung et al., 2009). The aforementioned psychological factors may play a mediating role in the relationship between religiosity/spirituality and addictive behaviors (including BZD use and NMU or dependence). However, protective factors of non-medical BZD use and dependence should be investigated more comprehensively across different samples and populations.

Beside the correlates, risk factors and protective factors, previous research emphasized that motivations are also crucial in understanding addictive behaviors (Cooper, 1994; Cox & Klinger, 1990). For instance, drinking motives were reported to be associated with the patterns and the severity of alcohol use (Carey & Correia, 1997; V. V. Grant et al., 2007; Mezquita et al., 2011; Sun et al., 2015). Results have also appeared in recent years focusing on the measurement of motivations in further addictive behaviors such as cannabis use, nicotine use, gambling, or online gaming (Demetrovics et al., 2011; Piper et al., 2004; Simons et al., 1998; Stewart & Zack, 2008) and several studies have been published investigating the motivations for BZD use. Based on these studies, the most common motivations for BZD use are self-treatment (reducing negative emotional states or withdrawal symptoms), enhancement, and/or sleep management (Fatséas et al., 2009; Stein et al., 2017). Nevertheless, examining comprehensively and systematically the motivations for BZD use (including NMU) and the development and validation of scales and questionnaires can be crucial in the recognition of risk factors and the prevention of BZD use disorder and its consequences. Furthermore, the existence of a standardized tool for comprehensively assessing the motivations behind BZD use could also help professionals to choose the appropriate therapy and to increase the efficiency of therapeutic processes. However, to the best of our knowledge, no standardized scale or

questionnaire is available in the scientific literature for the comprehensive investigation of the motivations for BZD use.

### III. Aims and hypotheses

In the present thesis, studies across six different samples (including community samples of different ages and a clinical sample) were conducted where the patterns of sedative/hypnotic use (including NMU) and the co-occurrence of different psychological factors, further addictive behaviors and motivational factors were all examined comprehensively. For this purpose, the present thesis had five aims:

**Aim 1:** The epidemiology and follow-up of the sedative/hypnotic use and NMU are crucial due to the number of potential individuals and public health consequences of NMU. Therefore, an explanatory study was conducted in order to reveal the prevalence of sedative/hypnotic use and NMU in Hungary (Study 1).

**Aim 2:** Based on the scientific literature, young adults are a risk population in terms of NMU of sedatives/hypnotics, however, this population is also at risk for further types of addictions including a broad factor of behavioral addictions due to distinct psychological characteristics of this age group (higher level of impulsivity or sensation seeking). Thus, our aim was to examine the relationship between NMU of sedative/hypnotic and the symptoms of distinct addictive behaviors in this high-risk population (Study 2). Based on the literature about the co-occurrence of addictive behaviors among young adults, we assumed that participants who reported NMU of sedatives and/or hypnotics will show higher level of the examined behavioral addiction symptoms.

**Aim 3:** There is evidence for the protective role of religiosity and spirituality preventing the development and aiding the recovery from several addictive behaviors. However, protective factors and the role of religiosity in non-medical sedative/hypnotic use is unknown. Therefore, our aim was to explore the link between religiosity and NMU of sedatives/hypnotics in the Hungarian adult population and in a young adult sample of Budapest (Study 3). Based on the previously documented protective role of religiosity, we hypothesized that the prevalence of NMU of sedatives/hypnotics will be lower among religious participants and this effect will be consistent in both adult and young adult samples.

**Aim 4:** Following the studies and models of Cooper (1994) and Cox and Klinger (1990), several studies have been published emphasizing the importance of understanding the motivations in addictive behaviors. Regarding the BZD use, literature suggests that motives are highly related to the indication of the BZDs (e.g. coping with negative states) and enhancement.

However, the comprehensive examination of these motivations across different populations has been missing, therefore, our aim was to explore the motivations as a first step to design a standardized tool for assessing the motivations for BZD use (Study 4).

**Aim 5:** The scientific literature suggests that motives behind substance use are highly related to psychiatric disorders, therefore, investigating the motivations for BZD use can be crucial in prevention and intervention processes. However, to the best of our knowledge, no standardized measurement can be found in the literature which can comprehensively assess the motivations for BZD use. Therefore, our aim was to develop an assessment by identifying the factor structure of the previously collected motives in a large community sample as well as to support the construct validity of our questionnaire in a community and in a clinical sample (Study 5). Based on the previous models and results related to the motivations in addictive behaviors, we assumed that four factors will appear as well as that the role of coping will be more expressed in the community and clinical samples as well.

## IV. Materials and methods

### 1. Samples

#### *1.1.National Survey on Addiction Problems in Hungary (NSAPH) 2019*

The NSAPH has been conducted every four years on a representative sample of the Hungarian adult population between the ages of 18 and 64 years. Data from data collection in the spring of 2019 were used (N=1385). In the final sample, 46.8% of the participants were male (n=648) and the mean age was 41.77 years (SD=13.08). Analyses on the sample of the NSAPH 2019 were conducted in Study 1 and Study 3.

#### *1.2.Budapest Longitudinal Study (BLS)*

The BLS is a representative longitudinal study assessing the prevalence and characteristics of substance use and behavioral addictions among young adults of Budapest aged between 18 and 34 years. Data from the first data collection (conducted in 2019) were used in our studies (N=3890). In the sample, 48.4% of the participants were male (n=1883). The mean age was 27.06 years (SD=4.76). Data from the BLS sample were used in Study 2 and Study 3.

#### *1.3.Psychological and Genetic Factors of Addictive Behaviors (PGA) Study*

The PGA Study was conducted by participating young adults from several Hungarian education facilities across four waves between 2011 and 2015. Three basic topics were examined: sociodemographic information, psychological factors, and addictive behaviors. The

size of the sample was 3003 with 42.6% male participants (n=1280). The mean was 21 years (SD=2.8). Data from the PGA sample were used in Study 2.

#### *1.4. The summary of motivations for benzodiazepine use*

During the collection of motivations for BZD use (Study 4) participants were included by snowball sampling targeting individuals who use BZDs in their everyday life. In the sample including 49 participants, 70.2% of them were female (n=40). The mean age was 43.56 years (SD=15.08).

#### *1.5. Motivations for benzodiazepine use in community sample*

An online survey was administered targeting adult people (18 years of age or older) who use BZDs. Overall, 1424 individuals were included in the final sample who reported BZD use during the past year with 81.21% female (n=1157); and 18.19% male participants (n=259). The mean age was 49.31 years (SD=14.75). Data from this sample were used in Study 5.

#### *1.6. Motivations for benzodiazepine use in clinical sample*

Data collection was conducted at the Department of Psychiatry, University of Szeged, Hungary targeting hospitalized adult patients who used BZDs before their admission. In the final clinical sample, 113 participants were included with 61.06% (n=69) female and 38.94% (n=44) male participants who reported past year medical or non-medical BZD use. The mean age was 46.13 years (SD=14.54). Data from the clinical sample were also used in Study 5.

## **2. Materials and methods**

**Study 1:** The prevalence of sedative/hypnotic use in a representative Hungarian adult population

The revised questions of the Epidemiological Model Questionnaire (EMQ) (EMCDDA, 2002; Karjalainen, 2018) were used in the study. The NMU of sedatives/hypnotics was defined as the use of these substances without medical prescription, in larger doses, for longer periods of time than recommended and/or for different purposes than prescribed (EMCDDA, 2002; Karjalainen, 2018). During the analyses, Chi-Square tests were conducted to explore the gender differences in the past month and past year sedative/hypnotic use and NMU.

**Study 2:** The severity of symptoms of behavioral addictions among young adults using non-prescribed sedatives/hypnotics

In the BLS sample, the NMU was defined and investigated the same way as in the NSAPH sample (see in Study 1). In the PGA study, the non-medical sedative/hypnotic use was assessed by the following questions: "Have you ever used sedatives, hypnotics without medical



prescription or with alcohol? If yes, when was the last time you used?". Behavioral addictions that are considered as common behaviors among young adults were assessed by validated scales and questionnaires. During the analyses, three groups were formed based on the NMU of sedatives/hypnotics: the non-user group (NU); the lifetime users' group (LU) and the current user group (CU). Non-parametric Kruskal-Wallis tests (KW) were used to explore the severity of behavioral addiction symptoms in the three groups. In case of significant KW, Mann-Whitney (MW) tests were conducted for post-hoc analyses.

**Study 3:** The potential role of religious status in the patterns of sedative/hypnotic use

Study 3 was conducted using the NSAPH and BLS samples, therefore, for the definition and assessment of sedative/hypnotic use (including NMU) see below the Study 1 and 2. Religiosity was defined in both samples as the individual's subjective perception of their own religious status. Chi-Square tests were conducted to investigate the differences in the past-year non-medical sedative/hypnotic use across the three religious status groups (religious, agnostic and non-religious).

**Study 4:** The summary of motivations for benzodiazepine use

During the collection of motivations for BZD use, participants were asked about their BZD use (including NMU) using the revised questions of the EMQ (EMCDDA, 2002; Karjalainen, 2018) and to complete the following sentence: "I use benzodiazepines because...". Motivations for BZD use were also collected from the literature. Furthermore, the items of the Hungarian version of Drinking Motives Questionnaire (DMQ-R) (Cooper, 1994; Németh et al., 2012) were included in the collection of the motivations by changing the term „alcohol” to „benzodiazepines”.

**Study 5:** Motivations for benzodiazepine use in a community and in a clinical sample

Participants completed the same questionnaire with questions related to BZD use and NMU in both samples (based on the EMQ (EMCDDA, 2002; Karjalainen, 2018)). BZD motives were measured by the items collected in Study 4. Participants were also asked if they acquired BZDs from an alternate source other than their doctor. The self-perceived 11 symptoms of BZD use disorder indicated in the DSM-5 (American Psychiatric Association, 2013) were assessed. Standardized scales and questionnaires measuring distinct psychological constructs and substance use were also used. During the statistical analyses, the factor structure of the questionnaire measuring BZD motives was developed with exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) in the community sample. Therefore, this sample was randomly divided into two more samples: EFA was performed in Sample 1 (N=712) and CFA

in Sample 2 (N=712). Interfactor correlations were also calculated based on EFA and CFA in the community sample, while correlations between subscales of BZD motives were also investigated in the clinical sample. Cronbach's  $\alpha$  was calculated in both subsamples of the community sample and in the clinical sample. The developed questionnaire was named as the Motives for Benzodiazepine Use Questionnaire (MBUQ-48). The construct validity of the developed questionnaire was examined by bivariate correlations, biserial and polyserial correlations. To test the incremental validity of the developed questionnaire, regression analyses were used to investigate the predictive effects of motives on different outcome variables of BZD use.

## V. Results

### **Study 1: The prevalence of sedative/hypnotic use and non-medical use in a representative Hungarian adult population**

In the Hungarian adult population, 8.3% ( $\pm 1.5\%$ ) have consumed sedative and/or hypnotic during their lifetime with or without medical prescription. The past year prevalence of sedative/hypnotic use was 7.5% ( $\pm 1.4\%$ ), while the past month prevalence was 6.7% ( $\pm 1.4\%$ ). Among female participants, both past year and past month prevalence of sedative/hypnotic use were approximately twice compared to male group. However, no significant difference was found in the frequency of use among participants who reported sedative/hypnotic use in the past year and past month ( $\chi^2(3)=3.13$ ;  $p=0.372$ ;  $V=0.19$ ;  $\chi^2(3)=4.60$ ;  $p=0.203$ ;  $V=0.23$ ). The lifetime prevalence of non-medical sedative/hypnotic use was 3.2% ( $\pm 1\%$ ) and the past year prevalence of NMU was 2.9% ( $\pm 0.9\%$ ), while the past month prevalence was 2.4% ( $\pm 0.8\%$ ). There was no significant difference in terms of gender in the past year and past month prevalence of NMU of sedatives/hypnotics ( $\chi^2(1)=0.04$ ;  $p=0.839$ ;  $\phi=0.01$ ;  $\chi^2(1)=0.49$ ;  $p=0.486$ ;  $\phi=0.02$ ) nor was there any in the frequency of use in the past year and past month ( $\chi^2(4)=1.00$ ;  $p=0.911$ ;  $V=0.03$ ;  $\chi^2(4)=4.85$ ;  $p=0.303$ ;  $V=0.06$ ). Within the sedative/hypnotic users, also no significant differences were found regarding the frequency of non-medical sedative and hypnotic use ( $\chi^2(3)=0.95$ ;  $p=0.813$ ;  $V=0.18$ ;  $\chi^2(3)=4.57$ ;  $p=0.206$ ;  $V=0.38$ ).

## **Study 2: The severity of symptoms of behavioral addictions among young adults using non-prescribed sedatives/hypnotics**

Compared to the NU group, the severity of symptoms of problematic internet use was significantly higher among both LUs (MW:  $p=0.013$ ) and CUs (MW:  $p<0.001$ ) in the BLS sample. The severity of problematic social media symptoms was significantly higher in the CU group, compared to the NU group in the BLS (MW:  $p<0.001$ ) as well as in the PGA (MW:  $p=0.001$ ) sample. Furthermore, in the PGA sample, the severity of problematic social media use symptoms was also significantly higher in the LU group compared to the NU participants (MW:  $p=0.013$ ). In the BLS sample, the severity of problem gambling symptoms was significantly higher among CU participants, compared to the NUs (MW:  $p<0.001$ ) and among LUs in the PGA sample (MW:  $p=0.006$ ). The severity of symptoms of exercise addictions was significantly higher among the CU participants of the BLS sample, compared to the NUs (MW:  $p<0.001$ ). Regarding the eating disorders, compared to the NU groups of both the BLS and PGA samples, the severity of symptoms was significantly higher among LU participants (MW in BLS:  $p<0.001$ ; PGA:  $p<0.001$ ) as well as among CUs (MW in BLS:  $p<0.001$ ; PGA:  $p=0.001$ ). Furthermore, the severity of the symptoms of compulsive buying behavior was also significantly higher among CUs, compared to the NUs (MW:  $p<0.001$ ). Regarding the problematic mobile phone use, the NUs showed significantly more severe symptoms, compared to the CU participants (MW:  $p=0.001$ ). The severity of work addiction symptoms was significantly higher among CU participants compared to both NUs (MW:  $p<0.001$ ) and LUs (MW:  $p=0.001$ ).

## **Study 3: The potential role of religious status in the patterns of sedative/hypnotic use**

The past-year prevalence of NMU of sedatives/hypnotics was significantly different among groups of the NSAPH sample with significantly lower level of religious participants than expected, based on the ASR indicator. However, the prevalence of past year non-medical sedative/hypnotic use did not differ significantly between groups in the BLS sample.

## **Study 4: The summary of motivations for benzodiazepine use**

Based on our collection by snowball sampling 26 different motivations for BZD use were explored, after the literature search, 124 further motivations were identified (including the items of the Hungarian version of DMQ-R (Németh et al., 2012; Cooper, 1994)). Thus, 150 motivations for BZD use were collected. After excluding the duplicate items and merging the similar ones, 82 motivations were left.

## **Study 5: Motivations for benzodiazepine use in a community and in a clinical sample**

The final EFA model contained 48 items. From these items, 18 loaded primarily and strongly or close-to-strongly on Factor 1 which was named as ‘personal and interpersonal benefits’. A total of 5 items loaded primarily and strongly on Factor 2, named as ‘substance use regulation’ factor. Furthermore, 18 items loaded primarily, strongly and close-to-strongly on Factor 3 which was labelled ‘coping’. Finally, seven items loaded strongly on Factor 4 which was named ‘sleep facilitation’. Based on the CFA with Sample 2, the four-factor model showed an adequate fit to the data ( $\chi^2$  [1074]=2784.56,  $p<0.001$ ; CFI=0.98; TLI=0.97; RMSEA=0.05; SRMR=0.08).

Strong levels of inter-factor correlations and internal consistency were observed. The construct validity of the MBUQ-48 was supported by positive correlations between the motivational factors and psychological constructs, different outcomes of BZD use and other substance use. Participants in the clinical sample had significantly higher rates of all four motives. Based on the results, the MBUQ-48 is a reliable and valid scale for assessing motives for BZD use.

## **VI. Discussion**

Using prescription medications non-medically has several potential harmful consequences (e.g. substance use disorder, overdose, mental and/or physical health issues or suicidal behavior) (European Monitoring Centre for Drugs and Drug Addiction., 2020; Votaw, Geyer, et al., 2019b). Therefore, various studies have been published in recent years regarding this phenomenon, however, its exact prevalence across countries, such as its risk factors and correlates are still unexplored due to the multifactorial nature of this behavior. In the present thesis, five studies were conducted where the prevalence, some correlates and protective factors of non-medical sedative/hypnotic use as well as the motivations for BZD use were comprehensively examined among community samples and in a clinical sample.

In Study 1, the lifetime, past year and past month prevalence, the frequency of sedative/hypnotic use and NMU as well as the gender differences in these phenomena were explored. In Study 2, the investigation of the non-medical sedative/hypnotic use in Hungary was expanded by exploring the relationship between NMU of sedatives/hypnotics and behavioral addictions in two large young adult samples. It was reported that the symptoms of the most of the examined behavioral addictions were significantly more severe among lifetime

and/or current non-medical sedative/hypnotic users, compared to the non-user young adults. In Study 3, the relationship between religious status and NMU of sedatives/hypnotics was examined and the protective role of religiosity was corroborated in the representative Hungarian adult sample, but not in the representative young adult sample of Budapest. In Study 4, motivations for BZD use were explored in a small sample of BZD users as well as from the scientific literature, thus, 82 motivations were noted. In Study 5, we aimed to identify the factors in the motivations for BZD use and to develop an assessment (Motives for Benzodiazepine Use Questionnaire (MBUQ-48)) for exploring the motivations for BZD use in community sample as well as to support the validity of the developed questionnaire in the same community and in a clinical sample.

Our results regarding the prevalence of sedative/hypnotic use and NMU (Study 1) can help us to detect this public health concern in Hungary as well as to examine the occurrence of this behavior in an international context. For instance, comparing the data from five European countries from 2017 with the results of the NSAPH 2019 shows that the lifetime prevalence of sedative/hypnotic use in Hungary is lower compared to the other countries, however, regarding the NMU of sedatives and/or hypnotics, the lifetime prevalence was the second highest in Hungary (Hockenhull et al., 2021). Nevertheless, it should be noted that little data is available in the international scientific literature on the prevalence of sedative and/or hypnotic use and NMU across individual countries. Our results regarding the prevalence and frequency of this behavior in Hungary also draws attention to the importance of monitoring this phenomenon (including the correlates of NMU, risk factors and protective factors as well) both in Hungary and internationally.

For instance, regarding the correlates of NMU of sedatives and/or hypnotics, to the best of our knowledge, our Study 2 was the first study which comprehensively examined the relationship between non-medical sedative/hypnotic use and several types of behavioral addictions. Previous studies have documented an association between several behavioral addictions and the symptoms of depression and/or anxiety (Carli et al., 2012; Hussain et al., 2020; Ioannidis et al., 2018; Liu & Ma, 2019; Orosz et al., 2016; Serrano-Fernández et al., 2021; Starcevic & Khazaal, 2017; Weinstein et al., 2015), however, behavioral addictions may also contribute to symptoms of depression, anxiety or sleep disturbances leading to NMU of prescription drugs, which in turn could aggravate the severity of behavioral addictions and vice versa (Starcevic & Khazaal, 2017). Further investigation of potential mediating effects behind NMU and behavioral addictions could help us to better understand the nature of the association between these phenomena.

The protective role of religiosity was examined in the nationally representative adult sample of Hungary and in the representative young adult sample of Budapest (Study 3). Our results revealed that being religious is the only significant indicator regarding the relationship between religiosity and non-medical sedative/hypnotic use with lower past-year prevalence of NMU among religious participants, however, this protective role was only shown in the nationally representative adult sample. A possible explanation for this protective role is that individuals with intrinsic religiosity who found to be committed to their religion can be described by higher level of psychological well-being (Bravo et al., 2016). In addition, previous research have also documented that religious identity commitment correlates with general life satisfaction and coherence in life, since religiosity in itself may contribute to a coherent worldview (Galen & Kloet, 2011; Villani et al., 2019). These results (including ours) about the protective role of religiosity on non-medical sedative/hypnotic use among adults corroborate that religiosity has implications regarding healthcare compliance and adherence. Thus, professionals working in the field of psychiatry, especially of addictions should pay more attention to patients' religious beliefs. Our findings can contribute to the development of more complex and integrative prevention programs.

These personalized, complex prevention and intervention programs for non-medical BZD use or BZD use disorder can also be improved by comprehensive exploration of the motives for BZD use. In our Study 5, a new assessment for different motives for BZD use was developed and the construct and incremental validity of the Motives for Benzodiazepine Use Questionnaire (MBUQ-48) was also evaluated using community and clinical samples: 48 different motivations were identified comprising of four factors: 'personal and interpersonal benefits', 'substance use regulation', 'coping', and 'sleep facilitation' with significantly higher occurrence of all these motives in the clinical sample. Overall, motives explored in our study were consistent with the results of previous studies on this topic which have documented that anxiety and stress and/or sleep management, emotion regulation, recreational motives, and getting high were the most common motives for prescription medication use (McCabe & Cranford, 2012; Messina et al., 2016; Rigg & Ibañez, 2010; Schepis et al., 2021b). However, to the best of our knowledge, our study was the first that focused specifically on BZDs and developed a psychometric assessment for BZD motives by comprehensively identifying the motives and the factors underlying BDZ use. The presence of this psychometric scale for BZD motives can help clinicians to indentify individuals with risk of NMU and BZD use disorder symptoms as well as to develop individual treatment plans by having information about motivations for BZD use.

## VII. Summary of the results and conclusions

According to the results, the novel findings of the present thesis are the following:

1. Our Study 1 revealed that the lifetime prevalence of sedative/hypnotic was 8.3% ( $\pm 1.5\%$ ), the past year prevalence was 7.5% ( $\pm 1.4\%$ ), while the past month prevalence was 6.7% ( $\pm 1.4\%$ ) in the Hungarian adult population aged between 18 and 64 years. Among female participants, both past year and past month prevalence of sedative/hypnotic use were approximately twice compared to male group. The lifetime prevalence of NMU was 3.2% ( $\pm 1\%$ ), the past year prevalence was 2.9% ( $\pm 0.9\%$ ), while the past month prevalence was 2.4% ( $\pm 0.8\%$ ). There was no significant difference in terms of gender in the past year and past month prevalence of NMU of sedatives/hypnotics. These results can help us to objectify this public health concern in Hungary as well as to examine the occurrence of this behavior in an international context.

2. In Study 2, the relationship between non-medical sedative/hypnotic use and several behavioral addictions (problematic internet use, problematic social media use, problem gambling, exercise addiction, eating disorders, compulsive buying behavior and work addiction) was comprehensively explored among young adults with higher severity of these behavioral addiction symptoms among lifetime and/or current non-medical sedative/hypnotic users. Thus, complex, adequate preventive interventions are crucial in this high-risk population.

3. The results of Study 3 revealed significantly lower past-year prevalence of NMU of sedatives/hypnotics among religious participants, however, this protective role was only shown in the adult sample, not among young adults. These results draw attention to the need of paying more attention to patients' religious beliefs in the clinical practice.

4. In Study 4, motives for BZD use were comprehensively explored among BZD users and summarized from the literature as a first step to design a standardized tool for assessing the BZD use motives. In Study 5, the Motives for Benzodiazepine Use Questionnaire (MBUQ-48) was developed by identifying the factor structure of the previously collected motives. The construct and incremental validity of the questionnaire was also evaluated in community and clinical samples. Based on our results, 48 different motivations were identified comprising four factors: 'personal and interpersonal benefits', 'substance use regulation', 'coping', and 'sleep facilitation' with significantly higher occurrence of all the four motives in the clinical sample. In conclusion, the MBUQ-48 is a reliable and valid scale for assessing motives for BZD use.

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