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ORIGINAL ARTICLE

A New Scale for Assessing Benzodiazepine Use Motives Among Community and Clinical Samples: The Development and Validation of the MBUQ- 48

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Abstract
The risk for non-medical use and dependence on benzodiazepines (BZDs) is high. However, there is no available validated psychometric instrument that assesses the motives for BZD use. Therefore, the aim of the present study was to develop a scale identifying the motives for BZD use, examine the factor structure, and corroborate the construct validity of the scale. Items for the scale were generated from previous data collection and from the empirical literature. Consequently, 82 motives were tested among a large community ($N = 1424$) and a clinical sample ($N = 113$). Medical and non-medical BZD use, other substance use, and several psychological constructs were assessed in both samples. Exploratory factor analysis (EFA) and confirmatory factor analysis (CFA), as well as bivariate correlations and regression analyses, were performed. The EFA model included 48 items with four factors: "personal and interpersonal benefits", "substance use regulation", "coping", and "sleep facilitation". The four-factor CFA model demonstrated adequate levels of model fit. Members of the clinical sample had significantly higher rates of all four motives. The construct validity of the Motives for Benzodiazepine Use Questionnaire (MBUQ-48) was supported by positive correlations between the motivational factors and psychological constructs, different outcomes of BZD use, and other substance use. Coping motives had positive association with various outcomes of BZD use. Based on the results, the MBUQ-48 is a reliable and valid scale for assessing motives for BZD use. Exploring the motivations underlying BZD use can help clinicians in the recognition of the risk of BZD use disorder and in increasing the efficacy of therapeutic processes.

Keywords Benzodiazepine use · Motivations · Motives for Benzodiazepine Use Questionnaire (MBUQ- 48) · Psychometric evaluation

Benzodiazepines (BZDs) are known for their depressant effect (i.e., sedative–hypnotic, anxiolytic, anticonvulsant, and muscle relaxant) on the central nervous system (Edinoff

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et al., 2021; Sanabria et al., 2021). Therefore, evidence-based guidelines have suggested that BZDs are highly effective in the treatment of wide range of conditions such as generalized anxiety disorder (GAD), panic disorder, insomnia, epileptic seizures, catatonia, and alcohol withdrawal (Edinoff et al., 2021; European Monitoring Centre for Drugs & Drug Addiction, 2021; Nielsen et al., 2017; Sanabria et al., 2021). Furthermore, the evidence-based guidance of The Royal Australian College of General Practitioners also suggests BZD use in mania/hypomania, in case of agitation in any inpatient setting, as well as in palliative care or for those with musculoskeletal disorders (Royal Australian College of General Practitioners, 2015). Consequently, they are used in many fields of healthcare, including primary care, emergency departments, somatic departments, and psychiatric settings. However, despite their effectiveness, they also have several adverse effects and potential for non-medical use (NMU) as well as the development of psychological and physical dependence (Bounds et al., 2024; Edinoff et al., 2021; Royal Australian College of General Practitioners, 2015).

Patients taking BZDs for longer than 3 to 4 weeks are at a high risk of developing withdrawal symptoms after the cessation. Therefore, several new guidelines have appeared in recent years that have updated some previous recommendations. For instance, both the World Health Organization's (WHO) guidelines for mental, neurological, and substance use disorders and the National Institute for Health and Care Excellence's (NIDA) clinical guidelines do not recommend BZDs for the treatment of adults with GAD and/or panic disorder (National Institute for Health and Care Excellence, 2011; World Health Organization, 2023). In addition, based on the WHO's guidelines, BZDs may be considered for emergency management of acute and severe anxiety symptoms, but only for short-term use (3–7 days). Other guidelines also recommend the use of BZDs for no longer than a few weeks (Brett & Murnion, 2015; Edinoff et al., 2021; Sanabria et al., 2021).

Among substance-related disorders, sedative, hypnotic and anxiolytic use disorder, as well as dependence, are included in both the DSM-5 (American Psychiatric Association, 2013) and ICD-11 (World Health Organization, 2019). The lifetime prevalence of sedative, hypnotic or anxiolytic use disorders (including BZDs) has been estimated to range between 1.0 and 1.1% in the USA (Huang et al., 2006). Moreover, a study from France (Morel et al., 2016) suggested that nearly 22% of individuals with alcohol use disorders had probable dependence on BZDs. It has also been reported that nearly 10% of individuals with NMU of BZDs meet the criteria for BZD abuse/dependence (Becker et al., 2007). Given these prevalence rates, NMU of BZDs has also become an increasing public health concern in the past two decades (Votaw et al., 2019).

NMU is defined as the use of BZDs without medical prescription, and/or in larger doses, and/or for longer periods of time than recommended, and/or for different purposes than prescribed (e.g., for recreational purposes). In 2023, a nationally representative study from the USA indicated that the past-year prevalence of NMU of BZDs was 1.7% among young adults aged between 18 and 25 years and 1.8% among adults aged 26 years or older (Substance Abuse & Mental Health Services Administration, 2024). In European countries, one study estimated that the past-year prevalence of NMU varied between 0.9% and 3.9% (Hockenhull et al., 2021). Engin (2023) suggested that two major reasons for NMU of BZDs might be reward-related effects of these medications, and the physical dependence (i.e., withdrawal symptoms). However, it is also important to highlight that in addition to eliminating unpleasant conditions, BZDs may also induce pleasant feelings and states (i.e., BZDs have a double rewarding effect which can also contribute to the development of NMU and/or BZD dependence). These findings draw attention to the importance of

better understanding and monitoring the reasons for BZD use to prevent NMU and BZD use disorder.

Previous research has emphasized that motivations are crucial factors in understanding addictive behaviors (Cooper, 1994; Cox & Klinger, 1990). Initial studies investigated the motivations underlying alcohol consumption. The motivational theory of Cox and Klinger (1990) and Cooper (1994) reported four groups of drinking motives across two underlying dimensions: positive/negative reinforcement and internal/external source. These four groups are (i) enhancement motives: using alcohol for pleasure; (ii) coping motives: alleviating negative feelings; (iii) social motives: using alcohol to help with socialization; and (iv) conformity: fear of missing out or drinking because of social pressure. The motivational models of Cox and Klinger (1990) and Cooper (1994) have been applied and used as basic concepts for several different addictions. Therefore, although the initial motivational studies focused on alcohol consumption, the study of motivations has extended to other substance-related disorders (Ágoston et al., 2018; Biolcati & Passini, 2019; Felvinczi et al., 2020; Piper et al., 2004; Simons et al., 1998) and behavioral addictions (Bőthe et al., 2021; Király et al., 2022; Koós et al., 2024; Maraz et al., 2015; Zsila et al., 2018), including the development of valid psychometric measures, highlighting the significant predictive power of motives in the examination of various addictive behaviors (Király et al., 2015; Koncz et al., 2024; Koós et al., 2022).

Moreover, several studies have also suggested that motives are potential predictors for the pattern of use, as well as more severe substance-related problems and addictive behaviors (Grant et al., 2007; Hagfors et al., 2023; Mathieu et al., 2020; Mezquita et al., 2011; Sun et al., 2015). For instance, a study including both general and clinical samples reported that coping with anxiety, social motivations, and enhancement were all related to alcohol consumption but only at weekends (Mezquita et al., 2011). However, coping with anxiety and social motivations were significant predictors of alcohol use on weekdays. In addition, participants who met the criteria for alcohol dependence showed higher scores in drinking motives related to negative reinforcements (coping and conformity). Moreover, it has been shown that social motives and enhancement are predictors of drinking frequency, while coping with depression, enhancement, and social motives are related to the quantity of alcohol consumption (Grant et al., 2007). In addition, one study reported a positive relationship between (i) social motives and heavy drinking, (ii) conformity and alcohol-related problems, and (iii) coping motives and both heavy drinking and alcohol-related problems (Sun et al., 2015).

Regarding cannabis use, coping and expansion motives have been significantly and positively associated with more frequent use, while coping, expansion, and enhancement motives have been significantly and positively associated with more frequent use among participants with potential cannabis use disorder (Ouellette et al., 2023). Moreover, in the case of gambling, a systematic review reported a significant and positive relationship between escape from distress/coping and gambling severity in 96% of studies (Neophytou et al., 2023). Overall, based on the aforementioned studies, coping appeared to be the most common factor in association with substance-related disorders and addictive behaviors.

However, there is a significant knowledge gap regarding motivational factors for prescription medication use, especially because motives could be different across distinct types of medications (e.g., opioids, BZDs or stimulants). However, the motivational models of Cooper (1994) and Cox and Klinger (1990) for alcohol use were used to help hypothesize similarities in the motivations for BZD and alcohol use due to the depressant effect of both psychoactive substances. However, a study conducted among non-medical prescription drug users reported three main motivations: getting

high, sleeping well, and dealing with stress or anxiety (Rigg & Ibañez, 2010). Among young adults, a higher level of recreational motivation was found among males, while females were more likely to report self-treatment motivations for NMU of prescription medications in general (Drazdowski et al., 2020). Based on a study conducted among individuals with opioid use, the most commonly reported motivation for BZD use was coping with anxiety, followed by enhancement, sleep management, and decreasing opioid withdrawal (Stein et al., 2016). Moreover, the motives for BZD use have even been associated with who they get their BZDs from: coping with anxiety was the primary motivation for individuals who got their BZDs from a doctor, while individuals who wanted to enhance feeling high were more likely to buy BZDs on the street (Stein et al., 2016). Also, among participants with opioid use, it was reported that individuals who reported BZD use for negative affect regulation were more likely to have a diagnosis of harmful BZD use or BZD use disorder, and they had a higher prevalence of psychiatric comorbidities (Vogel et al., 2013).

In conclusion, previous literature suggests that motives underlying substance use are related to substance-related problems. However, most of these studies did not focus specifically on BZDs or did not assess motives systematically (e.g., they were quantitative studies and/or not all the potentially relevant motivations were included or motives for prescription medication use were explored in general, including opiates and stimulants). Although these studies and theories relate to other types of psychoactive substance use or prescription medication use in general, they suggest that specific motivations (e.g., coping with stressful situations, adaptive social functioning or enhancement) appear in most types of substance use (including in BZD use). However, there is no currently available psychometrically validated scale that assesses motives for BZD use. Due to the therapeutic use of BZDs, coping is likely the most expressed motivation for BZD use. However, a standardized motivational scale might help clinicians to better understand this potentially addictive behavior, which may be crucial in the prevention processes, and identification of individuals at-risk for NMU of BZDs or for BZD use disorder, as well as the treatment of BZD use disorder. For instance, in cognitive behavioral therapy (CBT) for substance use disorders, motivational assessments are recommended to provide information about substance use and related high-risk situations (McHugh et al., 2010).

Based on the aforementioned reasons, the aims of the present study were to (i) develop a new BZD motives scale by comprehensively identifying motives based on BZD users' reports and previous literature (including the motivational theories of Cooper (1994) and Cox and Klinger (1990) for alcohol use, as well as previous studies examining the NMU of prescription medications and BZDs); (ii) establish the factor structure of this new BZD motives scale among a large community sample; and (iii) corroborate its construct validity in both a community sample and a clinical sample by examining the BZD motives scale's associations with various outcomes of BZD use, substance use-related behaviors (i.e., hazardous alcohol and cannabis use), and psychological constructs (i.e., well-being, stress, rumination, sleeping difficulties, and impulsivity).

Methods

Participants and Procedures

Data from two cross-sectional samples (a large community sample and a clinical sample) were included in the study. Participants were recruited by using non-representative, convenience sampling methods.

The community sample: An online survey was administered on *Qualtrics* between February 2023 and April 2024, targeting adults (18 years of age or older) who use BZDs. It was promoted on different online platforms, including news sites, social media platforms, and personal blogs. Before starting the survey, the participants were informed about the aims of the study. They also had to provide informed consent to participate in the survey. Participation in the study was anonymous, voluntary, and could be cancelled at any time during the completion of the survey. Incentives were offered for the participation in the survey: a draw was conducted for ten vouchers with a value of approximately €50 each. An e-mail address was asked only from participants who wanted to participate in the draw. These email addresses were only used to contact the participants who won of the vouchers. The study was approved by the Institutional Review Board of the Faculty of Education and Psychology, ELTE Eötvös Loránd University (Budapest, Hungary).

The clinical sample: Data collection was conducted at the Department of Psychiatry, University of Szeged, Hungary, between December 2021 and July 2024 involving hospitalized adult patients (18 years of age or older) with psychiatric disorders in cases when BZD use was reported. The exclusion criteria were the following: dementia, acute psychosis, substance withdrawal symptoms, or being under guardianship. Medical doctors explained in detail the purpose and methodology of the data collection to the patients in person. After providing their written informed consent, patients answered an anonymous, self-reported survey related to their BZD use and motivations underlying it. All participants were made aware of their right to discontinue the survey at any time. Medical records were used to collect the patients' sociodemographic data and data related to their present or past hospitalizations. The study was approved by the Human Investigation Review Board, University of Szeged (Hungary).

Overall, 7677 individuals started to complete the online survey in the community sample, while 142 participants did so in the clinical sample. Multiple criteria were considered to obtain the final samples. In both samples, individuals were included in the final sample if they reported past-year medical or NMU of BZDs and provided responses on more than half of the items assessing motives for using BZDs. Moreover, in the community sample, participants' textual responses were carefully reviewed to ensure the validity of their self-reported gender identity. More specifically, those who selected the "other" option in the question regarding gender had the opportunity to elaborate in a free-text field. Responses in this field were evaluated for relevance to gender minority identities (e.g., non-binary, gender fluid). Participants whose responses were clearly unrelated (e.g., providing names, random numbers, or humorous entries that did not reflect a gender identity) were excluded from the analyses. Based on these inclusion and exclusion criteria, 1424 individuals were included in the final community sample (gender: females—$n = 1157$ [81.25%], males—$n = 259$ [18.19%], other—$n = 8$ [0.56%]; mean age: 49.31 years [SD = 14.75]) and 113 individuals in the final clinical sample (gender: female—$n = 69$ [61.06%], males—$n = 44$ [38.94%]; mean age: 46.13 years [SD = 14.54]).

Measures

In both samples, participants completed a detailed survey with the same questions related to their BZD use and NMU of BZDs, as well as to other substance use. Standardized scales and questionnaires assessing several psychological constructs were also administered in both the community and clinical samples.

Assessment of BZD Use Motives

Assessing BZD use motives was preceded by a preliminary collection of motives in two steps. First, a community sample of 49 BZD users (gender: females—$n = 40$ [70.2%], males—$n = 19$ [29.8%]; mean age: 43.56 years [SD = 15.08]) were recruited by snowball sampling and were asked about their BZD use in October 2021. An online survey was administered on *Qualtrics*, where participants were able to express in their own words as many reasons for their BZD use as possible. They were asked to complete the following sentence: "*I use benzodiazepines because…"*. The study was approved by the Institutional Review Board of the Faculty of Education and Psychology, ELTE Eötvös Loránd University (Budapest, Hungary). Based on these sources of information, 26 different motivations for BZD use were identified.

Moreover, motivations for BZD use were also collected from previous empirical studies using different combinations of the following key search terms on *PubMed*: "motivations" OR "motives" AND "benzodiazepine" OR "sedative" OR "hypnotic". After the literature search, 124 further motivations were identified, including the motives for prescription medications previously reported in the literature (Gelkopf et al., 1999; McCabe & Cranford, 2012; McHugh et al., 2010; Messina et al., 2016; Milner, 2015; Nattala et al., 2011; Stein et al., 2016) as well as the items of the Drinking Motives Questionnaire-Revised (DMQ-R) (Cooper, 1994) modified to sedatives and hypnotics. Overall, after the preliminary collection and the literature search, 168 motives were initially identified. These motivations were reviewed in several steps by three researchers participating in the study. Duplicates were removed, similar items were merged, and 82 items related to motivations remained. BZD motives were assessed by these 82 items in both samples. The participants indicated how often they used BZDs for that reason in the past year on a five-point Likert scale (1 = *never/almost never*; 5 = *almost always/always*). For the items of the initial 82-item version of the BZD use motives scale, see Appendix 1 in the Supplementary Materials.

Frequency of Medical and Non-medical BZD Use

The past-year frequency of BZD use and NMU were assessed based on questions of the Epidemiological Model Questionnaire (EMCDDA, 2002; Karjalainen, 2018). NMU was defined as using BZDs without medical prescription, and/or in greater doses or frequency, and/or for different purposes than prescribed (i.e., with alcohol or other substances). Therefore, participants indicated on a Likert scale from 0 (*never*) to 6 (*several times a day*) the frequency of medical BZD use and these three types of NMU during the past year.

Illegal Access to Sedatives

Participants were asked if they tried to get BZDs from someone else and not the doctor who prescribed the medication (i.e., from another doctor, a family member, a friend, a stranger or through the internet). Dichotomous variables were created for the statistical analyses based on whether illegal access had occurred (0 = *No*; 1 = *Yes*).

Symptoms of BZD Use Disorder

Participants were also asked if they experienced (0 = *No*; 1 = *Yes*) any of the 11 symptoms of BZD use disorder indicated in the DSM-5 (e.g., tolerance, withdrawal symptoms, etc.) (American Psychiatric Association, 2013). During the statistical analyses, total scores were used. Very good internal consistency was observed in both the community ($\alpha = 0.81$) and clinical ($\alpha = 0.83$) samples.

Well-Being

The World Health Organization's five-item Well-Being Index (WBI-5) is primarily used for assessing subjective psychological well-being in general (Martos & Csordás, 2022; Susánszky et al., 2006; World Health Organization, 1998). However, the scale has also been reported to be a sensitive screening tool for potential depression (Topp et al., 2015). Participants indicated their feelings over the past 2 weeks on a Likert scale ranging from 0 (*very untrue of me*) to 3 (*very true of me*). Very good internal consistency was observed for the WHO WBI-5 in both the community sample ($\alpha = 0.88$) and clinical sample ($\alpha = 0.88$).

Stress

The four-item Perceived Stress Scale (PSS-4) assesses the degree of stress experienced in out-of-control and unpredictable situations (Cohen et al., 1983; Du et al., 2023; Stauder & Konkolÿ Thege, 2006). Participants indicated their feelings and thoughts during the past month on a Likert scale ranging from 0 (*never*) to 4 (*very often*). The PSS-4 had very good internal consistency in the community sample ($\alpha = 0.84$), and acceptable internal consistency in the clinical sample ($\alpha = 0.71$).

Rumination

The Ruminative Response Scale (RRS-10) was used to assess rumination and its two dimensions: brooding and reflection. Reflection is a self-reflective response to understand and solve problems related to depressive mood, while brooding involves a passive attention to the negative thoughts related to distress and bad mood (Eszlári & Kökönyei, 2021; Kokonyei et al., 2016; Parola et al., 2017; Treynor et al., 2003). Rumination can contribute to the symptoms of depression (Treynor et al., 2003). Participants indicated their responses on a Likert scale ranging from 1 (*almost never*) to 4 (*almost always*). Very good

internal consistency was observed for the total RRS-10 scale in both the community sample ($\alpha = 0.87$) and clinical sample ($\alpha = 0.86$).

Sleeping Difficulties

The eight-item Athens Insomnia Scale (AIS-8) was applied to assess the severity of insomnia. Five of the items explore difficulties with sleep induction, awakenings during the night, and awakenings during the early morning, as well as total sleep time and overall quality of sleep; the other three items reflect the consequences of insomnia (Novák, 2004; Soldatos et al., 2000, 2003). The answers to each item are rated from 0 to 3. Very good internal consistency was observed for the AIS-8 in both the community sample ($\alpha = 0.84$) and clinical sample ($\alpha = 0.88$).

Impulsivity

The short, 10-item version of the revised, 21-item Barratt Impulsiveness Scale (BIS-R-21-SF) was used to assess impulsivity (Barratt, 1959; Kapitány-Fövény, 2021; Kapitány-Fövény et al., 2020; Patton et al., 1995). Participants indicated their responses on a Likert scale ranging from 1 (*rarely never/never*) to 4 (*almost always/always*). Good-to-very good internal consistency was observed for the total BIS-R-21-SF in the community sample ($\alpha = 0.80$) and clinical sample ($\alpha = 0.79$).

Hazardous Alcohol Use

The 10-item Alcohol Use Disorders Identification Test (AUDIT) was used to assess hazardous and harmful alcohol consumption (Allen et al., 1997; Gerevich et al., 2006; Horváth et al., 2021, 2023; Saunders et al., 1993). Participants rated each item about their alcohol-related habits and experiences on a Likert scale from 0 to 4. Based on the recommended cut-off, dichotomous variables are formed: participants who have an AUDIT score below 8 are described as abstinent or participants with low-risk alcohol use, while individuals with 8 or higher AUDIT scores are classified as individuals with hazardous or more severe alcohol use (Saunders et al., 1993). Considering those participants' data who had valid responses on all items of the AUDIT (e.g., abstinent individuals did not complete the AUDIT due to the skip logic in the survey), excellent internal consistency was observed in both the community sample ($\alpha = 0.90$) and clinical sample ($\alpha = 0.95$).

Hazardous Cannabis Use

The six-item Cannabis Abuse Screening Test (CAST) was applied to assess problematic patterns of cannabis use (Legleye et al., 2007). Individuals indicated their habits regarding cannabis use on a Likert scale from 0 (*never*) to 4 (*very often*). A cut-off point of 3 was used to form dichotomous variables where 0 indicates abstinent individuals or individuals with low-risk cannabis use and 1 indicates individuals with hazardous cannabis use (Legleye et al., 2011). Based on those participants' data who had valid responses on all items of the CAST (e.g., abstinent individuals did not complete the CAST due to the skip logic in the survey), very good internal consistency was observed in both the community sample ($\alpha = 0.87$) and clinical sample ($\alpha = 0.87$).

Psychiatric and Neurological Disorders

Psychiatric and neurological disorders were examined differently in the two samples. In the community sample, participants were asked if they were currently under treatment for a neurological or psychiatric disorder (0 = *No*; 1 = *Yes*). In the clinical sample, medical records with ICD-10 (World Health Organization, 2016) diagnoses of the patients were collected. Dichotomous variables were formed (0 = *No*; 1 = *Yes*) based on five groups of mental health disorders: alcohol-related disorders (F10); mental and behavioral disorders due to further psychoactive substance use (F11-F19); schizophrenia, schizotypal, delusional, and other non-mood psychotic disorders (F20-F29); mood disorders (F30-F39); and anxiety, dissociative, stress-related, somatoform, and other nonpsychotic mental disorders (F40-F49).

Statistical Analyses

First, the factor structure of the newly developed BZD motives scale was examined with exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). Therefore, the community sample was randomly divided into two groups: an EFA was performed with Sample 1 ($N = 712$) and a CFA with Sample 2 ($N = 712$). In both the EFA and CFA, the items were defined as ordinal variables and the weighted least squares means and variances adjusted (WLSMV) estimation procedure was applied (Li, 2016). Several considerations were taken into account during the selection of WLSMV over other estimation methods, such as maximum likelihood robust to non-normality (MLR). WLSMV is particularly well-suited for measurement models with Likert-type or other ordered categorical indicators, especially when response categories are limited (e.g., 2–5 categories). In contrast, if such ordinal data are treated as continuous variables in MLR, correlations and standard errors may be underestimated. By using polychoric correlations, WLSMV-based estimations better capture the relationships between ordinal items, leading to more accurate factor loadings compared to Pearson correlation-based estimations. Additionally, WLSMV accounts for the threshold structure inherent in ordinal data, a feature not explicitly modeled in MLR-based approaches. Moreover, WLSMV is a robust and reliable method for handling non-normal or highly skewed indicator distributions, ensuring more stable parameter estimates (Li, 2016).

In addition, prior to the EFA, items with a frequency of $N < 10$ in a given response category were excluded from further analysis. The rationale for this exclusion criterion was twofold. On the one hand, it aimed to ensure the robustness and stability of inter-item correlation estimation. Because the EFA and CFA models were estimated using categorical indicators, they relied on polychoric correlations rather than Pearson correlations. When response categories contain extremely low frequencies (or zero observations), the estimation of polychoric correlations becomes unstable and can potentially lead to biased correlation estimates and distorted factor structures (e.g., non-positive definite covariance matrices due to negative item residual variances). On the other hand, because EFA and CFA were conducted on two randomly selected subsamples, it was essential to retain items with non-zero observations in each response category across both subsamples. If a response category was entirely missing in one of the subsamples, estimation problems could arise (e.g., non-positive definite covariance matrices due to negative item residual variances, out-of-range factor loadings, or correlations),

potentially hindering the comparability of factor structures across subsamples (e.g., the same model would have a different number of free parameters due to varying numbers of thresholds for the same item across subsamples).

In the EFA with Sample 1, the goal was to achieve a factor structure in which each item primarily and moderately-strongly loaded on only one factor and had low cross-loadings on the other factors. Consequently, items were considered suitable if the strongest factor loading was $>|0.40|$, the other factor loadings were $<|0.30|$, and the difference between the two strongest factor loadings in absolute value was >0.20 (Howard, 2016). All items that did not fit these criteria were excluded in separate steps. The decision on the number of factors to be retained was based on the scree plot (i.e., retain factors positioned to the left of the flattening breakpoint) and the content of the factors. The aim was to have at least three items on each factor that primarily loaded there. Oblique (geomin) rotation was applied for EFA. Subsequently, the goodness-of-fit of the factor structure was tested by using CFA with Sample 2. Optimal fit of the factor structure was indicated if the values of the comparative fit index (CFI) and Tucker-Lewis index (TLI) were ≥ 0.95 and the values of the root mean square error of approximation (RMSEA) and standardized root mean square residual (SRMR) were ≤ 0.05, while for adequate fit, the values of the CFI and TLI had to be ≥ 0.90, and the values of the RMSEA and SRMR had to be ≤ 0.08.

To examine the robustness of the identified and confirmed structure across Sample 1 and Sample 2, measurement invariance testing was conducted with the community sample. A series of increasingly restrictive invariance models was tested, each imposing additional equality constraints on model parameters across groups, in the following order: configural (baseline model), metric (i.e., equality of factor loadings), scalar (i.e., equality of item thresholds in addition to loadings), item residuals, factor variances, factor covariances, and factor means (Bőthe et al., 2023; Horváth et al., 2023). The level of invariance achieved was determined by comparing the fit of successive invariance models—more specifically, by assessing the extent to which model fit deteriorated as additional equality constraints were imposed on model parameters. A more restrictive model (i.e., one with more equality constraints) was accepted over its less restrictive counterpart as long as model fit deterioration remained minimal, defined as a CFI decrease of no more than 0.010, an RMSEA increase of no more than 0.015, and an SRMR increase of no more than 0.030 (Chen, 2007). It is important to highlight that although testing for measurement invariance between the community and clinical samples would have been theoretically warranted, it was not feasible in the present study. Based on previous simulation studies, measurement models estimated using the WLSMV procedure may exhibit significant statistical issues when sample sizes fall below 200 or 500 cases (i.e., low statistical power to reject models, biased parameter estimates, and standard errors) (Bandalos, 2014; Forero et al., 2009). Therefore, factor-analytic testing of the instrument was not conducted with the clinical sample, due to the small sample size and the associated risk of potential statistical errors. At the same time, considering these guidelines, the size of the two randomly selected subsamples from the community sample likely contributed to achieving adequate statistical power for conducting factor-analytic analyses.

Interfactor correlations in the community sample were calculated based on the EFA and CFA (i.e., each motive was a latent variable), while correlations between subscales of BZD motives (i.e., as observed variables) were also examined in the clinical sample. In the clinical sample, the use of observed variables and the absence of an analysis for the latent structure was due to the relatively small sample size. For the latter, a maximum likelihood robust to non-normality (MLR) estimation procedure was applied. To assess the internal consistency of the factors, Cronbach's α was calculated separately in both subsamples of

the community sample and in the clinical sample. In the community sample, McDonald's ω was also estimated for each factor separately in Sample 1 and Sample 2.

For the final developed 48-item instrument (consequently names the Motives for Benzodiazepine Use Questionnaire [MBUQ-48]), see Appendix 2 in the Supplementary Materials. The construct validity of the MBUQ-48 was assessed in a series of analyses. First, bivariate correlations were computed separately in the community and clinical samples between each subscale of the MBUQ-48 and the following variables: gender (including only male and female participants while excluding the "other" gender group due to the very low number of participants), age, illegal BZD access, frequency of medical and non-medical BZD use, BZD use disorder symptom severity, well-being, stress, rumination, sleep difficulties, impulsivity, hazardous alcohol use, and hazardous cannabis use. Moreover, in the community sample, a correlation was estimated with the presence of current treatment for a psychiatric or neurological disorder, while in the clinical sample, correlations were also calculated with the presence of different types of psychiatric disorders (i.e., alcohol-related, other substance use-related, schizophrenia and psychosis-related, mood, and anxiety disorders). Because in multiple cases correlations were examined with dichotomous variables (i.e., gender, illegal BZD access, presence of psychiatric or neurologic treatment or disorders) and ordinal variables (i.e., frequency of medical and non-medical BZD use), biserial and polyserial correlations were computed in these cases, respectively. Consequently, bivariate correlations were estimated using the WLSMV technique.

Next, to test the incremental validity of the MBUQ-48, regression analyses were conducted to investigate the predictive effects of different motives on different outcome variables of BZD use. In the community sample, the effects of gender (as previously, only the data of male and female participants were considered), age, well-being, stress, rumination, sleep difficulties, impulsivity, hazardous alcohol use and hazardous cannabis use, and current treatment for a psychiatric or neurologic disorder were controlled for. Due to the small sample size and statistical power in the clinical sample, only the subscales of the MBUQ-48 were entered as predictor variables in each regression model, and the effects of other variables were not controlled for. Overall, there were no signs of excessive multicollinearity among the predictor variables in the regression models because variance inflation factor (VIF) values ranged from 1.17 to 2.72 in the community sample, and from 1.08 to 3.30 in the clinical sample.

In both samples, predictive effects were examined for six outcome variables: illegal BZD access, frequency of medical BZD use, frequency of non-medical BZD use (without medical prescription, and/or in greater doses or frequency, and/or for different purposes than prescribed [i.e., with alcohol or other substances]), and BZD use disorder severity. In the community sample, the regression model (with probit link) was estimated using the WLSMV method with all outcome variables included in a single model, whereas in the clinical sample, separate regression models were constructed for each outcome variable. In the clinical sample, probit regression with the WLSMV estimation was used to predict the dichotomous outcome variable, ordinal regression models (also with the WLSMV estimation) were used to predict different frequencies of medical and non-medical BZD use, and linear regression (using the MLR estimation method) was applied in the last case.

Finally, it should be noted that supplementary analyses were also performed to compare the community and clinical samples for each variable. Chi-square tests were used for categorical and ordinal variables, and independent samples *t*-tests were used for continuous variables. Additionally, to assess sensitivity, post hoc power analyses were performed for validity analyses involving bivariate correlations in the community and clinical samples separately. These analyses aimed to identify the minimum detectable effect sizes based on

the given sample sizes, assuming a two-tailed statistical test with an alpha level of 0.05 and a statistical power of 0.80.

The comparisons of the community and clinical samples were performed using IBM SPSS 26 software (IBM Corp, 2018), while factor analysis and validity testing for the MBUQ-48 were performed with MPlus 8.0 (Muthén & Muthén, 2017). Sensitivity power analyses were performed by using the G*Power 3 software (Faul et al., 2007). During WLSMV-based estimation of EFA and CFA in the community sample, as well as WLSMV-based bivariate correlations with external variables in both community and clinical samples, missing data were handled using pairwise deletion. The full information maximum likelihood (FIML) method was used to handle missing data during MLR-based estimation of bivariate correlations among the motivational subscales in the clinical sample. In WLSMV-based probit regression models in both community and clinical samples, missing data were handled using pairwise deletion for dependent variables and listwise deletion for independent variables. Finally, missing data in the MLR-based linear regression model for the clinical sample were handled using a combination of FIML and listwise deletion. FIML was applied to the dependent variable, whereas listwise deletion was used for cases with missing data on independent variables. Listwise missing data handling was applied for the comparisons of the community and clinical samples.

Results

Preliminary Analysis: Comparison of the Community and Clinical Samples

Table S1 and Figs. S1–S15 show descriptive statistics for (and comparisons between) the community and clinical samples. Significant differences were observed between the two samples on multiple variables. More specifically, compared to the community sample, those in the clinical sample were characterized by a significantly higher proportion of males, lower age, more frequent medical BZD use (i.e., daily or more frequent use) and non-medical BZD use (i.e., with a frequency of at least several times a week), higher BZD use disorder symptom severity, lower well-being, and higher levels of stress, rumination, sleep difficulties, impulsivity, and hazardous alcohol use.

Exploratory and Confirmatory Factor Analyses

Prior to the EFA, 18 items were excluded because they had a response option with a frequency of $N < 10$. In the EFA performed with Sample 1, a further 16 items were excluded because they did not meet the defined criteria for factor loadings. Therefore, the final EFA model contained 48 items. Figure S16 presents the scree plot related to the 48-item EFA model. Based on this scree plot and the content of the factors, a four-factor model was selected (χ^2 [942] = 2156.04; $p < 0.001$; CFI = 0.99; TLI = 0.98; RMSEA = 0.04; SRMR = 0.05). Although the alternative five and six factor models could have been justified based on the scree plot, less than three items loaded primarily on these factors and/or the content of these factors was considered difficult to interpret (i.e., they were residual factors).

Table 1 presents the standardized factor loadings of the four-factor EFA model with 48 items. A total of 18 items loaded primarily and strongly or close-to-strongly on Factor 1. These items comprised motives that described positive effects on cognitive or task-related

Table 1 Standardized factor loadings and internal reliability indices based on exploratory and confirmatory factor analyses in the community sample

	Sample 1: Exploratory factor analysis ($N = 712$)				Sample 2: Confirmatory factor analysis ($N = 712$)			
	Factor 1: Personal and interpersonal benefits	**Factor 2: Substance use regulation**	**Factor 3: Coping**	**Factor 4: Sleep facilitation**	**Factor 1: Personal and interpersonal benefits**	**Factor 2: Substance use regulation**	**Factor 3: Coping**	**Factor 4: Sleep facilitation**
Because it helps in studying	**0.92*** **	−0.18	−0.08	−0.02	0.69***			
Because it helps me concentrate	**0.91*** **	−0.22***	0.02	0.09	0.85***			
To be more efficient	**0.89*** **	−0.21***	0.08	0.06	0.90***			
To don't feel like I'm missing out on something	**0.88*** **	0.20	−0.17	−0.04	0.80***			
Because it makes me more creative	**0.86*** **	0.10	−0.07	−0.02	0.80***			
To increase my awareness	**0.84*** **	−0.18	0.00	0.04	0.74***			
To get energy	**0.82*** **	−0.02	0.00	0.22***	0.87***			
Because it makes me more open to new experiences	**0.79*** **	0.06	0.11	−0.01	0.86***			
To feel refreshed	**0.78*** **	0.07	−0.06	0.18***	0.68***			
To fit into a group of people I like	**0.76*** **	0.18	0.00	0.07	0.83***			
To stay focused	**0.76*** **	−0.22***	0.22***	−0.01	0.89***			
To have fun with my friends	**0.76*** **	0.18	0.04	0.06	0.81***			
To make me feel more confident	**0.70*** **	0.05	0.26***	−0.14***	0.86***			

Table 1 (continued)

	Sample 1: Exploratory factor analysis ($N = 712$)				Sample 2: Confirmatory factor analysis ($N = 712$)			
	Factor 1: Personal and interpersonal benefits	**Factor 2: Substance use regulation**	**Factor 3: Coping**	**Factor 4: Sleep facilitation**	**Factor 1: Personal and interpersonal benefits**	**Factor 2: Substance use regulation**	**Factor 3: Coping**	**Factor 4: Sleep facilitation**
To be able to fulfill my duties	**0.69*** **	−0.25***	0.18	−0.04	0.70***			
To make me feel more assertive	**0.69*** **	0.06	0.26***	−0.09	0.91***			
To make it easier for me to socialize	**0.68*** **	0.20***	0.11	−0.03	0.85***			
Because it helps me see things from a new perspective	**0.55*** **	0.19***	0.23***	0.05	0.78***			
To get high	**0.49*** **	0.23***	0.23***	0.08	0.80***			
Because it helps to deal with my alcohol problems	0.08	**0.97*** **	0.02	−0.18		0.96***		
Because it helps to drink less alcohol	0.13	**0.86*** **	0.03	−0.15		0.96***		
To counteract the effects of other drugs	−0.05	**0.80*** **	−0.04	0.18		0.61***		

Table 1 (continued)

	Sample 1: Exploratory factor analysis ($N = 712$)				Sample 2: Confirmatory factor analysis ($N = 712$)			
	Factor 1: Personal and interpersonal benefits	**Factor 2: Substance use regulation**	**Factor 3: Coping**	**Factor 4: Sleep facilitation**	**Factor 1: Personal and interpersonal benefits**	**Factor 2: Substance use regulation**	**Factor 3: Coping**	**Factor 4: Sleep facilitation**
Because it alleviates the lack of alcohol or other drugs	0.13	**0.80*** **	0.09	−0.06		0.92***		
To reduce the effect of other drugs	−0.03	**0.73*** **	−0.03	0.19		0.81***		
Because it helps me when I'm tense	−0.10	−0.02	**1.00*** **	0.00			0.90***	
Because it helps to deal with stress	−0.02	−0.01	**0.93*** **	−0.02			0.86***	
To relieve my tension	0.01	−0.04	**0.92*** **	−0.04			0.89***	
Because it helps me when I'm nervous	−0.10	0.09	**0.90*** **	0.04			0.84***	
Because it eases my restlessness	−0.03	−0.02	**0.90*** **	0.04			0.89***	
To ease my anxiety	0.05	−0.18***	**0.89*** **	−0.14***			0.86***	
Because it calms me down	−0.04	−0.07	**0.84*** **	0.08			0.87***	
Because it helps in difficult times	0.08	0.01	**0.77*** **	0.07			0.85***	

Table 1 (continued)

	Sample 1: Exploratory factor analysis ($N = 712$)				Sample 2: Confirmatory factor analysis ($N = 712$)			
	Factor 1: Personal and interpersonal benefits	**Factor 2: Substance use regulation**	**Factor 3: Coping**	**Factor 4: Sleep facilitation**	**Factor 1: Personal and interpersonal benefits**	**Factor 2: Substance use regulation**	**Factor 3: Coping**	**Factor 4: Sleep facilitation**
Because it helps in difficult situations	0.19***	− 0.07	**0.67*** **	− 0.07			0.80***	
Because it eases my frustration	0.19***	0.13***	**0.67*** **	0.00			0.85***	
To make my problems less pressing	− 0.04	0.07	**0.67*** **	0.09			0.75***	
To feel better	0.27***	0.06	**0.63*** **	− 0.03			0.85***	
To forget about my worries	0.14	0.22***	**0.61*** **	0.13***			0.84***	
Because it eases my anger	0.04	0.27***	**0.59*** **	0.14***			0.70***	
Because it helps me to deal with depression	0.28***	− 0.06	**0.56*** **	0.03			0.76***	
Because it helps me to relax	0.04	0.16***	**0.56*** **	0.26***			0.70***	
To avoid panic attacks	0.16	− 0.22***	**0.54*** **	− 0.21***			0.59***	
Beacuse it helps me not to think about everyday problems	0.22***	0.21***	**0.49*** **	0.17***			0.85***	

Table 1 (continued)

	Sample 1: Exploratory factor analysis ($N = 712$)				Sample 2: Confirmatory factor analysis ($N = 712$)			
	Factor 1: Personal and interpersonal benefits	**Factor 2: Substance use regulation**	**Factor 3: Coping**	**Factor 4: Sleep facilitation**	**Factor 1: Personal and interpersonal benefits**	**Factor 2: Substance use regulation**	**Factor 3: Coping**	**Factor 4: Sleep facilitation**
Because it helps with sleep	0.06	−0.05	−0.05	**0.98*** **				0.96***
Because it helps me to fall asleep	−0.02	0.00	0.01	**0.97*** **				0.93***
To sleep well enough	0.07	−0.05	−0.02	**0.95*** **				0.93***
To improve the quality of sleep	0.02	0.03	0.02	**0.92*** **				0.92***
Because it helps me to reduce sleep disturbances	0.00	−0.05	0.09	**0.91*** **				0.92***
Because it helps me to sleep deeper	−0.06	0.07	0.12	**0.90*** **				0.94***
To be able to rest	0.10	−0.01	0.10	**0.79*** **				0.86***

Values next to each item are standardized factor loadings (λ). Bolded factor loadings in exploratory factor analysis are ≥ 0.40 (in absolute value). Level of significance: ***$p < 0.001$ (to ease the interpretation of the findings, significant factor loadings at lower p-levels are not highlighted)

performance (e.g., *it helps me concentrate; to be able to fulfill my duties*), positive affective changes (e.g., *to get high*), enhancement of creativity and awareness (e.g., *To increase my awareness; It helps me see things from a new perspective*), and positive effects on social life (e.g., *To fit into a group of people; to have fun with my friends*) due to BZD use. Therefore, Factor 1 was labelled "personal and interpersonal benefits". Five items loaded primarily and strongly on Factor 2, all expressing motivations where BZD use would help the person to use less alcohol or other psychoactive substances (e.g., *it helps to drink less alcohol*) and to cope with the use and non-use of alcohol and other substances (e.g., *It helps to deal with my alcohol problems; It alleviates the lack of alcohol or other drugs*). Therefore, Factor 2 was labelled "substance use regulation". A total of 18 items loaded primarily, strongly and close-to-strongly on Factor 3. These were motives describing motivations for coping with and alleviating different negative affective states, such as stress (e.g., *It helps to deal with stress*), psychological tension or strain (e.g., *It helps me when I'm tense; It helps me when I'm nervous*), depression (e.g., *It helps me to deal with depression*), different forms of anxiety (e.g., *To ease my anxiety*), as well as motives for coping with difficult situations and problems in general (e.g., *It helps in difficult situations*), motives for improving mood or affective states (e.g., *To feel better*), and motives of escapism (e.g., *It helps me not to think about everyday problems*). Therefore, Factor 3 was labelled "coping". Finally, seven items loaded strongly on Factor 4. This factor was labelled"sleep facilitation", because the items generally represented positive changes to sleep in general (e.g., *It helps with sleep*) as well specifically to its different stages (e.g., *It helps me to fall asleep; It helps me to sleep deeper*) and its quality (e.g., *To improve the quality of sleep; It helps me to reduce sleep disturbances*) due to BZD use.

Based on the CFA with Sample 2, the four-factor model demonstrated an adequate fit to the data (χ^2 [1074] = 2784.56, $p < 0.001$; CFI = 0.98; TLI = 0.97; RMSEA = 0.05; SRMR = 0.08). As shown in Table 1, all standardized factor loadings were significant, strong, and positive. Therefore, based on the results of the EFA and CFA, the MBUQ-48 was accepted, and its reliability and construct validity were further examined in both the community and clinical samples.

Table S2 presents the findings of the measurement invariance testing between Sample 1 and Sample 2. The results indicated that each invariance model demonstrated adequate-to-optimal levels of model fit. Additionally, only minimal changes were observed in the model fit indices across successive levels of invariance. Consequently, the highest level of measurement invariance was achieved, indicating equality between the two subsamples in terms of factor loadings, item thresholds, item residual variances, factor variances, and covariances, as well as factor means. These findings supported the robustness of the four-factor model across the two subsamples.

Inter-factor Correlations and Internal Consistency

Table 2 presents the inter-factor correlations and internal reliabilities in both samples. The "personal and interpersonal benefits" factor had a moderate-to-strong positive association with "substance use regulation", strong positive association with "coping", and weak-to-moderate positive association with "sleep facilitation". "Coping" motives had weak-to-moderate positive correlation with "substance use regulation" and moderate-to-strong positive association with "sleep facilitation" in both samples. Considering the correlation estimates from both samples, the strongest levels of inter-factor

Table 2 Inter-factor correlations, internal reliability indices, and descriptive statistics of the motivation subscales

	Community sample ($N=1424$)						Clinical sample ($N=112$)			
	1	2	3	4	Cronbach's α	McDonald's ω	1	2	3	4
1. Personal and interpersonal benefits	-	0.50***	0.77***	0.24***	0.92	0.97	-			
2. Substance use regulation	0.39***	-	0.34***	0.24***	0.75	0.93	0.34**	-		
3. Coping	0.69***	0.17*	-	0.39***	0.95	0.97	0.72***	0.30**	-	
4. Sleep facilitation	0.22***	0.08	0.31***	-	0.96	0.98	0.47***	0.22*	0.71***	-
Cronbach's α	0.94	0.77	0.95	0.97			0.95	0.85	0.97	0.95
McDonald's ω	0.97	0.94	0.97	0.98			-	-	-	-
M (SD)	6.48 (10.51)	0.78 (2.21)	23.13 (18.98)	14.06 (10.05)			14.43 (16.61)	3.19 (4.83)	36.02 (22.01)	17.10 (9.55)

Notes: In the community sample correlation coefficients (r) below the diagonal are estimated based on exploratory factor analysis (Sample 1; $N=712$), while estimates above the diagonal are estimated based on confirmatory factor analysis (Sample 2; $N=712$). Cronbach's α values below the diagonal are estimated in Sample 1, while Cronbach's α values above the diagonal are estimated in Sample 2. In the clinical sample, each motivation subscale was treated as observed variables (not latent variables) to calculate correlation coefficients. Mean (M) and standard deviation (SD) values are estimated based on the complete community and clinical samples. Level of significance: *$p<0.05$; **$p<0.01$; ***$p<0.001$

correlations were observed between "personal and interpersonal benefits" and "coping" motives, while the correlation between "coping" and "sleep facilitation" motives was also very strong in the clinical sample.

Very good internal consistency was observed in both samples for the factors of "personal and interpersonal benefits", "coping", and "sleep facilitation". In the case of "substance use regulation", adequate and very good internal consistency was observed in the community and clinical samples, respectively.

Table S3 and Figs. S17–S20 show the comparison of the motivation subscales between the community and clinical samples. Those in the clinical sample had significantly higher prevalence of all four motives. There were moderate-high effect sizes for "personal and interpersonal benefits", "substance use regulation" and "coping", and a small effect size for "sleep facilitation".

Bivariate Correlations

Table 3 presents the bivariate correlations between each motivation subscale and the study variables. To keep the findings concise, only those correlations which were significant in both samples or were significant and moderate in either of the two samples are reported here. Higher levels of "personal and interpersonal benefits" had significant weak-to-strong positive correlations with higher levels of frequency of medical BZD use, frequency of non-medical BZD use with greater dose or frequency and with alcohol or other substances, BZD use disorder symptom severity, stress, rumination, sleep difficulties, and impulsivity in both samples. Higher levels of "substance use regulation" had significant, positive, and weak-to-moderate correlations with being male, all forms of non-medical BZD use frequency, rumination, and hazardous alcohol use in both samples. Higher levels of "coping motives" had significant, positive, and weak-to-strong correlations with illegal BZD access, frequency of medical BZD use, frequency of non-medical BZD use with greater dose or frequency and with alcohol or other substances, BZD use disorder symptom severity, stress, rumination, sleep difficulties, impulsivity, and hazardous cannabis use in both samples. Higher levels of "sleep facilitation" had significant weak-to-moderate positive correlations with illegal BZD access, and higher rates of frequency of non-medical BZD use with greater dose or frequency and with alcohol or other substances, BZD use disorder symptom severity, stress, rumination and sleep difficulties in both samples.

In the community sample, higher levels of "substance use regulation" had significant weak positive correlations with illegal BZD access and hazardous cannabis use, and higher levels of coping motives had a significant weak negative correlation with well-being. The presence of current treatment for a psychiatric or neurologic disorder was significantly, positively, and moderately correlated with "personal and interpersonal benefits" and "coping" motives in the community sample.

In the clinical sample, frequency of BZD use without prescription had significant, positive, and moderate correlations with "personal and interpersonal benefits" and "coping" motives. Significant, positive and moderate-to-strong correlations were observed for "substance use regulation" with the presence of alcohol use-related psychiatric disorders and the absence of mood disorder as well as between "sleep facilitation" and the presence of other substance use-related psychiatric disorders in the clinical sample.

Table 3 Bivariate correlations with each motivation subscale

	Community sample ($N=1424$)				Clinical sample ($N=113$)			
	Personal and interpersonal benefits	**Substance use regulation**	**Coping**	**Sleep facilitation**	**Personal and interpersonal benefits**	**Substance use regulation**	**Coping**	**Sleep facilitation**
Gender[1]: males (vs. females)	0.06	0.29***	−0.02	−0.07	0.04	0.34***	−0.14	−0.03
Age	−0.10***	−0.19***	−0.16***	−0.01	−0.08	−0.13	−0.14	−0.06
Illegal BZD access: yes (vs. no)	0.12***	0.31***	0.21***	0.15***	0.22	0.15	0.42***	0.34**
Frequency of medical BZD use	0.28***	−0.01	0.29***	0.13***	0.19*	−0.13	0.33***	0.17
Frequency of non-medical BZD use: greater dose or frequency	0.37***	0.27***	0.44***	0.26***	0.39***	0.23*	0.59***	0.37***
Frequency of non-medical BZD use: with alcohol or other substances	0.26***	0.29***	0.31***	0.15***	0.46***	0.40***	0.54***	0.25*
Frequency of non-medical BZD use: without medical prescription	−0.01	0.21***	0.05	0.07*	0.41***	0.46***	0.44***	0.18
BZD use disorder symptom severity	0.43***	0.28***	0.45***	0.27***	0.54***	0.15	0.62***	0.46***
Well-being	−0.19***	−0.05*	−0.32***	−0.14***	−0.12	−0.05	−0.15	−0.12
Stress	0.31***	0.13***	0.44***	0.16***	0.20*	0.05	0.34***	0.23**
Rumination	0.34***	0.13***	0.45***	0.18***	0.37***	0.19*	0.44***	0.25*
Sleep difficulties	0.18***	0.09***	0.25***	0.30***	0.32***	0.17	0.40***	0.41***
Impulsivity	0.25***	0.22***	0.30***	0.07**	0.27**	−0.01	0.41***	0.15
Alcohol use: hazardous use (vs. abstinence or low risk drinking)	0.19***	0.37***	0.22***	0.14***	−0.13	0.59***	0.03	−0.09
Cannabis use: hazardous use (vs. abstinence or low risk use)	0.09*	0.34***	0.15***	0.10*	0.08	−0.02	0.33*	0.02
Current treatment for a psychiatric or neurologic disorder: yes (vs. no)	0.39***	0.03	0.40***	0.07*	-	-	-	-
Alcohol-related disorders: presence (vs. absence)	-	-	-	-	−0.05	0.52***	0.00	−0.16
Other substance use-related disorders: presence (vs. absence)	-	-	-	-	0.24	0.20	0.29*	0.38**

Table 3 (continued)

	Community sample ($N = 1424$)				Clinical sample ($N = 113$)			
	Personal and interpersonal benefits	**Substance use regulation**	**Coping**	**Sleep facilitation**	**Personal and interpersonal benefits**	**Substance use regulation**	**Coping**	**Sleep facilitation**
Schizophrenia- and psychosis-related disorders: presence (vs. absence)	-	-	-	-	0.15	−0.21	−0.01	−0.02
Mood disorders: presence (vs. absence)	-	-	-	-	−0.05	−0.51***	0.02	0.23
Anxiety disorders: presence (vs. absence)	-	-	-	-	−0.11	0.06	−0.04	−0.04

Notes. Level of significance: *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$. [1]Only male and female participants were included while "other" gender group was excluded due to its small sample size

Table 4 Predictive effects on outcomes of BZD use in the community sample

	Outcome variables					
	Illegal BZD access	**Frequency of medical BZD use**	**Frequency of non-medical BZD use: greater dose or frequency**	**Frequency of non-medical BZD use: with alcohol or other substances**	**Frequency of non-medical BZD use: without medical prescription**	**BZD use disorder symptom severity**
Gender[1]: males (vs. females)	0.07 (0.04)	0.01 (0.03)	0.12 (0.03)***	0.08 (0.04)*	0.08 (0.03)*	0.03 (0.02)
Age	−0.19 (0.04)***	0.24 (0.03)***	−0.07 (0.04)	−0.07 (0.05)	−0.24 (0.04)***	0.04 (0.03)
Well-being	0.04 (0.05)	−0.04 (0.03)	0.00 (0.05)	−0.03 (0.06)	−0.02 (0.05)	−0.02 (0.04)
Stress	0.04 (0.05)	0.06 (0.04)	0.03 (0.05)	−0.03 (0.06)	−0.01 (0.05)	0.01 (0.04)
Rumination	0.04 (0.04)	−0.07 (0.03)*	0.00 (0.04)	0.06 (0.05)	0.03 (0.04)	0.00 (0.03)
Sleep difficulties	0.05 (0.04)	−0.02 (0.03)	0.07 (0.04)	−0.04 (0.04)	0.08 (0.04)*	0.15 (0.03)***
Impulsivity	0.09 (0.04)*	−0.03 (0.03)	0.13 (0.04)***	0.09 (0.04)*	0.05 (0.03)	0.10 (0.03)***
Alcohol use: hazardous use (vs. abstinence or low risk drinking)	0.12 (0.04)**	−0.09 (0.03)**	0.09 (0.03)**	0.26 (0.03)***	0.08 (0.03)*	0.02 (0.02)
Cannabis use: hazardous use (vs. abstinence or low risk use)	0.15 (0.04)***	−0.04 (0.03)	0.08 (0.03)*	0.17 (0.03)***	0.10 (0.03)**	0.10 (0.02)***
Current treatment for a psychiatric or neurologic disorder: yes (vs. no)	−0.15 (0.03)***	0.45 (0.02)***	0.13 (0.04)***	0.09 (0.04)*	−0.36 (0.03)***	0.12 (0.02)***
Motives: personal and interpersonal benefits	−0.06 (0.04)	0.12 (0.03)***	0.10 (0.04)**	0.08 (0.04)	−0.07 (0.04)	0.15 (0.03)***
Motives: substance use regulation	0.13 (0.04)***	0.02 (0.03)	0.07 (0.04)*	0.05 (0.04)	0.07 (0.03)*	0.12 (0.02)***
Motives: coping	0.12 (0.05)*	0.10 (0.04)**	0.15 (0.05)**	0.08 (0.05)	0.06 (0.04)	0.18 (0.03)***
Motives: sleep facilitation	0.06 (0.04)	0.06 (0.03)*	0.11 (0.04)**	0.04 (0.04)	0.02 (0.04)	0.09 (0.03)***
Explained variance (R^2)	28%	35%	35%	32%	29%	34%

$N = 1313$. Values next to each predictor variable are standardized regression coefficients (β) and standard error (SE) values. Level of significance: *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$. [1]Only male and female participants were included while "other" gender group was excluded due to its small sample size. Correlations between the outcome variables are estimated, these are shown in Table S4

Table 5 Predictive effects on outcomes of BZD use in the clinical sample

	Outcome variables					
	Illegal BZD access	**Frequency of medical BZD use**	**Frequency of non-medical BZD use: greater dose or frequency**	**Frequency of non-medical BZD use: with alcohol or other substances**	**Frequency of non-medical BZD use: without medical prescription**	**BZD use disorder symptom severity**
Motives: personal and interpersonal benefits	−0.02 (0.21)	−0.18 (0.16)	−0.08 (0.17)	0.03 (0.18)	0.29 (0.18)	0.22 (0.12)
Motives: substance use regulation	0.06 (0.15)	−0.23 (0.12)	0.06 (0.13)	0.24 (0.14)	0.37 (0.12)**	−0.09 (0.07)
Motives: coping	0.20 (0.24)	0.56 (0.27)*	0.69 (0.24)**	0.73 (0.24)**	0.38 (0.21)	0.47 (0.14)**
Motives: sleep facilitation	0.28 (0.21)	−0.02 (0.22)	−0.07 (0.20)	−0.36 (0.20)	−0.34 (0.17)*	0.04 (0.13)
Explained variance (R^2)	20%	21%	37%	43%	44%	42%

$N = 66–75$. Values next to each predictor variable are standardized regression coefficients (β) and standard error (SE) values. Level of significance: *$p < 0.05$; **$p < 0.01$

Predictive Effects

Predictive effects on different outcomes of BZD use are reported in Tables 4 and 5 in the community and clinical samples, respectively. To ease the interpretation of these multivariate analyses, only the significant predictive effects related to BZD motives are reported here. In the community sample, the presence of illegal BZD access was significantly, positively, and weakly associated with "substance use regulation" and "coping" motives. Significant, positive, and weak associations were found between frequency of medical BZD use and "personal and interpersonal benefits", "coping", and "sleep facilitation" motives in the community sample. All four BZD use motives had significant, positive, and weak predictive associations with frequency of non-medical BZD use with greater dose or frequency as well as on BZD use disorder symptom severity in the community sample. Finally, a significant, positive, and weak association was found between "substance use regulation" and frequency of non-medical BZD use in the community sample.

In the clinical sample, "coping" motives had significant, positive, moderate-to-strong predictive effects on frequency of medical BZD use, frequency of non-medical BZD use with greater dose or frequency and with alcohol or other substances, and BZD use disorder symptom severity. Moreover, higher frequency of BZD use without prescription was significantly and moderately associated with higher "substance use regulation" and lower "sleep facilitation" motives in the clinical sample. However, the negative relationship with "sleep facilitation" should be interpreted with caution because the bivariate correlation with BZD use without prescription was non-significant. Therefore, this might represent a negative suppressor effect due to the high correlations between the subscales of the MBUQ-48.

Sensitivity Analyses: Post Hoc Power Analyses

Sensitivity analysis for the bivariate correlations in the community sample indicated that effects of $|r| \geq 0.07$ could be reliably detected, given a statistical power of 0.80, an alpha error probability of 0.05, two-tailed tests, and a total sample size of 1424 participants. Accordingly, all significant bivariate correlations ($|r| \geq 0.07$; see Table 3) observed in the community sample were detected with adequate statistical power. Sensitivity analysis for the bivariate correlations in the clinical sample indicated that effects of $|r| \geq 0.26$ (in absolute value) could be reliably detected, given a statistical power of 0.80, an alpha error probability of 0.05, two-tailed tests, and a total sample size of 113 participants. In the clinical sample, seven significant correlations (18.92%; $|r| = 0.19$–0.25; see Table 3) did not reach the desired statistical power threshold of 0.80.

Discussion

The present study developed a new scale for assessing different motives for BZD use and evaluated the construct and incremental validity of the developed Motives for Benzodiazepine Use Questionnaire (MBUQ-48) using community and clinical samples. To the best of the present authors' knowledge, the present study is the first to comprehensively examine the motives for BZD use and develop a new scale for assessing BZD motives. EFA and CFA identified 48 different motivations for BZD use comprising four factors: "personal and interpersonal benefits", "substance use regulation", "coping", and "sleep facilitation"

with significantly higher prevalence of all four motives in the clinical sample. Moreover, lower well-being and higher levels of stress, rumination, sleep difficulties, impulsivity, and hazardous alcohol use were reported in the clinical sample which help explain the higher presence of BZD use and higher rates of motivations.

The presence of these four factors in BZD use is consistent with the first motivational models of Cooper (1994) and Cox and Klinger (1990). However, motives for alcohol use were different in some aspects: social motives and conformity were two separate factors, while personal and interpersonal motives for BZD use in the present study included both social motives (e.g., *To have fun with my friends*) and motives related to conformity (e.g., *To fit into a group of people I like*) as well as some further motives related to positive affective changes (e.g., *To get high*), which were included in enhancement factor in case of alcohol use. In addition, sleep facilitation was not a motivation for alcohol use. This can be attributed to the fact that BZDs are also prescribed for sleeping disturbances (European Monitoring Centre for Drugs & Drug Addiction, 2021). Nevertheless, coping is a crucial motive for both substances, which may be explained by the fact that there are similarities between these substances and they often appear comorbidly (Blanco et al., 2018; Lopez et al., 2021; Maust et al., 2019). Furthermore, the strong correlation between "coping" and "personal and interpersonal benefits" motives in the present study suggests that individuals who use BZDs for coping purposes may often use these medications for personal and interpersonal benefits. "Substance use regulation" as a common motive for BZD use can also be related to the high comorbidity of BZD and alcohol use.

Overall, motives identified in the present study were mostly consistent with previous literature on this topic which have reported that anxiety/stress and/or sleep management, affect regulation, recreational motivations, and getting high were the most common motives (McCabe & Cranford, 2012; Messina et al., 2016; Rigg & Ibañez, 2010; Schepis et al., 2021). However, most of these studies examined the motives for several types of prescription medication use, not just sedatives and hypnotics. The present study is the first to focus specifically on BZDs and developed a psychometric scale for assessing BZD motives by comprehensively exploring the motives and the factors underlying BZD use which can help clinicians in the identification of individuals with BZD use disorder symptoms as well as in the development of individual treatment plans.

Moreover, the construct validity of the developed scale was also corroborated in the community and clinical samples as well across several variables correlating with distinct motives (e.g., substance use regulation with hazardous cannabis use, and coping with the presence of psychiatric or neurological disorder in the community sample; and substance use regulation with alcohol-related psychiatric disorders, and coping with non-medical BZD use in the clinical sample). In addition, several motivational factors had significant predictive effects on different outcomes of BZD use, such as substance use regulation on illegal BZD access in the community sample and coping on the frequency of non-medical BZD use in both samples. Therefore, the present study's results are consistent with previous findings which reported that motives can predict the patterns of use and substance-related problems (Grant et al., 2007; Hagfors et al., 2023; Mathieu et al., 2020; Mezquita et al., 2011; Sun et al., 2015). For example, coping has also been related to the quantity of consumption, and substance-related problems in case of alcohol and cannabis use (Grant et al., 2007; Ouellette et al., 2023; Sun et al., 2015), as well as with gambling severity (Neophytou et al., 2023). Previous studies focusing on BZD use also suggested coping (especially with anxiety and stress due to adverse life events) as one of the most common motives for problematic BZD use (Rigg & Ibañez, 2010; Stein et al., 2016). As in the present study, sleep management and decreasing the withdrawal symptoms from other

psychoactive substances have also been reported as motives for BZD use among opioid users (Stein et al., 2016).

A previous study found that those with NMU of tranquilizers to help to deal with emotions and NMU of sedatives to relieve tension or relax were more likely to report mental health problems (Drazdowski et al., 2022). However, it has also been reported that non-therapeutic motives (i.e., experimentation, curiosity or altering the effects of further psychoactive substances) for anxiolytic and sedative use are associated with a more extensive history of other substance use (McLarnon et al., 2013). It is also important to note that other studies have suggested that participants with other substance use disorders often use BZDs for reducing withdrawal symptoms from other substances or to increase the effect of these drugs (Gelkopf et al., 1999; Liebrenz et al., 2015; Rigg & Ibañez, 2010). It is consistent with the present study's result in the clinical sample: substance use regulation as a motive for BZD use was also associated with the presence of alcohol-related diagnoses.

Overall, the results regarding the motives for BZD use and the correlations of these motives are consistent with the previous literature on the motives for psychoactive substance use (four motivational types such as that found in alcohol use; the role of coping; and the relationship between specific motives and the outcomes of substance use). However, some specificities were also found regarding the motives for BZD use (e.g., "sleep facilitation" as a common motive) which draw attention to the need for exploring the characteristics of BZD users and their motivations underlying the consumption. Exploring these factors may help clinicians and mental health professionals in the recognition of the risk of BZD abuse and/or BZD use disorder by better understanding the reasons for BZD use. The WHO's (2023) guidelines draw attention to the importance of discussing the treatment options, the potential benefits and harm, side-effects, drug interactions, the importance of taking medicines as prescribed, and the potential for addiction before prescribing BZDs (World Health Organization, 2023). However, having information about the associations and the predictive effect of distinct motivational subtypes on different outcomes of BZD use may also help mental health professionals in faster and more efficient identification of BZD abuse during general health or psychological care, thereby accelerating the start of prevention and/or intervention processes.

Moreover, information about motivations for BZD use may also increase the efficiency of therapeutic processes. For example, in case of BZD use for coping, it may be important to familiarize the individual with alternative methods that can be used in situations that require everyday coping, such as stress management (Rigg & Ibañez, 2010). In addition, cognitive behavioral therapy could be recommended as the first-line treatment for insomnia to help individuals who consume BZDs for sleeping disturbances (Riemann et al., 2017). In conclusion, the findings of the present study may help develop individual treatment plans for BZD users and/or for patients with BZD use disorder.

Limitations

Some limitations of the study should be acknowledged. First, the construct validity of the scale was supported in both a community and a clinical sample. However, both of the samples were non-representative to the population of Hungary, limiting the generalizability of findings. Additionally, the sample size of the clinical sample was much smaller than the community sample, due to difficulties in accessing a large clinical population. More specifically, the low sample size of the clinical sample impeded achieving sufficient statistical power to perform EFA and/or CFA, as well as to reliably detect small

effects between BZD use motives and the validating variables. Future studies should examine the factor structure of the MBUQ-48 in a larger clinical sample as well as using nationally representative samples. This would allow for testing measurement invariance of the MBUQ-48 between clinical and community samples. Moreover, self-report scales were used during the data collection in both samples. Therefore, social desirability bias could have affected the data. The disproportionate gender distribution in the community sample should be also accounted for. However, it should be also noted that based on the previous studies on BZD use, in general, females are almost twice as likely to report BZD use compared to males (Agarwal & Landon, 2019; Olfson et al., 2015). Furthermore, it is important to note that the data of participants who identified as "other" gender were only considered in the EFA and CFA, and they were excluded from gender-based comparisons. Therefore, no conclusions can be drawn regarding the “other” gender group (i.e., those whose gender identity fell outside the binary categories of male and female) in relation to gender-related differences in motives underlying BZD use. In addition, a cross-sectional design was used in both samples. Therefore, the longitudinal psychometric characteristics of the MBUQ-48 were not evaluated (e.g., test–retest reliability, longitudinal invariance). Comparisons between the community and clinical sample were applied without measurement invariance testing due to the small sample size in the clinical sample, therefore, measurement biases might have been present. Another source of measurement bias could be that, although the community sample was relatively large, specific items had to be excluded before conducting the EFA and CFA due to extremely low or zero frequencies in some response categories. Consequently, not all motivations underlying BZD use were incorporated into the MBUQ-48. Finally, the study was conducted in Hungary. The validation of the developed MBUQ-48 on other samples and languages would increase the generalizability of the results of the resent study.

Conclusions

Overall, the validity of four existing factors underlying BZD motives identified (personal and interpersonal benefits; substance use regulation; coping; and sleep facilitation) was confirmed in both a community sample and a clinical sample and is the first study that has comprehensively examined BZD motives. Results of the study also suggested that the Motives for Benzodiazepine Use Questionnaire (MBUQ-48) is a valid and reliable scale to assess motives for BZD use, which can be a first step towards the development of an internationally uniform screening tool. Moreover, due to the BZD use motives’ associations with the outcomes of the BZD use, these results highlight the importance of considering the motivations underlying BZD use and help clinicans and mental health professionals in the development of an appropriate treatment plan.

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Data Availability The dataset used in the study will be made available upon reasonable request.

Declarations

Ethics Approval and Consent to Participate All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000. Informed consent was obtained from all patients for being included in the study.

Competing Interests The authors declare no competing interests.

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