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11 **Development and validation of the Benzodiazepine Consumption Scale (EC-BDZ) in a sample of Peruvian adults**

ABSTRACT

Objective: To develop and validate the Benzodiazepine Consumption Scale (EC-BDZ) in Peruvian adults to assess the problematic use of these substances. Method: An instrumental, cross-sectional study with a quantitative approach was developed. Psychometric analyses were applied to a pilot sample (n = 298) and a confirmatory sample (n = 518) of adults between 18 and 60 years of age. Results: The EC-BDZ showed high content validity (V > 0.70). The AFC confirmed a unidimensional structure, with factor loadings between .62 and .89, explaining 68% of the variance. The initial CFA had poor fit, but after eliminating two items (3 and 4), adequate indices were achieved (CFI = .998, TLI = .998, RMSEA = .072, SRMR = .035). The scale correlated moderately with depressive symptomatology (r = .39). Reliability was excellent (α and ω = .97). Conclusions: The EC-BDZ is a valid and reliable instrument to assess problematic benzodiazepine use in Peruvian adults, with potential for clinical and preventive application in public health contexts.

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Keywords: Benzodiazepines, consumption, psychotropic drugs, young people.

INTRODUCTION

Addiction is defined as a chronic and recurrent disorder characterized by the compulsive search and consumption of psychoactive substances despite their negative consequences (MacKillop, 2020). One of the most harmful consequences is in the brain, because it generates functional changes in the brain's circuits that are involved in reward, stress, and self-control (Dresp-Langley, 2023). In addition, they can trigger heart disease that in many cases ends in death (National Institute on Drug Abuse, 2021).

Although the consumption of psychotropic drugs is in adequate doses and/or medical prescription, it can generate dependence, physical problems, psychic alteration, emotional problems, tolerance and withdrawal syndrome, so a rigorous evaluation and gradual reduction of benzodiazepines is recommended (Mendoza et al., 2020). Important factors influencing the abuse of benzodiazepine consumption were identified, which are: Primary care physicians do not have sufficient knowledge to adequately prescribe psychotropic drugs; the lack of clinical psychologists in the face of patient demand means that not all of them can have the care that helps them stop using psychotropic drugs; Reduced psychiatric care Since most doctors are specialized in anxiety and depression as they are the most common disorders, these factors make it difficult to carry out adequate follow-up in patients who abuse benzodiazepine consumption (Coyle, 2023).

The indiscriminate use of benzodiazepines can lead to the development of chronic users who are prone to experience tolerance and dependence (Costa et al., 2020) and negatively affect cognitive performance and memory, alter motor control, and amplify the effects of other sedatives (Aitken et al., 2023; Zetsen et al., 2022; Aitken et al., 2021). Sudden discontinuation of prolonged treatments can trigger symptoms such as anxiety, panic attacks, hyperventilation, tremors, sleep disturbances, muscle spasms, loss of appetite, weight loss, visual problems, sweating, or dysphoria (Van Leeuwen et al., 2021). Therefore, it is recommended that the duration of treatment be as short as possible, avoiding exceeding four weeks in cases of insomnia and three months in treatments for anxiety, also considering the time needed to progressively reduce the dose before stopping the medication (Marin et al., 2021).

Benzodiazepines are used as central nervous system depressants, mainly affecting the inhibitory neurotransmitter GABA. Despite being effective in treating symptoms of anxiety and sleep disorders, their continued use can lead to serious dependence, including emotional and cognitive impairments (Edinoff et al., 2021). The repetitive use of psychoactive substances favors the development of dependence disorders that are considered chronic and recurrent, since their main characteristic is the uncontrollable desire for their consumption regardless of whether it may affect health or interpersonal relationships (ten Have et al., 2021).

Chronic use of benzodiazepines could alter synaptic plasticity, negatively affecting cognitive functions, mainly learning and memory. It is also associated with the alteration of the

neurotransmitter GABA, which could cause emotional dysregulation in addition to negatively influence the stress response, increasing the likelihood of creating dependence or aggravating psychiatric symptoms such as depression or anxiety (Vashchinkina, et al., 2014). Another adverse problem of benzodiazepine use is increasing the risk or aggravating symptoms in patients with liver or kidney problems since they are metabolized in the liver and tend to accumulate in lipid-rich tissues, such as body fat and the brain (Griffin et al, 2013).

Anxiolytic, sedative, muscle relaxant, and anticonvulsant medications are used to treat problems such as insomnia, panic attacks, epilepsy, and catatonia (Sobolewki, 2021). Although their use continues to increase, they present drawbacks due to a lack of knowledge about their effectiveness and their side effects, which include memory impairment, increased risk of falls (especially in older people), risk of abuse, risky behaviors, and social problems. (Valenzuela, 2024)
The anxiolytics and amnesic effects of benzodiazepines cause a loss in the restriction that governs normal social behavior and generates a reduced ability to focus on external social cues, which guide appropriate behavior. (Paton, 2002)

Regarding global prevalence, it has been found that higher benzodiazepine consumption was statistically associated with higher GDP (i.e., in high-income countries) and a higher prevalence of anxiety, self-harm, neurological disorders, chronic respiratory diseases, cardiovascular diseases, and cancers (Ma et al., 2023). The pandemic has generated many mental discomforts or illnesses in people such as anxiety, stress, or depression, leading them to consume anxiolytics for their calming effect (Garakani et al., 2020).

Another study mentions that benzodiazepine overdose deaths in the U.S. from 1999 to 2020 were from drug overdoses involving benzodiazepines and increased continuously from 1,135 in 1999 to 11,537 in 2017. It also notes that between 2017 and 2020, deaths rose again to 12,290. The large number of benzodiazepine-related deaths were in combination with synthetic opioids other than methadone (mainly fentanyl) or without any opioids at all (National Institute on Drug Abuse [NIDA], 2024).

In Cuba, results were obtained regarding the consumption of benzodiazepines. The results show that older adults who consume benzodiazepines for less than one year did not show dependence. As for 1 to 3 years, 66.7% did not show dependence. Likewise, 71.4% of those who consumed benzodiazepines aged 3 years or older had dependence (Corp Quijano et al., 2019).

There is a rapid increase in the prescription and consumption of benzodiazepines throughout Scotland. Prescribing benzodiazepines is particularly concerning and is not unusual in patients with severe chronic pain, potentially putting them at high risk of overdose and dependence (Torrance et al., 2020). Long-term use of benzodiazepines in depressive disorders is limited due to the risks of tolerance, dependence, withdrawal syndrome, and cognitive impairment among patients. Higher rates of benzodiazepine use have been observed in marginalized

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populations, such as those involved in street drug use, and among older adults (Wang et al., 2024).

A study carried out on 874 adult patients at the San Juan De Lurigancho hospital sought to establish a relationship between BZP consumption and the risk of abuse. 485 of the participants had a prescription and another 389 without a prescription. Of all the participants, only 128 needed treatments with BZP. They concluded that there is a significant relationship between self-medication and the risk of abuse (Cabanillas-Tejada et al., 2022).

A review article on BZP consumption mentions that BZPs have been prescribed for more than 50 years generally to treat anxiety and insomnia. The study highlights that there is a high risk of dependence and abuse of BZPs despite having medical supervision and accompaniment. This indicates that better regulation and monitoring of benzodiazepine use is of utmost importance (Lader, 2011). This study gives insight into the importance of creating tools that measure benzodiazepine consumption

To measure whether there is problematic benzodiazepine use, the Benzodiazepine Dependece Questionnaire (BDEPQ) was developed in Australia with 34 items divided into 3 related factors, in the general population (Baillie & Mattick, 1996). In the Netherlands, a test called Benzodiazepine Dependence Self-Report Questionnaire (Bendep – SRQ) was developed in consumer patients with 24 items and a related 4-factor model (Kan et al, 1999). Likewise, the screening test called Severity of Dependence Scale (SDS) was adapted, consisting of 5 items, for the dependent population in the Canary Islands, Spain (De las Cuevas et al., 2002), although the instrument was not specifically designed for benzodiazepine consumption, favorable results were found for the diagnosis of dependence. In all cases, favorable adjustment results were obtained, but cultural adaptations or invariance studies were not carried out in other contexts, with the exception of SDS, but benzodiazepines were no longer considered as a drug of consumption.

Therefore, the present study aims to construct and validate the Benzodiazepine Consumption Scale (EC-BDZ) in Peruvian adults, in this way it can be a useful instrument to identify problematic benzodiazepine use and highlight this public health problem.

MATERIAL AND METHODS

Design and context

The research is of non-experimental design, since the study variable was not modified. It is instrumental, because the psychometric properties of the Benzodiazepine Consumption Scale were identified, to identify problematic consumption in people between the ages of 18 and 60 years. It is quantitative in approach, because the instrument used provided numerical results, which were processed through statistical analysis. It is also cross-sectional, since it was applied at the same time (Ato et al., 2013)

Participants

The samples were obtained using the probabilistic convenience sampling method (Otzen & Manterola, 2017). Table 1 indicates that the largest number of participants were male with a percentage of 52.7%. Regarding marital status, the highest frequency was single participants with 60.7%. Likewise, in origin there was a higher frequency on the coast with 50.3%.

[Table 1]

For the confirmatory study, the sample was made up of 518 participants, where 54.05% are women, while 45.95% are men. In relation to marital status, the majority are single (76.01%), followed by cohabitants (14.67%), married (7.33%), divorced (1.15%), and widowers (0.77%). In terms of occupation, 38.99% of the participants study, 4.63% do not work or study, 35.52% work, and 20.84% work and study simultaneously. As for the origin, most of the participants are from the coast (71.04%), followed by the mountains (21.23%) and the jungle (7.72%). Regarding the academic degree, 14.67% have secondary education, 75.67% have higher education, and 9.6% have technical training. This analysis provides a detailed view of the demographic and educational characteristics of the sample under study.

[Table 2]

Instruments

The Benzodiazepine Consumption Scale was designed by Yeli Cruz, Kevin Ballivian and Nicole Bautista with the purpose of measuring the frequency of benzodiazepine consumption. This scale is one-dimensional and is composed of 20 items. The response method is a 4-choice Likert (0: never, 1: almost never, 2: sometimes, 3: almost always and 4: always).

The PHQ-9 is a scale that costs 9 items that is related to depressive symptomatology in the last 2 weeks, this questionnaire has a Likert score ranging from 0 (no day) to 3 (almost every day). The PHQ-9 scores divide 5 categories of depressive disorder severity: none (0-4 points), mild (5-9 points), moderate (10-14 points), moderately severe (15-19 points) and severe (20-27 points), studies carried out in Latin America have shown that the PHQ-9 is a reliable and valid instrument for the identification of depressive symptoms in various types of population. For this study, the modified version of the PHQ-9 was used by a group of Peruvian experts

Procedures

To carry out this work on benzodiazepine consumption, a systematic review was carried out. To ensure the accuracy and relevance of the questions, the review included scientific articles, research journals, specialist books and news sources on the use of benzodiazepines. In addition to considering the criteria for disorders related to other substances, the criteria found in the DSM-V (American Psychiatric Association, 2014).

At the end of the creation of the items, they were reviewed by 3 judges: 2 specialists in clinical psychology and a psychologist expert in teaching and research. To perform the content validation, a basis was used on 4 criteria: relevance, coherence, clarity and construct content. To do this, he used Aiken's V coefficient (Penfield & Giacobbi, 2004; Merino-Soto, 2023)

Data analysis

In the statistical analysis, the R studio software was used, the psych package was applied. The V of Aiken was estimated, considering the greater than (V > 0.70) in the indicators of representativeness, coherence and clarity valid. The Exploratory Factor Analysis was performed using the Minimal Residue extraction method, which is more robust for samples that do not present multivariate normality, and the Oblimin rotation method, likewise, the suitability of the sample was verified by the Kaiser-Meyer Olkin test (KMO > 0.50), as well as the Bartlett sphericity test (p<0.01) for the definition of factors, parallel analysis and sedimentation diagram were used. As for the factor loads of each item, they were considered adequate when they are greater than 0.30. Using the lavaan statistical package, version 0.6-7 (Jak et al., 2021), and the WLSMV (Weighted Least Squares with Adjusted Mean and Variance) estimator, a Confirmatory Factor Analysis (CFA) was carried out to determine the validity of the construct. The evaluation of the fit of the model was carried out by applying robust indices, including CFI (>0.90), TLI (>0.90) and RMSEA (<0.05), according to the guidelines recommended by Kline (2020). For reliability, McDonald's ordinal alpha and omega were acquired since this is a measure oriented to the Likert type test, values between 0.70 and 0.90 are considered appropriate for an accurate psychometric measurement (Revelle, 2021; Viladrich et al., 2017)

Ethical aspects

The project proposal was submitted to the Research Ethics Committee of the Universidad Peruana Unión, and through resolution number 2023-CE-FCS–UPEU-148, it was approved. It should be noted that the participants voluntarily approved their participation in the study, considering their decision whether to participate in the evaluation. In addition, all personal information is kept anonymous following articles 36 and 65 of the Code of Ethics of the College of Psychologists of Peru. In addition, the purposes and results of our research were communicated using clear and understandable language to avoid any situation that could jeopardize the emotional stability of the person being evaluated. In case of any problems, the contact information of the authors responsible for this research will be provided following the recommendations of the Declaration of Helsinki (World Medical Association, 2013).

RESULTS

Analysis for evidence of content validity

Table 3 shows the results of the content validity analysis. In general, a high content validity is observed, since most of the items obtained scores close to or equal to 1.00, especially in the dimensions of relevance and coherence, which indicates that the items are relevant and conceptually adequate. Items 3, 6, 8, 9, 10, 11, 12 and 13 stand out, reaching the highest score in all four criteria. However, weaknesses were identified in the clarity dimension in some items, particularly items 15, 16 and 18, with scores of 0.56 and 0.44, which allowed some words to be changed for better understanding. Item 5 showed the lowest scores in coherence (0.78), clarity (0.71) and context (0.67), so it required an in-depth review that resulted in the writing of the item having to be improved.

[Table 3]

Analysis for evidence of construct validity

Exploratory Factor Analysis

Table 4 presents the results of the Kaiser-Meyer-Olkin (KMO) sample adequacy test and the Bartlett sphericity test. The KMO value obtained was 0.97, which is considered excellent according to the criteria established by Kaiser (1974), indicating that the correlation matrix is suitable for factor analysis, since there is a high degree of intercorrelation between the items. Likewise, Bartlett's sphericity test was significant ($\chi^2 = 76.035$; $df = 19$; $p < .01$), which allows us to reject the null hypothesis that the correlation matrix is an identity matrix.

[Table 4]

In Figure 1, the parallel analysis indicates that only one factor should be retained, suggesting that the instrument has a solid one-dimensional structure. This supports the idea that all items are measuring a single underlying construct.

[Figure 1]

Table 5 shows the results of the exploratory factor analysis with Oblimin rotation applied to the 20 items of the instrument on benzodiazepine consumption, revealing a solid one-dimensional structure. All factor loads in the single factor extracted (F1) were significant, with values between .62 and .89, exceeding the minimum recommended threshold of .40, indicating that the items are adequately related to the overall construct. The commonalities (h^2) were mostly high, except for item 7 (.39), which presented the lowest proportion of variance explained by the factor. The items with the highest saturation, such as 14 (.89), 19 (.88) and 13 (.87), stand out as the most representative of the construct. Together, the model accounted for 68% of the total variance.

[Table 5]

Confirmatory Factor Analysis

Table 6 shows the descriptive values of the items where the asymmetry and kurtosis are in the range of ± 1.5, which allows us to assume the normality of the items.

[Table 6]

Table 7 presents the adjustment indices of two confirmatory models that evaluate the one-dimensional structure of the instrument to measure benzodiazepine consumption. The first model, which includes all items, shows a high chi-square value ($\chi^2 = 1366.876$; df = 170) indicating a poor fit to the model. Although incremental indices such as CFI (0.995) and TLI (0.994) are within the excellent range (≥ 0.95), the RMSEA = 0.117 with a 90% confidence interval between 0.111 and 0.122, and the SRMR = 0.063, exceed the recommended values (≤ 0.08), signaling a poor fit in terms of absolute and residual error.

In contrast, the adjusted model, which excludes items 3 and 4, shows a substantial improvement in all indicators. The chi-square value decreases to 494.537 (df = 135), which represents an acceptable fit. In addition, both CFI and TLI reach an excellent value of 0.998, while RMSEA decreases to 0.072 (90% CI [0.065 – 0.079]) and SRMR to 0.035, both within acceptable and recommended ranges.

[Table 7]

In Figure 2, the model confirms that the 18 items of the instrument are significantly loaded into a single latent factor, which supports the one-dimensional structure of the questionnaire. Although all loads are statistically significant, some variability is observed: item 8 (0.80) and item 15 (0.83) have lower loads, suggesting that these items explain a smaller proportion of the construct's variance compared to others, such as item 17 or item 18 (1.07). However, since all the loads are solid and significant, the model shows good empirical support for the factorial validity of the instrument.

[Figure 2]

Analysis for evidence of relation with depressive symptomatology

Table 8 shows the adjustment indices of the four-factor confirmatory model that includes the covariance between the latent variables BEN (benzodiazepine consumption) and PHQ9 (depressive symptomatology), evidencing an adequate fit of the model to the data. The chi-square value was $\chi^2 = 1085.090$ with 323 degrees of freedom, and although significant, it should be considered together with other indicators. Both the CFI and TLI achieved an excellent value of 0.997, indicating an outstanding fit compared to a null model. Likewise, the RMSEA was 0.068, with a 90% confidence interval between 0.063 and 0.072, within the acceptable range, while the SRMR was 0.055, also within the recommended limits. Taken together, these results support the relevance of the four-factor model and suggest a significant and well-represented relationship between benzodiazepine use and depressive symptomatology.

[Table 8]

Figure 3 shows a confirmatory structural equation model that evaluates the relationship between two latent factors: PHQ (depressive symptomatology) and BEN (benzodiazepine consumption), measured respectively by items P1 to P9 and B1 to B20. The correlation between PHQ and BEN is 0.39, suggesting a positive and moderate relationship between depressive symptomatology and problematic benzodiazepine use.

[Figure 3]

Reliability

Table 9 presents the reliability indices of the benzodiazepine consumption instrument, considering a one-dimensional structure composed of 18 items. Both Cronbach's alpha and McDonald's omega scored a value of .97, indicating excellent internal consistency. These results suggest that the items of the instrument consistently measure the same underlying construct, and that the scores derived from the test are highly reliable.

[Table 9]

Invariance analysis by sex

The multigroup measurement invariance analysis by sex for the Benzodiazepine Consumption Scale (EC-BDZ) demonstrated that the configural, metric, scalar, and strict models all showed acceptable fit indices (CFI and TLI $\geq .95$; RMSEA $\leq .065$). Moreover, chi-square difference tests between successive models were not statistically significant ($p > .05$), indicating that the imposed constraints did not significantly deteriorate model fit.

[Table 10]

DISCUSSION

The objective of this study was to construct and validate the Benzodiazepine Consumption Scale (EC-BDZ) in Peruvian adults, to have a reliable and valid instrument that allows identifying problematic benzodiazepine consumption and contributing to the approach to this public health problem.

The results showed a high content validity in criteria such as relevance, coherence and representativeness of the items. This finding is consistent with previous studies such as that of Baillie and Mattick (1996), who developed the BDEPQ in Australia with a clear and well-founded structure for measuring dependence. Likewise, De las Cuevas et al. (2002) validated the Severity of Dependence Scale (SDS) in the Canary Islands, highlighting the importance of the contextualized content of the substance evaluated. Unlike these instruments, the EC-BDZ

was designed specifically for the Peruvian context, responding to the lack of culturally adapted tools, a limitation pointed out in previous studies.

The Exploratory and Confirmatory Factor Analysis showed a one-dimensional structure with an excellent fit after eliminating two items, statistically validating the model. This structure was similar to that found by Kan et al. (1999) in the Netherlands, with their Bendep-SRQ instrument, although the latter had a four-factor structure. In contrast, CD-BDZ follows a more parsimonious model, similar to SDS, which facilitates its rapid clinical application. In addition, studies such as those by Griffin et al. (2013) have suggested that benzodiazepine use is usually expressed in a comprehensive manner, which supports a one-dimensional approach that captures the entire spectrum of addictive behaviors in a single factor.

A moderate positive correlation was observed between problematic benzodiazepine use and depressive symptoms ($r = 0.39$). This relationship has been documented in multiple studies such as those by Van Leeuwen et al. (2021) and Wang et al. (2024) who report that chronic benzodiazepine use can alter the GABA system and synaptic plasticity, exacerbating symptoms of anxiety and depression. Garakani et al. (2020) also link the increase in anxiolytic consumption during the pandemic with a deterioration in mental health, reinforcing the need to evaluate both variables together. The CD-BDZ, as it correlates significantly with the PHQ-9, demonstrates sensitivity to comorbid constructs, which increases its clinical and predictive value. In addition, epidemiological studies such as that of Ma et al. (2023) have shown a direct association between higher rates of benzodiazepine consumption and mental illnesses such as anxiety and depression globally, particularly in middle- and high-income countries. This further supports the relevance of having instruments such as the EC-BDZ, capable of detecting consumption patterns that may go unnoticed in contexts where these prescriptions are socially accepted. It is also relevant to contrast with studies that have addressed the phenomenon of self-medication. Cabanillas-Tejada et al. (2022) found a significant relationship between benzodiazepine self-medication and the risk of abuse, supporting the focus of several items of CD-BDZ that evaluate uncontrolled and out-of-context use.

Therefore, strict invariance is supported across male and female groups. This allows for valid comparisons of latent means, structural relationships, and measurement errors between sexes, supporting the use of the EC-BDZ in both clinical and research settings with mixed-gender samples.

The validation of this scale has significant clinical and social implications. First, it provides mental health professionals with an effective tool to identify patterns of problematic benzodiazepine use, even when the use has not been formally diagnosed. Second, it facilitates monitoring in community and primary care contexts, where these types of medications are frequently prescribed without sufficient specialized follow-up. In addition, the relationship found with depressive symptomatology reinforces the need for comprehensive mental health interventions.

It is recommended to apply the CD-BDZ in clinical and non-clinical populations to refine its applicability in various contexts. Likewise, it would be pertinent to carry out studies of factorial invariance and cultural adaptations in other regions of the country or in other Spanish-speaking countries. Given the elevated risk of dependence associated with long-term use of benzodiazepines, it is suggested that mental health institutions implement early detection protocols and programs to prevent the abuse of psychotropic drugs.

The CD-BDZ is a psychometrically sound, valid, and reliable instrument to assess problematic benzodiazepine use in Peruvian adults. Its application can contribute to the early detection and prevention of dependence, as well as to the design of more effective public health interventions.

Conflict of interest

KDBP, NSBD, JCCS and IACR declare that they have no conflict of interest.

Informed Consent

The project proposal was submitted to the Research Ethics Committee of the Universidad Peruana Unión, and through resolution number 2023-CE-FCS–UPEU-148, it was approved following the recommendations of the Declaration of Helsinki (World Medical Association, 2013).

Author contributions

Conceptualization: KDBP, NSBD; Methodology: KDBP, NSBD, JCCS, IACR; Formal analysis and investigation: KDBP, NSBD, JCCS, IACR; Writing - original draft preparation: KDBP, NSBD, JCCS, IACR; Writing - review and editing: KDBP, NSBD, JCCS, IACR; Resources: KDBP, NSBD; Supervision: JCCS, IACR

Data availability statement

The data that support the findings of this study are available from: https://doi.org/10.17605/OSF.IO/M8VCQ

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