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Screening properties of the DMQ-R to assess alcohol involvement in university students

Propriedades de rastreio do DMQ-R na avaliação do envolvimento com o álcool por parte dos estudantes do ensino superior

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Abstract

Aim: To evaluate the accuracy properties of the Drinking Motives Questionnaire – Revised (DMQ-R) to identify alcohol involvement in college students and, consequently, describe its predictive validity.

Methods: A cross-sectional study was performed. Through a convenience sample of 302 undergraduate students was obtained, with an average age of 20.4±2.7 years old and 52.8 were of male students. A self-reported questionnaire was used to evaluate the screening properties, ROC curve analysis was done by using the Alcohol, Smoking and Substance Involvement Screening Test (ASSIST) as gold-standard comparison.

Results: Areas under the curves ranged between .660 and .714. Values between .538 and .667, and .616 and .726 were observed for sensitivity and specificity, respectively. Also, predictive positive values ranged between .205 and .265, and between .913 and .926 for negative predictive values.

Conclusion: The present study shows the unsuitable accuracy properties of the DMQ-R to assess alcohol involvement among university.

Keywords: Alcohol drinking; Drinking behavior; College Students; Specificity; Sensitivity.

Resumo

Objetivo: Avaliar as propriedades de exatidão do *Drinking Motives Questionnaire – Revised* (DMQ-R) para identificar o envolvimento com o álcool dos estudantes do ensino superior e, consequentemente, a sua validade preditiva.

Métodos: Realizado um estudo transversal, através de uma amostra por conveniência de 302 estudantes universitários com uma idade média de 20,4±2,7 anos (52,8% do sexo masculino).

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Através de um questionário auto-reportado para avaliar as propriedades de rastreio, análises a curvas de ROC foram concretizadas, utilizando o *Alcohol, Smoking and Substance Involvement Screening Test* (ASSIST) como *gold-standard*.

Resultados: Áreas sob as curvas variaram entre 0,660 e 0,714. Valores de 0,538 e 0,667, e 0,616 e 0,726 foram observados para a sensibilidade e especificidade, respetivamente. Ainda, valores preditivos positivos variaram entre 0,205 e 0,265, e entre 0,913 e 0,926 para valores preditivos negativos.

Conclusão: O presente estudo demonstra uma inadequada propriedade de exatidão do DMQ-R para avaliar o envolvimento com o álcool em estudantes do ensino superior.

Palavras-chave: Consumo de álcool; comportamentos de consumo; Estudantes do Ensino superior; Especificidade; Sensibilidade.

Resumen:

Objetivo: Evaluar las propiedades de precisión del *Drinking Motives Questionnaire - Revised* (DMQ-R) para identificar el consumo abusivo de bebidas alcohólicas entre los estudiantes universitarios y, consecuentemente, su validad predictiva.

Metodologías: Se ha realizado un estudio transversal con una amuestra de conveniencia de 302 estudiantes universitarios con una edad media de 20.4 ± 2.7 años (de los cuales 52.8% hombres). A través de un cuestionario autocumplimentado se realizaron análisis de las curvas ROC, utilizando el *Alcohol, Smoking and Substance Involvement Screening Test (ASISST)* como el estándar de comparación para evaluar las propiedades de rastreo.

Resultados: Las áreas bajo de las curvas variaron entre 0.660 y 0.714. Se observaron valores de sensibilidad y especificidad de 0.538 a 0.667, y 0.616 a 0.726, respectivamente. Sin embargo, los valores predictivos positivos variaron entre 0,205 a 0,265, y entre 0,913 a 0,926 para los valores predictivos negativos.

Conclusiones: El presente estudio demuestra una propiedad de precisión del DMQ-R inadecuada para evaluar los consumos abusivos de bebidas alcohólicas de los estudiantes universitarios.

Palabras-clave: Consumo de alcohol; comportamientos de consumo; Estudiantes universitarios; Especificidad; Sensibilidad

Introduction

Young adults, between 16 and 22 years old (which represents the first stage of transition) (Tavares, Pereira, Gomes, Monteiro, & Gomes, 2007), especially university students, undergo through a transitional and changing phase (Arnett, 2015), commonly associated with an

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increased engagement in health risky behaviors such as the hazardous alcohol consumption (Fromme, Corbin, & Kruse, 2008). It normally represents a critical development period, in the one autonomy, independency, social identity and sense of belonging to a particular social group are developing (Scott-Sheldon, Carey, Elliott, Garey, & Carey, 2014).

Whilst the transition into university alongside interpersonal development, it can be observed an increasing in substance consumption, including alcohol (Bewick et al., 2008), leading to a higher risk of alcohol hazardous consumption behaviors in students (Arria et al., 2016).

Thus, alcohol consumption by college students is influenced by different determinants, such as age (Gasparotto, Fantineli, & Campos, 2015), sex (Kraemer, McLeish, & O'Bryan, 2015), peer pressure (Borsari & Carey, 2001), and concurrent consumption of substances (polydrug consumption) (Gebreslassie, Feleke, & Melese, 2013).

Problem statement

Among young adults, particularly university students, alcohol consumption is influenced by personal and motivational factors such as peer pressure, consumption intentions and environmental/social factors (Collins, Witkiewitz, & Larimer, 2011; Eisenberg, Golberstein, & Whitlock, 2014; Peltzer & Pengpid, 2014). These factors could increase the risk of engagement to hazardous drinking behaviors, which are commonly observed among this population (Davoren, Shiely, Byrne, & Perry, 2015).

Also, considering alcohol consumption and the development of alcohol-related problems, such as health, financial and psychosocial problems (World Health Organization, 2003), academic-related problems should not be disregarded. Regarding the latter problem, cognitive problems (learning and memory impairment) and mental health (depression and anxiety) (Centers for Disease Control and Prevention, 2018) can lead to academic impairment (Piazza-Gardner, Barry, & Merianos, 2016).

These alcohol-related problems support the need to develop health projects aiming to prevent and promote healthier behaviors towards alcohol consumption. On the other hand, these projects can be relevant to identify of at-risk students, featuring hazardous consumption behaviors, reducing alcohol-related problems.

In the context of assessing hazardous drinking behaviors, prevention and health promotion, questionnaires such as the *Alcohol, Smoking and Substance Involvement Screening Test* (ASSIST) (WHO ASSIST Working Group, 2002) and , *The Alcohol Use Disorders Identification Test (AUDIT)* (Babor, Higgins-Biddle, Saunders, & Monteiro, 2001) aim to detect the substance consumption involvement and related problems.

Nonetheless, the present paper, based on the association between drinking motives (an alcohol determinant among university students) with hazardous alcohol consumption and involvement found in the literature (Anderson, Garcia, & Dash, 2017), attempts to study the

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properties of the Portuguese version of the Drinking Motives Questionnaire-Revised (DMQ-R) (Fernandes-Jesus et al., 2016) developed by Cooper (1994) to screen hazardous alcohol consumption and its involvement.

Thus, this study is aimed to evaluate the accuracy properties of the Drinking Motives Questionnaire-Revised (DMQ-R) for the assessment of the alcohol involvement in university students and, consequently, describe its predictive validity.

Methodologies

It was performed a cross-sectional study whose population under study consisted of students enrolled in the academic year of 2016/2017, from an university of the central region of Portugal. As inclusion criteria for the sample, it was defined to be an undergraduate student and aged between 18 and 29 y.o., to enclose the emerging adulthood phase (Arnett, 2000).

Through a convenience sampling procedure, between February and May of 2017, a total of 400 students, where 98 questionnaires were excluded due to the presence of non-responses (missing responses) in ASSIST and/or DMQ-R related variables. These non-responses may be due to the sensitive nature of the questions (drinking consumption and behaviors) leading to reluctance of respondents to answer such questions (McNeeley, 2012) and also, possibly, because of the length of the questionnaire, where students possibly are more likely to abandoning the questionnaire (Manfreda, Batagelj, & Vehovar, 2006).

Thus, the study sample was composed by 302 students, with an average age of 20.4±2.7 years old and a proportion of male students of 52.8%. A prevalence of alcohol involvement of 12.9% among university students was observed.

Before the data collection, ethical approval was obtained by the Scientific Commission of the University where the sample was collected, and all participants provided written informed consent. It was asked permission to the authors in order to applicate the Portuguese version of the Drinking Motives Questionnaire – Revised (DMQ-R) (Fernandes-Jesus et al., 2016).

For data collection it was used a self-reported questionnaire, composed by: i) socio-demographic variables; ii) drinking motives related variables and iii) alcohol involvement related variables (the *Alcohol, Smoking and Substance Involvement Screening Test* – ASSIST). In the present sample, internal consistencies of ASSIST ranged between 0.556 and 0.842 (Cronbach's α).

The *Drinking Motives Questionnaire* (DMQ) was developed and applied by Cooper (1994), in order to examine 20 items comprising 4 domains (underlying 2 dimensions – valence and source) associated with alcohol consumption motives: positive and negative valence and, internal and external source of the outcomes an individual hopes to achieve by drinking. At Box 1, It could be observed the relation between the dimensions of the framework categorizing drinking motives with motivations for alcohol use

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Box 1. Relation between the framework categorizing drinking motives with motivations for alcohol use (adapted from Cooper, 1994).

	Internal source	**External source**
Positive valence	Enhancement motives	Social Motives
Negative valence	Coping motives	Conformity

This scale was validated for the Portuguese population in a multicultural study, applied in 6 European countries (Germany, Switzerland, Portugal, Italy, Denmark and England) (Fernandes-Jesus et al., 2016), where the final version of the scale for Portugal was composed of 18 items of the 20 original items. In the present paper, this questionnaire showed an adequate internal consistency, when applied to the studied sample (.748 ≤a≤.902).

With regard to ASSIST, the version used in this study is the one proposed by "General Directorate of Health Of Portugal" (Direcção-Geral da Saúde, 2014), validated for Portuguese University Students (cfr. Ramalho Mostardinha, Bartolo, Bonifácio, & Pereira, 2019), presenting an adequate internal consistency was observed regarding alcohol involvement items (Cronbach's a of .671). ASSIST enquiries about 9 psychoactive substances (such as tobacco, alcohol, cannabis, cocaine, etc) and is composed by 8 items to provide substance involvement (low, moderate or high risk) (World Health Organization, 2003).

To evaluate the screening properties of the Portuguese version of the DMQ-R (Fernandes-Jesus et al., 2016), in order to identify hazardous alcohol consumption, a ROC curve analysis was conducted, using as gold-standard for comparison the ASSIST. The ASSIST was used as gold-standard due to the association found in the literature between drinking motives and hazardous consumption (Anderson et al., 2017) and also to evaluate the Predictive Validity, of the DMQ-R, to assess harmful consumptions. Also, with this analysis it was evaluated the Predictive Validity, i.e. the prediction individual performance on some measure scores administered at a later date (Lin & Yao, 2014). ROC analysis is used by different studies to analyze this validity on scales and questionnaires on several areas (Kotz, Brown, & West, 2013; cfr. Martin & Jolly, 2002).

The areas under the curve (AUC) have been calculated and the respective 95% confidence intervals (95% CI). Still, for each domain of the DMQ-R, the appropriate cut-off point, the sensitivity and specificity, the positive (PPV) and negative predictive value (NPV), the accuracy and efficiency were assessed. The assessment of the cut-off point was performed through the observation of the highest Youden Index observed, calculated by the formula suggested by Youden (1950).

To determine the characteristics of each cut-off point in the DMQ-R score, it was considered "positive" (student with higher alcohol involvement, who needs a brief intervention need or referral to more intensive treatment), a score in the ASSIST ≥ 11 (WHO ASSIST Working Group, 2002). Lower scores were considered "negative" (students with low-risk consumption behaviors, without the need for intervention).

The score of the alcohol involvement, through ASSIST assessment was computed as explained by ASSIST Working Group (2002). For the different domains of drinking motives (coping, conformity, enhancement and social motives) and drinking motives in general (total score

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obtained from DMQ-R), the scores were computed in a scale ranging between 0 and 100, meaning that higher the score, higher the student's drinking motives.

Data analysis was performed through the *add-in* XLSAT for Microsoft Excel, using a significance level of .05 (a).

Results

Observing the table 1, related to the AUC of the different DMQ-R domains, it is noticed, when compared with the ASSIST, areas under the curve between the .660 and .717. Although the Coping domain is the only one (among the different drinking motives) which presents an AUC > .700, all areas showed the AUC significantly greater than .500 (see Figure 1).

To assess the alcohol involvement, in terms of the efficiency of each domain, it has been calculated, for all possible cut-off points, the characteristics that can be observed in table 2. In this table are presented the characteristics for the best observed cut-off points observed.

For the selected cut-off points, an efficiency between .626 (Conformity) and the .697 (Coping) is observed. Still, it presents an accuracy between .623 (Enhancement) and the .719 (Coping), i.e. a proportion of correct predictions between 62.3% and 71.9%, respectively.

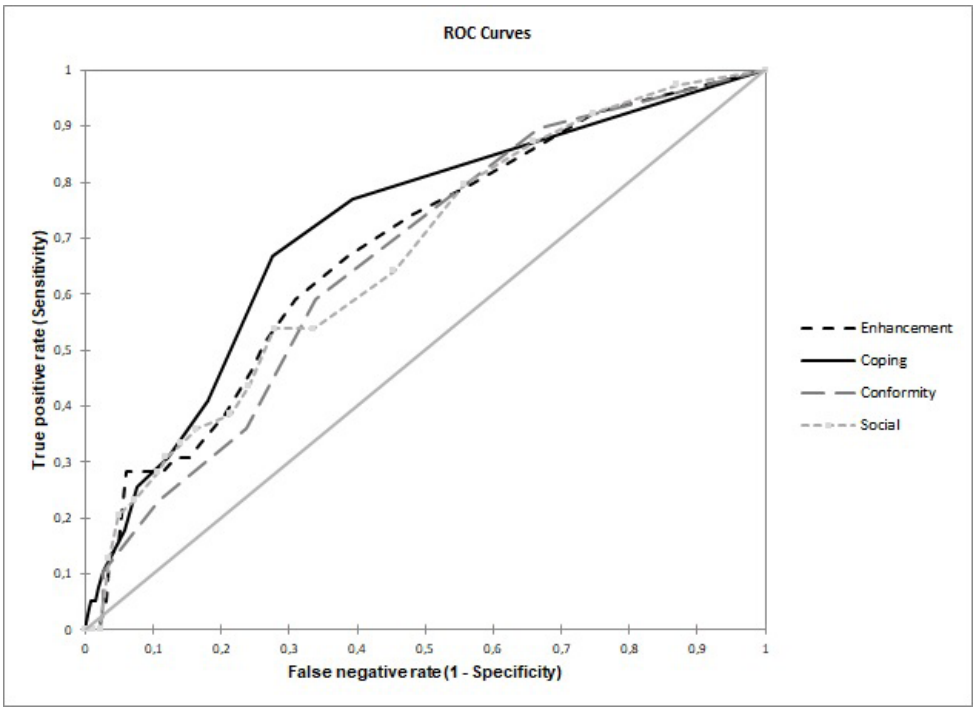

Figure 1. ROC curves for each drinking motive domain of the DMQ-R.

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Table 1. Characterization of the area under the curve (AUC) for the different drinking motives.

Drinking Motives	AUC (95% CI)	Standard error	z	p-value
Enhancement	.681 (.585;.778)	.049	3.687	<.001
Coping	.717 (.630;.805)	.045	4.862	<.001
Conformity	.660 (.572;.748)	.045	3.552	<.001
Social	.668 (.571;.765)	.049	3.387	.001

Table 2. Sensitivity, Specificity, positive predicted value (PPV), negative predictive value (NPV), accuracy, efficiency and Youden index for each cut-off from DMQ-R domains.

	Cut-off	Sensitivity (95% CI)	Specificity (95% CI)	PPV	NPV	Accuracy	Efficiency	Youden index(J)
Enhancement	≥25.0	.667 (.509;.794)	.616 (.556;.673)	.205	.926	.623	.642	.384
Coping	≥12.5	.667 (.509;.794)	.726 (.669;.777)	.265	.936	.719	.697	.274
Conformity	≥12.5	.590 (.434;.729)	.662 (.602;.716)	.205	.916	.652	.626	.338
Social	≥35.0	.538 (.386;.687)	.722 (.665;.773)	.223	.913	.699	.630	.278

The sensitivity ranged between .538 (Social) and .667 (Enhancement and Coping), meaning that the DMQ-R was able to identify between 53.8% and 66.7% of true positives (students who truly present risk for alcohol involvement).

On the other hand, the specificity of the DMQ-R ranged between .616 (Enhancement) and .726 (Coping) and therefore, having the ability to identify 61.6% to 72.6% of true negatives (students who truly do not present risk for alcohol involvement).

Also, it was noticed PPVs between .205 (Coping and Conformity) and .265 (Coping) meaning that the DMQ-R identifies a proportion of true positives (probability that true students with a positive screening test truly have alcohol involvement) to alcohol abuse among the 20.5% and 26.5%. However, it was also noticed that NPVs between .913 (Social) and .936 (Coping), i.e. the DMQ-R identifies a proportion of true negatives between the 93.6% and 91.3% (probability that the students with a negative screening test truly do not have alcohol involvement).

Discussion

In the present study, the different domains of the DMQ-R showed a fair accuracy for Coping Drinking Motives and a poor accuracy for the other domains. Additionally, through the observation of sensitivity, specificity, PPVs, NPVs values, this questionnaire did not show adequate properties for the assessment of the alcohol involvement in university students. Hence, the DMQ-R do not present a suitable Predictive Validity to assess hazardous alcohol consumption by university students.

It should be noted that the values of sensitivity and specificity, PPV and NPV, are influenced by the selected cut-off (decided through the observation of the Youden index).

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Still, the predictive values observed are conditioned by the prevalence of alcohol involvement at a given cut-off (Naeger et al., 2013). The obtained PPVs are low, however this values are affected by the i) prevalence of alcohol involvement in the sample (the higher the prevalence, the higher the PPV) and ii) specificity of the instrument (when the prevalence is low, a greater specificity is required to increase the PPV) (Gordis, 2011).

In the context of primary prevention, the DMQ-R shows not to be appropriate to apply in a context of health intervention projects developed to improve and change behaviors and attitudes through interventions such as brief motivational interventions, psycho-educational interventions and health education sessions, at a secondary (routine screening focused in example detecting hazardous consumption) and tertiary (focused on the treatment and management of conditions related to alcohol consumption) levels of prevention (secondary and tertiary level of prevention were defined accordingly Gordis, 2011).

Concerning the different motives of the DMQ-R, observing the AUCs, the domain of Coping Motives was the one which presented a greater AUC, followed by the Enhancement, Social and, finally, the Conformity drinking motives.

According to the evidence, coping motives are significantly associated with alcohol consumption consequences (Merrill, Wardell, & Read, 2014) and with the motivational systems underlying sensitivity to punishment (Studer et al., 2016) and, the Enhancement motives are indirectly associated with those consequences (Merrill et al., 2014). These associations may explain the accuracy values observed for Coping and Enhancement drinking motives. On the other hand, Conformity and Social motives do not have direct or indirect effects with alcohol consumption and its consequences (Merrill et al., 2014), which may explain the lower areas under the curves.

This study presents as main limitation the geographical restriction of the sample because all students included belonged to the same University. Also, the possible presence of the social desirability bias, due to the sensitive nature of the assessed variables, could influenced students' alcohol consumption behaviors evaluation. However, by observing the AUCs of the different drinking motives, this results agreed with the evidence found regarding de relation between alcohol consumption and drinking motives (Merrill et al., 2014; Studer et al., 2016).

However, the DMQ-R could be useful to be used in the research context, due to its screening characteristics and to its self-completion capability without the need of an interview between health professional with the student, which may decrease the social desirability bias (Grimm, 2010). So, future research may focus on the study of the accuracy properties of the DMQ-R, using as gold-standard other instruments which assess alcohol involvement and/or alcohol related-problems, i.e., to assess DMQ-R predictive validity when used to evaluate alcohol involvement, and to evaluate its efficiency as a self-reported and self-completion tool.

Conclusions

The present study provides evidence concerning DMQ-R accuracy properties to assess alcohol involvement among university studies, being unsuitable and not recommended for screening hazardous alcohol consumption among this population.

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