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Examining the alcohol-related consequences of adult drinkers who self-report medicating low mood with alcohol: an analysis of the 2001-2002 National Epidemiologic Survey on Alcohol and Related Conditions survey data.

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Abstract

The aim of this paper is to examine the alcohol-related consequences experienced by adults who experienced a two-week period of low mood and identify as a 'self-mediator' compared to those who do not. Our focus is on assessing whether the conceptualization of alcohol use disorder severity differs across adult drinkers who self-medicate with alcohol during a period of low mood, compared to those who do not. This study used secondary data from the NESARC survey. The analytic sample consisted of 5945 participants who answered questions from the alcohol abuse/dependence (alcohol experiences) section, in the last 12 months. The sample was split into four groups by whether they self-medicated with alcohol or not, and drank alcohol in the last year and their drinking class. The findings indicated that a one factor model was the best fit and all items were a strong indicator of alcohol use disorder. The two-parameter model had the best fit, indicating that the diagnostic criteria were placed as a good fit along a continuum of severity. It was revealed that the hazardous drinking group who self-medicated, experienced more consequences even at low levels of severity. As the self-medicating hazardous drinking group also showed the highest estimates for alcohol use disorder severity, this may indicate that this group are high functioning self-medicators who are trying to regulate their drinking, and may not be as clinically high risk as expected, due to their drinking patterns.

Introduction

First introduced by Khantzian (1985), the self-medication hypothesis (SMH) purports that individuals use substances, such as drugs or alcohol, as a coping mechanism to help alleviate psychological distress during periods of emotional disturbance. Use of drugs or alcohol in this way is a concerning health behavior. Although alcohol use (the focus of this study) may temporarily relieve feelings of psychological distress, for many individuals, increased alcohol consumption over time is likely necessary to experience the same level of psychological relief (due to the development of increased tolerance for alcohol), and drinking higher volumes of alcohols, coupled with greater frequency of use, is likely to not only exacerbate feelings of psychological distress, but may lead the individual to experience alcohol-related consequences (e.g. impaired relationships, difficulties with occupational functioning, etc.) or other negative outcomes.

Various strands of evidence have been put forward in support of the validity of the SMH. At the broadest diagnostic level, several studies have demonstrated that the most common pattern of temporal onset is whereby a primary diagnosis of a mood disorder (e.g., major depression) is typically followed by the onset of secondary alcohol use disorder, rather than vice versa (Turner et al., 2017). Other studies have focused directly on examining the associations between general alcohol use patterns and associated levels of depression, with varying results. For example, in their analysis of the 2014 Health Survey for England data, Awaworyi and Churchill (2017) demonstrated that consumption intensity, but not frequency, was statistically correlated with self-reported depression. Bell and Britton (2015) found that consumption of alcohol increased in response to stress and low mood, and consumption also increased when adults had the opportunity to attend more social events because they had fewer social/occupation/family responsibilities.

Whilst evidence of this nature demonstrates quite compelling support for the SMH, it does not provide a detailed understanding as to how individuals who purposively use alcohol to improve their low mood (i.e., ‘self-medicators’) consume alcohol (e.g., type of beverages consumed, quantity or frequency patterns, context in which alcohol is consumed), or what type of alcohol-related consequences (besides increased tolerance) they might experience in attempting to ameliorate their psychological distress through alcohol use. Information of this nature is important to help direct intervention efforts to decrease the level of harm self-medicators are exposed to, which includes an increased risk of developing an alcohol use disorder, as well as a host of other adverse health-related outcomes, including psychiatric comorbidity, high levels of stress and dysfunction, suicidal behaviour, and low levels of health-related quality of life (Turner et al., 2017).

Our work in the area of self-medication has focused on analyzing data from the 2001-2002 National Epidemiologic Survey on Alcohol and Related Conditions (NESARC; Grant et al., 2005). In addition to its broad assessment of major depressive disorder and alcohol use disorder according to the DSM-IV classification system, the 2001-2002 NESARC included a unique design feature to allow adult drinkers the opportunity to identify as a ‘self-medicator’ (i.e., they were asked: *did you ever drink alcohol to improve your mood or make yourself feel better when you felt sad, blue, depressed or down/didn’t care about things or enjoy things for at least two weeks?*’). Using this data, we recently compared the past year drinking patterns for a large group of adult drinkers (n=5900) who experienced a two-week period (or more) of low mood and who reported that their alcohol use was motivated by an attempt to improve their low mood (Mc Hugh & McBride, 2020). We found evidence of important differences between adult drinkers who identified as a ‘self-medicator’ compared to those who did not:

self-medicators were distinct in their drinking patterns – either hazardous drinking or low risk use - whereas non-self-medicators were classified as normal or very seldom drinkers. In short, only evidence for a problematic drinking pattern emerged in the self-medicating group and, as motivation for this group was to use alcohol to improve their mood, this motivation appeared to be associated with more hazardous patterns of use. Evidence for a hazardous drinking pattern was not found for individuals who used alcohol while experiencing low mood, without this motivation.

In this paper, we continue to pursue this line of investigation to examine the alcohol-related consequences experienced by adults who experienced a two-week period of low mood and identify as a ‘self-mediator’ compared to those who do not. Previous research studies using this survey data have demonstrated quite broad support for a uni-dimensional construct of alcohol use disorder severity underpinning the DSM-IV diagnostic criteria for alcohol abuse and dependence (Lynskey & Agrawal, 2007; Saha et al., 2006; Beseler et al., 2010) as measured by the Alcohol Use Disorder and Associated Disabilities Interview Schedule (AUDADIS-IV; Grant and Dawson, 2001). Indeed, evidence from this body of research directly informed the DSM’s re-classification of alcohol use disorders in its most recent 2013 edition (DSM-5). Here, our focus is on assessing whether the conceptualization of alcohol use disorder severity differs across adult drinkers who self-medicate with alcohol during a period of low mood, compared to those who do not. To achieve this goal, we first aim to replicate the uni-dimensional alcohol use disorder continuum in our sub-sample of interest (i.e., adult drinkers who provided data on their experiences of self-medication during a period of low mood) using confirmatory factor analysis. Next, we compare the characteristics of this alcohol use disorder continuum across our sub-sample of interest using a multiple group model. Specifically, we hypothesis, based on our previous work on alcohol use patterns (Mc

Hugh & McBride, 2020), that self-medicators will experience more alcohol related consequences.

Materials and Methods

Survey

The 2001-2002 National Epidemiologic Survey on Alcohol and Related Conditions (NESARC; Grant et al., 2005) was a national household survey (n=43,093) conducted on the United States civilian, non-institutionalised, adult population, by the National Institute on Alcohol Abuse and Alcoholism. Specific racial groups including African Americans and Hispanics were oversampled, as well as young adults. The overall response rate was 81%.

Measures

AUDADIS-IV

The Alcohol Use Disorders and Associated Disabilities Interview Schedule DSM-IV version (AUDADIS-IV) was the structured interview used in the NESARC, in conjunction with the Diagnostic and Statistical Manual of Mental Disorders Fourth Edition (DSM-IV). Reliability and validity of the AUDADIS-IV diagnoses ranged from fair to excellent (Grant et al., 2003).

DSM-IV Alcohol use disorders

Adults who consumed at least one alcoholic drink (10g of alcohol) in the year prior to the interview were asked a series of 38 item symptom questions used to operationalize eleven binary coded DSM-IV alcohol use disorder criteria to indicate the presence or absence of the following each criteria over the last year: (1) Major role obligations not met (Role); (2) Continued use despite friend/family problems (Interpersonal), (3) Use in hazardous situations

(Hazard); (4) Legal problems (Legal); (5) Effect of drinking (Tolerance); (6) Aftereffects of drinking (Withdrawal); (7) Drinking larger amounts over a longer period of time (Longer); (8) Unsuccessful efforts to cut down or control drinking (Quit); (9) Reduced pleasurable activities (Social); (10) Substantial time spent procuring, using or recovering from drinking (Timespent); (11) Continued to drink despite physical/psychological problems (PhyPsych).

DSM-IV Major Depression

In NESARC, the diagnostic module for DSM-IV major depression begins with two stem questions to ascertain whether the respondent experienced the two core diagnostic criteria for a major depressive episode: low mood (dysphoria) and loss of interest (anhedonia), with at least four of eight additional criteria that lasted two weeks, in their lifetime. Only participants who experienced either one or both of these symptoms completed the remaining questions relating to depression (n=13,753).

Analytic sample

The analytic sample was reduced further to 5945 participants as it consisted of only those who answered questions from Section 2B: alcohol abuse/dependence (alcohol experiences) in the last 12 months. The sub-sample used in this study comprised of past-year adult drinkers who: (1) reported experiencing a period of two-weeks or more then they experienced low mood and/or anhedonia; and (2) provided data as to whether they used alcohol to improve their low mood during this period (n=5900). We previously identified (Mc Hugh & McBride, 2020), using a multiple group latent class model, four unobserved drinking groups (or classes) in our target sub-sample of adult drinkers: (1) self-medicating hazardous drinkers (2) self-medicating seldom-drinkers (3) non-self-medicating normal drinkers and (4) non-self-medicating very seldom drinkers. The main differences between the two groups were the two

classes of ‘normal drinkers’ and ‘hazardous drinkers.’ Using the posterior probabilities, most likely class membership was saved as a four-category observed variable (i.e., self-medicating hazardous drinkers, self-medicating seldom-drinkers, non-self-medicating normal drinkers, and non-self-medicating very seldom drinkers). Dummy variables were created to compare each drinking group to the ‘very seldom drinkers’ reference group. Table 1 describes the age and gender profile of the four drinking classes (seldom drinkers, normal drinkers, very seldom drinkers and hazardous drinkers).

Insert Table 1 about here

Analytic plan

All of the analyses were conducted using MPlus version 7.2 (Muthén & Muthén, 1998-2018). The analysis conducted in this study was in two main stages, described below.

Stage 1 - Confirmatory Factor Analysis (CFA)

The first aim of this study was to confirm whether the 38 item symptom questions used to operationalize the DSM-IV alcohol use disorder criteria in the AUDADIS-IV assessed a uni-dimensional model of alcohol use disorder. In the first stage of the analysis, confirmatory factor analysis (CFA) was conducted to assess the dimensionality of the symptom questions. Previous research has suggested that a one factor model is robustly measured by these 11 criteria, and that they are representing different severities of alcohol use disorder, and not two separate ‘conditions’ (alcohol abuse and alcohol dependence) as outlined by the DSM-IV (Langenbucher et al., 2000). The analysis included the 11 items that were deduced from the 38 items in the AUDADIS-IV assessment. This analysis was conducted, using robust

weighted least squares estimator (WLSMV). The WLSMV is considered to be the best estimator for modelling categorical data (Brown, 2006).

Stage 2 – IRT model

The second aim was to explore the drinking patterns of those who self-medicate low mood with alcohol on the latent continuum of alcohol use disorder, using IRT analysis. The first factor model (a one parameter Rasch model) supports the idea that each of the 11 criteria have a relatively similar ability to discriminate between the individuals in the sample at the same level and severity of alcohol use, and that all items are the same severity of alcohol use disorder. In this model, the discrimination parameters are constrained to be equal for all items.

The two parameter model estimates both the discrimination and severity parameters, exploring the underlying latent continuum of alcohol use disorder, and that there is meaningful differences between items and where they sit in regards to severity of alcohol use disorder. This model is more parsimonious and the assumptions of a one parameter model are relaxed. Goodness of fit statistics are used to compare both of these models, and the model with the smallest values is considered to be the best fit.

To explore whether the four groups are different in regards to the alcohol use disorder continuum factor, the dummy coded covariates of drinking classes (seldom drinkers, normal drinkers, hazardous drinkers) are regressed on the best fitting model, and using the item discrimination and severity parameters, these are compared to the reference group of very seldom drinkers. The observed variable of drinking class was measured through the 'knownclass' command in MPlus, which treats it as a categorical latent variable, which aims to establish separate results for each drinking class group.

Results

Stage 1: Confirmatory factor analysis

Table 2 shows the results of the CFA. The factor loadings are shown for a one factor structure below (Table 2) for the latent structure of alcohol use disorder. Stevens (1992) suggested using a cut-off of 0.4, irrespective of sample size, for interpretative purposes.

Insert Table 2 about here

Stage 2: IRT analysis

The estimates for the one-parameter and two-parameter IRT models and goodness of fit statistics are presented in Table 3. The chi-square difference test (TRd) using the loglikelihood values and scaling correction factors obtained using MLR estimator (Muthén & Muthén, 2018) indicated that the two-parameter model was a superior fit to the data [TRd=177.034, $p < 0.001$]. The other fit statistics (AIC, BIC, ssa-BIC) were lower for the two-parameter model compared to the one-parameter model, which also supports the superiority of the two-parameter model. All of the factor loadings in the two-parameter model were strong, positive, and statistically significant ($p < 0.001$).

Insert Table 3 about here

Prior to conducting the multiple-group IRT model, the observed self-medicator drinking status variable (dummy coded to compared seldom, normal and hazardous drinkers to the non-self-medicating very seldom drinker group) was regressed on the two-parameter model of alcohol use disorder to test for differences at the latent level between each group. Table 4

outlines the regression coefficients and standard error results for the model (loglikelihood= -11216.192; AIC = 22482.384; BIC = 22649.641; SSABIC = 22570.198). The results show that compared to the very seldom group of drinkers, all other groups (seldom, normal and hazardous drinkers) were statistically more likely to have higher mean estimates for alcohol use disorder, with the hazardous drinking group showing the highest mean estimates.

Insert Table 4 about here

Item characteristic curves (ICC) derived from the multiple-group analysis using the preferred two-parameter models are presented in Figure 1 (Panel A: non-self-medicating very seldom drinkers; Panel B: non-self-medicating normal drinkers; Panel C: self-medicating seldom-drinkers; and Panel D self-medicating hazardous drinkers). Each curve represents the probability of endorsing a diagnostic criteria with increasing severity on the alcohol use disorder continuum, which are derived from the item discrimination and severity estimates presented in Table 5. The curves for the non-self-medicating very seldom' drinking group (Panel A) are mostly cut off, and the items do not appear to be endorsed by this group. There are clear and obvious differences between some of the groups, however, the self-medicating 'seldom' drink (Panel B) and non-self-medicating 'normal' drinker (Panel C) groups appear to have quite similar curves. For the 'seldom' and 'normal' drinking groups, most of the curves are cut off, so the items are not really being endorsed by these types of drinkers. This implies that drinkers in both of these groups have a low probability of endorsing these criteria, which fits as they rarely use alcohol to a hazardous extent. The most common consequence experienced in this group was 'interpersonal,' however, only at the moderate/severe end of the continuum. The ICCs for the non-self-medicating 'normal drinker' group (Panel C) are slightly tighter than the self-medicating 'seldom drinker' group

(Panel B), which indicates a slightly higher probability of endorsing these criteria, but overall these groups appear to be similar with regards to drinking-related criteria, despite differing in terms of drinking patterns.

In the self-medicating ‘hazardous’ drinking group (Panel D, Figure. 1), the ICC curve much earlier on the continuum, and some criteria are experienced quite quickly, meaning they do not have to have a lot of alcohol use problems before they are experiencing these criteria, which may be in response to their hazardous drinking, as they are trying to curtail it. Criteria such as ‘legal,’ ‘social’ and ‘role’ are less commonly endorsed in this group, only further along and at a more severe point of alcohol use, indicating that they this group have a lower risk of experiencing these type of criteria. Experiences of alcohol-related consequences such as ‘interpersonal,’ ‘timespent,’ ‘tolerance’, and ‘withdrawal’ are common and at more moderate levels of severity on the alcohol use continuum. This may indicate that these individuals may have high levels of severity, in that they have a large probability of endorsing all of the criteria placed at the lower ends of the continuum.

Insert Table 5 about here

Discussion

This study aimed to extend the existing evidence base on the important topic of self-medication of low mood with alcohol use by interrogating survey data collected from a large, nationally representative sample of adults who self-reported that they had engaged in this potentially hazardous health behaviour. Specifically, we extended the focus of investigation beyond patterns of alcohol use as a coping mechanism to ameliorate low mood, to compare how the alcohol-related consequences of adults who self-medicate low mood with alcohol compared to adults who do not.

As a preliminary first step to achieving this aim, we found, consistent with previous research (Martin et al., 2006; Saha et al., 2006; Hagman & Cohn, 2018), strong evidence that the 11 diagnostic criteria for DSM-IV alcohol use disorders, as assessed by the AUDADIS-IV in the 2001-2002 NESARC, tapped into a continuum of alcohol use disorder severity in other study sample. Our findings indicate that compared to the non-self-medicating ‘very seldom’ group of drinkers, all other self-medicating drinking groups were statistically more likely to have higher mean estimates for alcohol use disorder severity, with the self-medicating hazardous drinking group having the highest mean estimates of alcohol use disorder severity.

The main findings from subsequent analyses examining how the position of the diagnostic criteria along this continuum varied by self-medicating and drinking group status revealed some important findings. First, the self-medicating hazardous drinking group experienced a wide range of alcohol-related criteria, even at low levels of alcohol use disorder severity. At the most severe end, were legal problems, reduced social pleasurable activities and major role obligations not met. Although the legal problem criteria has now been dropped from the DSM-5, the current findings suggest that it may be an important indicator for those who self-

medicate and are trying to function, and may be experiencing problems trying to hide their problematic alcohol use (e.g., driving while under the influence or experiencing domestic violence related issues). This highlights an important consideration as the association between sensation-seeking behaviors and alcohol use does not extend to the quantity or type of alcohol use in the literature (Lydon-Staley, Falk & Bassett, 2020). For this group, interpersonal difficulties with family and friends, tolerance and withdrawal issues and substantial time spent procuring, using or recovering from drinking were also evident. Most alcohol-related criteria were experienced at this moderate range of alcohol use disorder problems, and not at a severe chronic alcohol use point, as was expected. The middle region of the continuum is where most criteria are experienced in the self-medicating hazardous drinking group, indicating moderate severity of alcohol use disorder.

Previous research has highlighted the effects of use of harmful drinking on family relationships, friendships and work colleagues (Walters & Simons, 2020; Murase, Simons & Simons, 2021). The importance of these findings is the indication of how self-medicating low mood with alcohol can have a high impact on interpersonal relationships. For example, an individual may be experiencing low mood due to relationship difficulties, which may lead them to use alcohol in a hazardous way to self-medicate, resulting in more interpersonal and familial or friend problems. This is a key point for therapeutic intervention. Also, the fact that most of the hazardous drinkers were placed at the moderate region of the alcohol use disorder continuum, and not at the severe end, as expected, indicates that this group of drinkers may be high functioning; still fulfilling their 'roles' but still causing problems with their family or friends, still experiencing tolerance and withdrawal issues and spending a lot of time sourcing, using or recovering from drinking. This indicates that alcohol use is large part of their day to day lives.

Strengths and Limitations

The novel aspect is the fact that the types of drinkers used were derived from previous analyses (Mc Hugh & McBride, 2020), distinguishing four types of drinkers based on whether these individuals self-medicate their low mood with alcohol. The finding that those who self-medicate and drink alcohol in a hazardous way, experienced the most alcohol related criteria is important because it highlights what difficulties these individuals are experiencing when they self-medicate low mood by engaging in a hazardous drinking pattern.

There are several limitations to this study. The study did not explore how the items would have performed for specific samples (e.g., sex, age, ethnicity, etc). This was due to the fact that the numbers in each group would have been too small, to produce any meaningful insights. This study focused solely on alcohol use and did not consider use of other substances or drugs for similar reasons. Also, as the data used was from a US population, this does not represent all drinking cultures, however, the findings may be generalisable to cultures with similar drinking patterns. In regards to the data used, questions on frequency of use referred to the last 12 months, which was a limited time frame. The criteria of legal problems, which has been removed from the DSM-5, was included in this study, and the new criteria of cravings was not included. The rationale for this was that research has suggested that the craving criteria did not provide additional information in the context of other changes (Keyes et al., 2011).

Implications

The findings highlight an insight into the types of alcohol related criteria experienced by different types of drinkers, with the self-medicating hazardous drinking group experiencing

more common consequences at a moderate levels of the alcohol use disorder severity. These findings highlight the impact of self-medication of low mood with alcohol, and suggest that more research is required to understand how individuals who engage in this behaviour may be a more vulnerable group in terms of alcohol use disorder severity and of experiencing specific alcohol-related consequences.

The main findings provide a unique contribution to a gap in research to provide insight into the consequences experienced by those who specifically self-medicate their depression with alcohol use. The middle region of the continuum is where most criteria were experienced in the hazardous group of drinkers, indicating moderate severity of alcohol use, and not severe chronic alcohol use. It is also possible that this group may under report as they become habituated or used to effects, and this should also be considered.

Conclusion

The self-medicating hazardous drinking group had the highest estimates for alcohol use disorder severity when compared to other drinking groups who experienced low mood but did not use alcohol as a coping mechanism. This may indicate that this group are high functioning self-medicators who are trying to regulate their drinking, and may not be as clinically high risk as expected, due to their drinking patterns. They may still be able to fulfil their roles but problems may occur with relationships, tolerance and withdrawal, and spend a lot of time sourcing, using or recovering from alcohol. It also highlights key points for intervention which may impact both the individual's low mood and drinking patterns. These findings are also important to inform DSM and ICD classifications in regards to the criteria of legal problems, which has been removed from the DSM-5, but was included and significant in this study.

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Table 1: Age and gender profile of self-medicating drinking groups .

	Non-self medicators Very seldom drinkers		Non-self-medicators Normal drinkers		Self-medicators Seldom drinkers		Self-medicators Hazardous drinkers	
	N	%	N	%	N	%	N	%
<i>Gender</i>								
Male	778	24.1	692	46.1	100	44.6	68	61.3
Female	2451	75.9	808	53.9	124	55.4	43	38.7
<i>Age group (years)</i>								
18-29	696	21.5	360	24.0	75	33.5	37	33.4
30-44	1203	37.3	538	35.9	93	41.5	38	34.2
45-64	1079	33.4	506	33.7	44	19.6	29	26.1
65 and over	251	7.8	96	6.4	12	5.4	7	6.3

Table 2: Factor loadings for symptom criteria of alcohol use disorder

Symptom criteria	Model 1 Alcohol use disorder
Role	0.92
Interpersonal	0.94
Hazard	0.76
Legal	0.78
Tolerance	0.81
Withdrawal	0.87
Longer	0.89
Quit	0.80
Social	0.92
Timespent	0.91
Phypsych	0.91

Table 3: Parameter estimates and goodness of fit statistics for the one-parameter and two-parameter item response theory (IRT) models.

DSM-IV diagnostic criteria for alcohol use disorder	Models					
	One-parameter model			Two-parameter model		
	Factor loading	Item discrimination	Item severity	Factor loading	Item discrimination	Item severity
Role	0.853	2.969	2.230	0.915	4.107	2.065
Interpersonal	0.853	2.969	2.153	0.943	5.120	1.938
Hazard	0.853	2.969	1.342	0.761	2.127	1.501
Legal	0.853	2.969	2.515	0.777	2.241	2.754
Tolerance	0.853	2.969	1.438	0.809	2.494	1.521
Withdrawal	0.853	2.969	1.370	0.869	3.193	1.355
Longer	0.853	2.969	1.134	0.894	3.626	1.095
Quit	0.853	2.969	1.260	0.798	2.405	1.349
Social	0.853	2.969	2.380	0.918	4.212	2.187
Timespent	0.853	2.969	1.887	0.905	3.865	1.781
Phpsych	0.853	2.969	1.605	0.906	3.874	1.524
Fit statistics						
Loglikelihood	-122291.473			-12291.473		
Scaling correction factor for MLR	1.5904			1.5769		
Number of free parameters	12			22		
AIC	24606.946			22482.384		
BIC	24687.229			22649.641		
ssa-BIC	24649.097			22570.198		

Note. AIC = Akaike information criterion; BIC = Bayesian information criterion; ssa-BIC = sample-size adjusted BIC; MLR=maximum likelihood estimator with robust standard errors

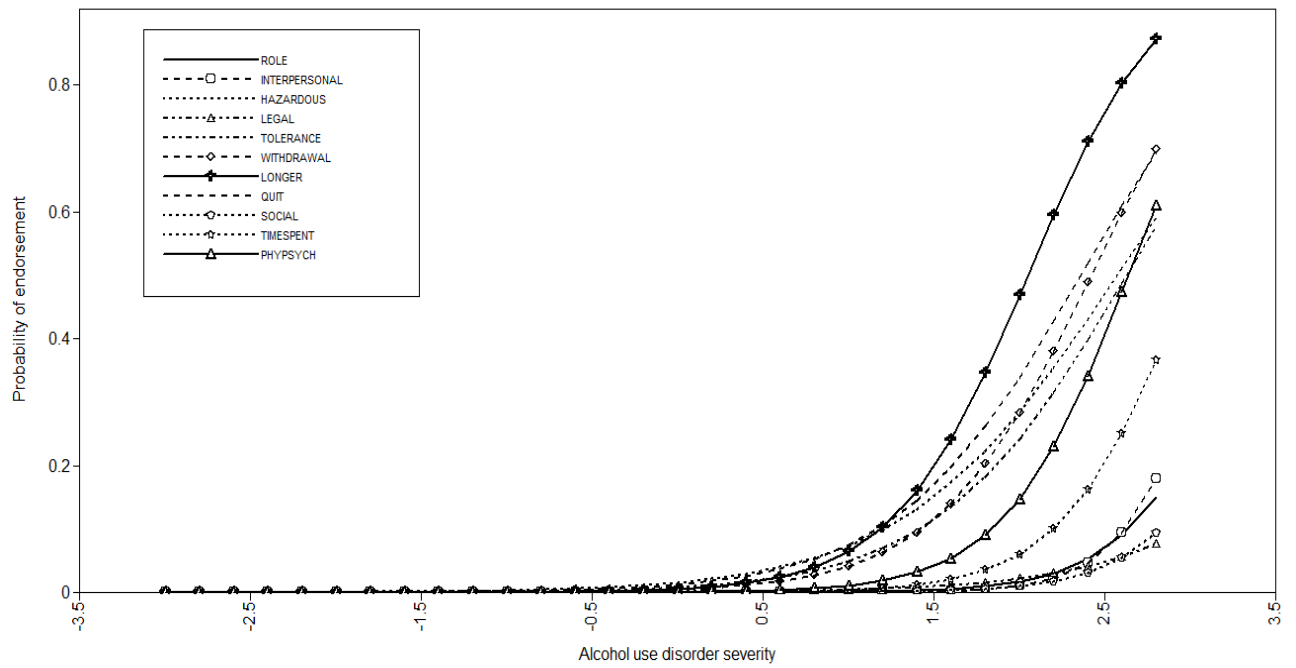
Table 4: Estimated effects of self-medicating drinker groups on alcohol use disorder factor.

Drinking group	Alcohol use disorder Coefficient	Standard error
Very seldom (r)		
Seldom	0.269	0.017
Normal	0.348	0.011
Hazardous	0.537	0.015

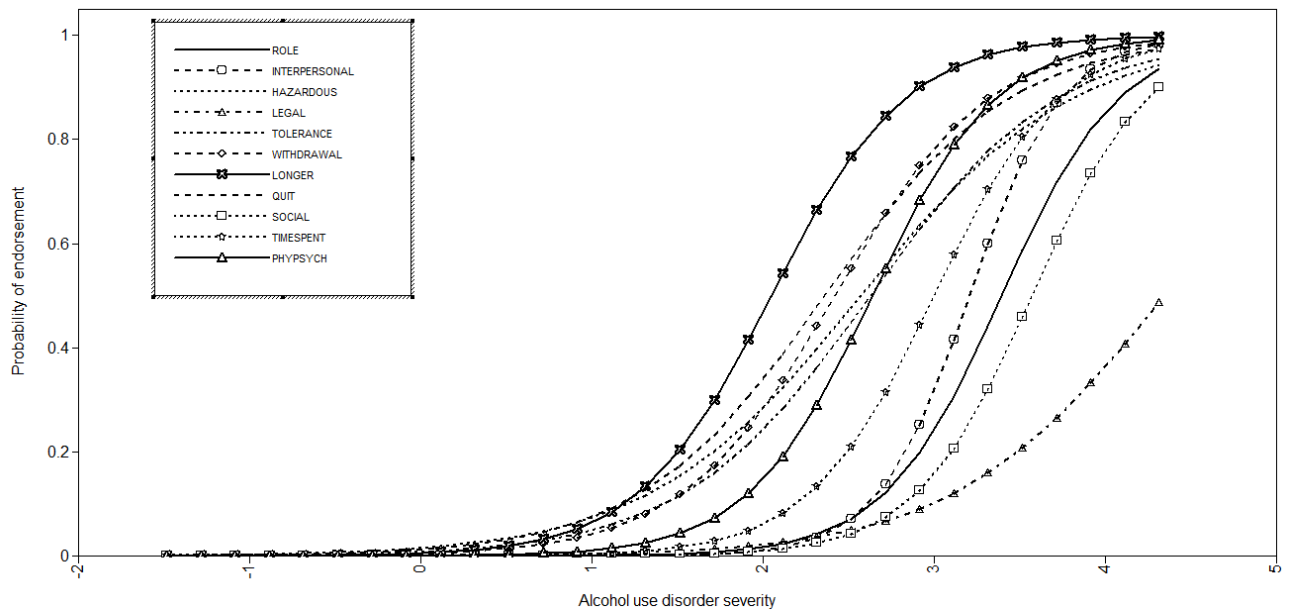
Note: r = reference group. All coefficients were statistically significant ($p < 0.01$).

Table 5: Parameter estimates obtained from the multiple-group item response theory (IRT) analysis for a two-parameter model of alcohol use disorder severity by self-medicating drinking status group

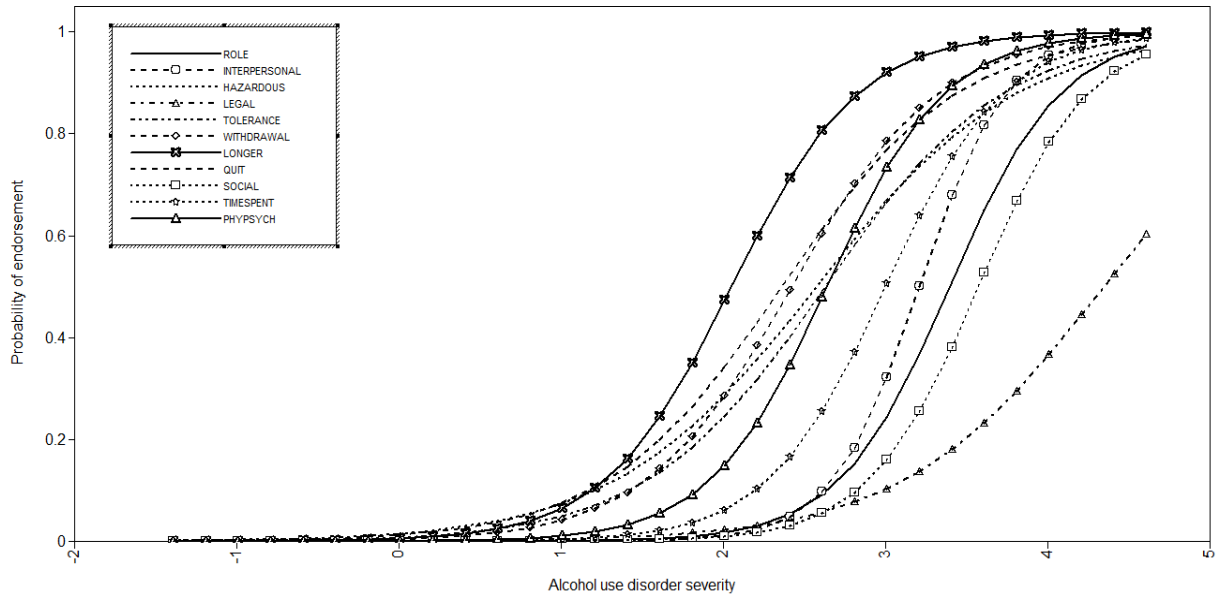
DSM-IV alcohol use disorder criteria	Observed groups										
	Non-self-medicating Very seldom drinkers			Non-self-medicating Normal drinkers			Self-medicating Seldom drinkers			Self-medicating Hazardous drinkers	
	Factor loading	Item discrimination	Item severity	Factor loading	Item discrimination	Item severity	Factor loading	Item discrimination	Item severity	Factor loading	Item discrimination
Role	0.849	2.919	0.366	0.849	2.919	1.787	0.849	2.919	0.080	0.849	2.919
Interpersonal	0.900	3.735	0.179	0.900	3.735	1.600	0.900	3.735	0.061	0.900	3.735
Hazard	0.664	1.610	-0.457	0.664	1.610	0.964	0.664	1.610	0.068	0.664	1.610
Legal	0.665	1.614	1.318	0.665	1.614	2.739	0.665	1.614	0.199	0.665	1.614
Tolerance	0.708	1.817	-0.401	0.708	1.817	1.020	0.708	1.817	0.059	0.708	1.817
Withdrawal	0.774	2.215	-0.608	0.774	2.215	0.813	0.774	2.215	0.051	0.774	2.215
Longer	0.815	2.554	-0.979	0.815	2.554	0.442	0.815	2.554	0.043	0.815	2.554
Quit	0.714	1.849	-0.669	0.714	1.849	0.752	0.714	1.849	0.053	0.714	1.849
Social	0.852	2.951	0.543	0.852	2.951	1.964	0.852	2.951	0.093	0.852	2.951
Timespent	0.835	2.749	-0.030	0.835	2.749	1.391	0.835	2.749	0.056	0.835	2.749
Phypsych	0.836	2.764	-0.390	0.836	2.764	1.031	0.836	2.764	0.046	0.836	2.764



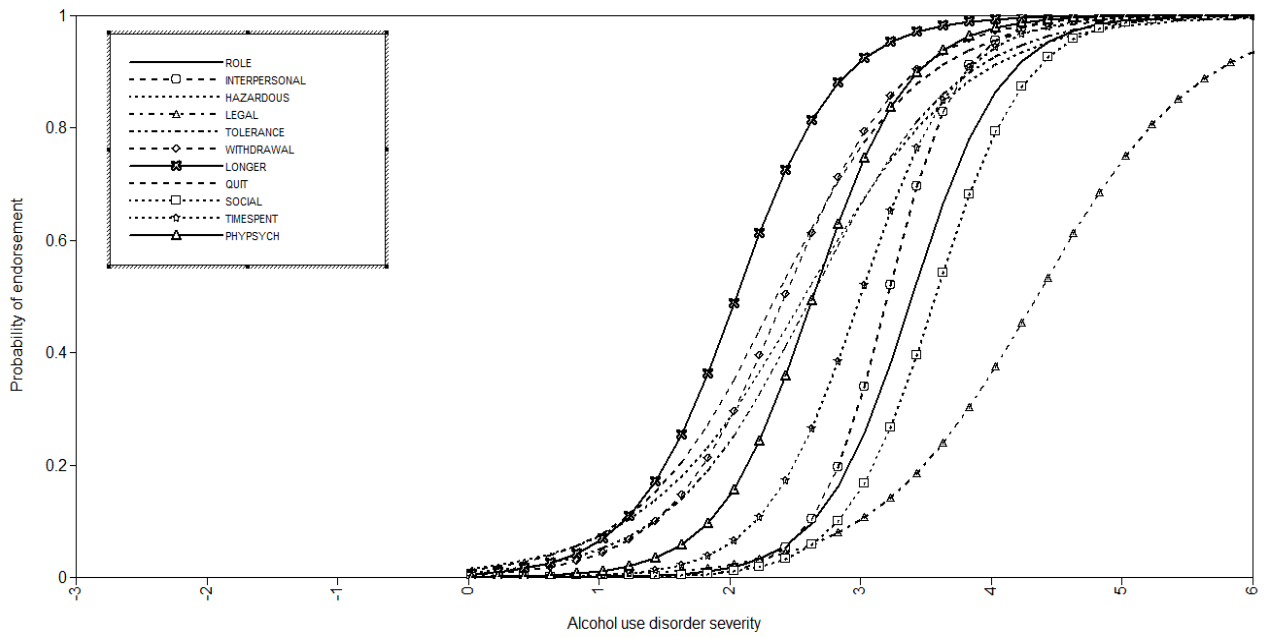
Panel A: Non-self mediating, very seldom drinker group



Panel B: Non-self mediating, normal drinker group



Panel C: Self-medicating, seldom drinker group



Panel D: Self-medicating, hazardous drinker group

Figure 1. Item characteristic curves (ICC) for the two-parameter multiple-group model of DSM-IV alcohol use disorder criteria by self-medicating drinking group status