



Short Communication

The influence of age and gender on the likelihood of endorsing cannabis abuse/dependence criteria



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HIGHLIGHTS

- Younger age predicted higher rates of cannabis abuse/dependence criteria for men.
- Younger age predicted higher rates of social problems and quit attempts for women.
- Past year abuse/dependence criteria show no bias across age and gender.

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ABSTRACT

Introduction: Higher prevalence rates of cannabis abuse/dependence and abuse/dependence criteria in 18–24 year old versus older cannabis users and in males versus females might reflect true differences in the prevalence of these disorders across age and gender or, alternatively, they could arise from age- and gender-related measurement bias. To understand differences in endorsement across important subgroups, we examined the influence of age and gender simultaneously on the likelihood of endorsement of the various abuse/dependence criteria.

Method: The sample consisted of 1603 adult past year cannabis users participating in the National Epidemiological Survey on Alcohol and Related Conditions (NESARC), a U.S. population study (39.6% aged 18–24; 62.1% male). Past year DSM-IV cannabis abuse/dependence criteria and withdrawal were assessed with the AUDADIS-IV. A restricted factor analysis with latent moderated structures was used to detect measurement bias.

Results: Although cannabis abuse and dependence diagnoses and various individual abuse/dependence criteria showed different prevalence rates across younger and older male and female cannabis users, none of the items showed uniform or non-uniform measurement bias with respect to age or gender.

Conclusion: The results indicate that, although prevalence rates of cannabis abuse/dependence criteria differ across age and gender, past year abuse/dependence criteria function similarly across these groups. It can thus be concluded that the criteria are applicable to younger and older, as well as male and female, adult cannabis users.

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1. Introduction

Young adults aged 18–24 have the highest likelihood of past year cannabis use and cannabis dependence compared to older adults (Degenhardt, Hall, & Lynskey, 2001; Mewton, Teesson, & Slade, 2010).

Moreover, all cannabis abuse/dependence criteria besides reduced activities have been found to be more prevalent among younger versus older adult cannabis users (Dennis, Babor, Roebuck, & Donaldson, 2002; Mewton et al., 2010). Differences in the prevalence of abuse/dependence between subgroups could reflect true differences in symptom endorsement, or could be due to measurement bias. For a valid measure of cannabis abuse/dependence, it is important to examine these differences.

Measurement bias occurs when there are differences in symptom endorsement — e.g., due to difference in meaning or interpretation of

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the criteria — between subpopulations with a similar underlying level of cannabis abuse/dependence severity. Mewton et al. (2010) found that none of the DSM-IV cannabis abuse/dependence criteria besides hazardous use showed measurement bias across different age groups, thus supporting the application of these criteria across different age groups. Nonetheless, users aged 25 or above were more likely to endorse hazardous use at low levels of cannabis abuse/dependence severity, while those aged 18–24 were more likely to endorse this criterion at high levels of abuse/dependence severity, indicating that hazardous use is a more discriminating measure of cannabis abuse/dependence for younger adults.

It is important to take gender into account as well, as younger men show the highest prevalence of cannabis abuse/dependence compared to women and older men (Compton, Grant, Collier, Glantz, & Stinson, 2004). Moreover, Agrawal and Lynskey (2007) found that, at similar levels of severity, women were more likely to endorse failed quit attempts and use despite health or psychological problems, and men were more likely to endorse hazardous use and legal problems. To date, no study has focused on measurement bias across age and gender simultaneously. For a more complete picture of the functioning of the cannabis abuse/dependence criteria, we aimed to replicate and expand the study by Mewton et al. (2010) and focus on measurement bias across age groups and gender simultaneously. We compared two subgroups of younger and older adult cannabis users to facilitate the specification of a cut-off for age, if bias is present. To adhere to the study by Mewton et al. (2010), and because the prevalence of abuse/dependence declines after age 25 (Degenhardt et al., 2001), we compared past year cannabis users aged 18–24 years to those aged 25 years and older.

2. Method

2.1. Sample

We used data from U.S. participants in the National Epidemiological Survey on Alcohol and Related Conditions (NESARC; Grant, Moore, Shepard, & Kaplan, 2003), a nation-wide sample with 43,093 participants between 18 and 99 years. The first wave was collected in 2001–2002 by the U.S. Bureau Census, on behalf of the National Institute on Alcohol Abuse and Alcoholism. The overall survey response rate was 81%. Participants provided written informed consent after complete description of the study.

We selected participants who reported past year cannabis use, resulting in 1603 participants (62.1% male; age range 18–78; mean age 30.81, SD = 11.01). Among these, 635 (39.6%) were aged 18–24 (60.2% male; mean age 20.58, SD = 1.95), and 968 were aged 25–78 (63.4% male; mean age 37.52, SD = 9.19).

2.2. Measurements

Past year endorsement of DSM-IV cannabis abuse and dependence criteria was assessed with the Alcohol Use Disorder and Associated Disabilities Schedule (AUDADIS-IV; Grant, Harford, Dawson, Chou, & Pickering, 1995). The AUDADIS-IV shows good reliability as an assessment of past year DSM-IV cannabis abuse/dependence ($\kappa = 0.78$, S.E. = 0.15) in a general population (Grant et al., 1995). Withdrawal was added to the DSM-IV criteria of cannabis abuse/dependence, defined as endorsing three or more of a list of withdrawal symptoms, or the use of cannabis to avoid these symptoms. Although withdrawal is not a DSM-IV criterion of cannabis abuse/dependence, previous cannabis abuse/dependence studies — including the study by Mewton et al. — also added withdrawal because of available evidence for a cannabis withdrawal syndrome (e.g., Agrawal & Lynskey, 2007; Budney, Vandrey, Hughes, Moore, & Bahrenburg, 2007; Hartman et al., 2008; Langenbucher et al., 2004; Mewton et al., 2010; Verweij et al., 2013).

2.3. Statistical analyses

Statistical analyses were performed using SPSS version 20.0 for Windows (SPSS Inc. Chicago, IL) and Mplus 6.0 (Muthén & Muthén, 1998–2010). We applied weights to generalize results to the population, and we performed clustering for primary sampling units (PSU), with stratification using the stratum variable, adjusting standard errors for the complex sampling design (Grant et al., 2003).

First, we calculated percentages of endorsement of cannabis abuse/dependence and abuse/dependence criteria across age and gender, and tested differences using chi-square tests. To confirm unidimensionality, we performed a confirmatory factor analysis (CFA), using the Maximum Likelihood (ML) estimator, indicated by the Comparative Fit Index (CFI), Tucker–Lewis Index (TLI) and RMSEA. CFI and TLI values above 0.95, and RMSEA values below 0.06 reflect a good model fit (Hu & Bentler, 1999).

To detect measurement bias, we used a restricted factor analysis with latent moderated structures (RFA/LMS; Barendse, Oort, Werner, Ligtoet, & Schermelleh-Engel, 2012). With this analysis, data of different groups (younger and older adults, males and females) are examined together. Cannabis abuse/dependence is operationalized as a (latent) common factor with multiple measures (the 11 criteria) as (observed) indicators. Group membership (e.g., age group) is added as an exogenous variable to examine direct effects of group on the criteria, and interaction effects of group by level of cannabis abuse/dependence. In the present study, we added two exogenous variables (age group and gender). Uniform bias is indicated by direct effects, i.e., the presence of across-group differences in thresholds. With uniform bias, likelihood of endorsing this criterion is higher in one particular group conditional on a specific level of latent severity. Non-uniform bias, i.e., the presence of across-group differences in factor loadings, is indicated by interaction effects of the exogenous variable with cannabis abuse/dependence. With non-uniform bias, the size of the bias varies with different levels of cannabis abuse/dependence.

3. Results

Table 1 presents prevalence rates of cannabis abuse and dependence diagnoses and individual criteria across age groups separately for men and women. Chi-square differences showed that cannabis abuse and dependence were more prevalent in younger (18–24) than older (25–78) men ($\chi^2 = 25.33$ and 41.32 , respectively), and that cannabis dependence was more prevalent in younger than in older females ($\chi^2 = 5.28$). All cannabis abuse/dependence criteria were significantly more prevalent in younger than in older male users (χ^2 ranging from 15.27 to 83.34). Social problems and failed quit attempts were more prevalent in younger than in older female users ($\chi^2 = 4.18$ and 4.90 , respectively).

3.1. Measurement bias

CFA showed that a one-factor model resulted in a good fit ($\chi^2(44) = 92.37$, $p < 0.01$, CFI = 0.98, TLI = 0.97, RMSEA = 0.03). Age and gender were added to this model as exogenous variables, and were allowed to correlate with each other and with cannabis abuse/dependence. We fixed direct effects of age and gender on the criteria to zero. Uniform bias was determined with modification indices (MIs). With a Bonferroni adjusted alpha level ($\alpha = 0.002$; nominal alpha of 5% was divided by pq , where p and q are numbers of criteria [11] and exogenous variables [2]), we tested whether the largest of the MIs was significant (Jak, Oort, & Dolan, 2010). MIs did not indicate significant uniform bias for any of the DSM-IV cannabis abuse/dependence criteria.

Then, we tested for non-uniform bias by adding interaction terms of cannabis abuse/dependence with age and cannabis abuse/dependence with gender. Non-uniform bias was determined by comparing model fit of the models including the interaction terms and the model without interaction terms. Differences in chi-square and AIC did not indicate

Table 1
Prevalence of past year endorsement of cannabis abuse and dependence and cannabis abuse/dependence criteria in younger and older adults, separate for men and women who report past year cannabis use ($n = 1603$).

DSM-IV diagnoses	Description	Men (%)			Women (%)		
		18–24 ($n = 382$)	25+ ($n = 614$)	χ^2 (df = 1)	18–24 ($n = 253$)	25+ ($n = 354$)	χ^2 (df = 1)
Cannabis abuse		21.2	9.8	25.33*	11.9	7.6	3.10
Cannabis dependence		17.8	5.2	41.32*	11.5	6.2	5.28**
<i>DSM-IV criteria</i>							
Role impairment	Failure to fulfill major role obligations	7.1	1.1	25.10*	3.4	4.7	3.72
Hazardous use	Use in hazardous situations	42.7	24.4	36.36*	22.9	19.5	1.05
Legal problems	Legal problems/getting arrested	6.3	1.5	17.06*	0.8	1.1	0.17
Social problems	Trouble with friends or family	20.4	7.3	37.28*	12.3	7.3	4.18**
Tolerance	Tolerance	18.3	6.0	37.15*	12.3	8.2	2.73
Larger/Longer use	Using larger amounts or longer than intended	13.9	3.6	35.82*	7.1	5.1	1.09
Failed quit attempts	More than once trying to stop or cut down	42.9	16.6	83.34*	29.6	21.8	4.90**
Much time spent	Much time is spent getting or using cannabis	18.3	7.5	26.86*	25.0	36.0	0.01
Reduced activities	Give up or cut down on important activities	6.5	1.8	15.27*	3.2	2.3	0.47
Use despite problems	Use despite health/psychological problems	18.1	8.8	18.69*	13.4	9.3	2.55
Withdrawal	Withdrawal	8.1	2.1	20.06*	5.1	3.1	1.60

* $p < 0.01$.

** $p < 0.05$.

presence of non-uniform bias, demonstrating that past year abuse/dependence criteria function similarly across age groups and gender ($\chi^2(64) = 119.80$, $p < 0.01$, CFI = 0.98, TLI = 0.97, RMSEA = 0.02).

4. Discussion

The present study confirms earlier established prevalence differences in cannabis abuse/dependence criteria between age groups (Dennis et al., 2002; Mewton et al., 2010) and gender (Agrawal et al., 2014), and extended these findings by testing the influence of age and gender simultaneously. Our findings indicated that cannabis abuse/dependence as well as the individual criteria were most prevalent in younger versus older male cannabis users. Younger female cannabis users showed higher prevalence rates of cannabis dependence and were more likely to endorse social problems and failed quit attempts than older female users. Despite these age and gender differences, we did not find measurement bias across the criteria, indicating that the differences across age groups and gender reflect true prevalence differences between younger and older male and female adults. These results support the application of the DSM-IV cannabis abuse/dependence criteria and withdrawal across different age groups and gender.

This study is the first to look at measurement bias in cannabis abuse/dependence criteria across different age groups and gender simultaneously. Previous studies assessing measurement bias across either one showed that the likelihood to endorse hazardous use is higher among males (Agrawal & Lynskey, 2007), as well as for younger adults with more severe cannabis abuse/dependence, and older adults with low levels of abuse/dependence severity (Mewton et al., 2010). In our subsample, we did not find bias on age group or gender. The difference with the study of Mewton et al. (2010) may be explained by differences in assessment of hazardous use. However, creating a criterion with exact similar content did not change the results. Possibly, country differences in what constitutes hazardous use may explain the differences between our findings and those by Mewton et al., with young Australian users believing that cannabis use is only hazardous in large amounts (hence, this criterion was more likely to be endorsed at high levels of cannabis abuse/dependence), while older Australian or American cannabis users believe that any amount can be dangerous.

The differences between our findings and those by Agrawal and Lynskey (2007) may be due to the assessment of lifetime versus past year endorsement of cannabis abuse/dependence criteria. Selecting lifetime cannabis users could have resulted in the inclusion of individuals who experimented with cannabis use in adolescence, as age of onset of cannabis use has been found to start in adolescence (Copeland, Rooke, & Swift, 2013). The selection of past year cannabis users could

have resulted in the selection of more frequent male and female users, who could be more equal to each other. Our results are in line with the study by Grant et al. (2006), who found that men and women who use cannabis repeatedly showed, in general, similar patterns of endorsement for DSM-IV cannabis abuse/dependence criteria.

A limitation of our study is the heterogeneity of the older adults. Cannabis abuse/dependence is least likely to be endorsed by cannabis users aged 45 or older (Stinson, Ruan, Pickering, & Grant, 2006), which could be affected by measurement bias. Unfortunately, due to power limitations, we were not able to further distinguish between age groups while assessing bias across gender simultaneously, and truncating the sample at 45 years did not differ the results. Another limitation is that we used self-report interview data, conducted by a government representative (Gruzca, Abbacchi, Przybeck, & Gfroerer, 2007). It is possible that, because of social stigma, especially older participants were less inclined to give honest information about their cannabis use and cannabis abuse/dependence criteria. Last, NESARC data did not include DSM-5 Cannabis Use Disorder (CUD) criteria, which limits the present study to DSM-IV abuse/dependence criteria and withdrawal, which was not a full equivalent of the DSM-5 withdrawal criterion because our data did not include all DSM-5 withdrawal symptoms. In DSM-5, the criterion legal problems has been excluded and craving and withdrawal have been added as CUD criteria (American Psychiatric Association, 2013). Although craving seems to provide largely redundant information in addition to the other criteria (Hasin, Fenton, Beseler, Park, & Wall, 2012), it is unclear how the inclusion of craving and the exclusion of legal problems affects measurement bias of CUD criteria across these age groups and gender.

The present study indicates that past year DSM-IV cannabis abuse/dependence criteria are applicable to younger and older adults, and to males and females. Future studies should focus on the applicability of these symptoms in adolescents (<18 years), as there are indications that for example tolerance has a low specificity for cannabis abuse/dependence in adolescent users (Chung, Martin, Winters, Cornelius, & Langenbucher, 2004), possibly indicating normative development of using substances. Similarly, more research is needed on DSM-5 CUD-criteria, with the addition of craving and withdrawal and the exclusion of legal problems. Future research should replicate the findings of the present study on the new CUD construct for its applicability across age groups and gender.

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Contributors

Authors Agrawal, Lynskey, and Huizink designed the study and author Huizink provided the funding for this research. Author Delforterie performed the literature searches and summaries of previous related work.

Authors Delforterie, Creemers and Jak performed the statistical analysis, and author Delforterie wrote the first draft of the manuscript. All authors contributed to the writing of the manuscript and have approved the final version of this manuscript.

Conflict of interest

The authors do not have financial or other conflicts of interest that may affect their contribution to this manuscript.

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