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Short-term stability of different drinking patterns over the course of four weeks among adults. A latent transition analysis

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ABSTRACT

Objective: The purpose of the present study was to identify drinking patterns and determine their intraindividual stability over the course of four weeks among a sample of adults from the general population.
Methods: The sample comprised 288 adults who reported drinking alcohol at least once per month (49% female; mean age = 33.1 years, *SD* = 12.8 years). Participants were recruited in the waiting area of a local registration office in northeastern Germany. Data were collected four times over four consecutive weeks by interview (once in the registration office and thrice by telephone). To assess alcohol consumption in the past seven days, timeline follow-back questions were administered each time. For data analysis, latent profile and latent transition analyses were applied. Indicators for latent classes were total number of drinks per seven days, number of drinking days, and number of days with heavy episodic drinking.
Results: Three classes of seven-day drinking patterns were identified at baseline: (a) light drinkers (77%), (b) moderate drinkers (18%), and (c) heavy drinkers (5%). Approximately one-fifth (21%) of baseline light drinkers and 94% of baseline moderate drinkers changed their drinking pattern at least once during the four weeks. The majority (81%) of baseline moderate drinkers also reported light drinking in at least one of the three subsequent weeks.
Conclusions: Our findings suggest intraindividual changes in drinking patterns even during a short period of time. Instability of drinking patterns may potentially impair the assessment of light to moderate alcohol consumption when a quantity-frequency approach is applied.

1. Introduction

Light to moderate alcohol consumption has been found to be potentially associated with a reduced risk of disease, particularly cardiovascular disease (Movva and Figueredo, 2013). Epidemiological data have suggested a J-shaped relationship between alcohol consumption and all-cause mortality, with light drinkers having a reduced mortality risk compared to abstainers (Rehm and Patra, 2012). This evidence is invoked in discussions about low-risk drinking thresholds (Stockwell and Room, 2012) that have implications for prevention and policy measures. The J-curve is currently questioned (Stockwell et al., 2016b); methodological shortcomings have been identified that cast doubt (Fekjaer, 2013), in particular with respect to the assessment of light to moderate drinking (Stockwell et al., 2012). Additionally, the widely used quantity-frequency approach may be flawed in its imprecision (Stockwell et al., 2016a). For one, the potential instability of drinking patterns over time has been brought up as a limitation with the notion that multiple assessments of alcohol consumption, including the frequency of heavy episodic drinking (HED) over time, are required (Stockwell and Naimi, 2016). HED is commonly defined as drinking four or more alcoholic drinks on a single occasion for women and five or more for men (National Institute on Alcohol Abuse and Alcoholism, 2010).

Evidence shows that alcohol consumption varies as a function of time of the year (Knudsen and Skogen, 2015). Special events (Kushnir and Cunningham, 2014), holidays (Tremblay et al., 2010) and

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differences between weekdays and weekends (Baumann et al., 2017) have been investigated as well as long-term developments, for instance in the stage of emerging adulthood (Lee et al., 2013) or from mid- to older age (Molander et al., 2010). Little is known about transitions during short time spans such as within one month. One possible approach to analyze the potential short-term instability of light to moderate drinking is to study drinking patterns. The concept of drinking patterns goes "beyond average" alcohol drinking (Stranges et al., 2006) and typically encompasses quantity and frequency of alcohol consumption as well as the frequency of HED (Lau-Barraco et al., 2016). Drinking patterns have been identified in a variety of study populations (Cleveland et al., 2013; Davoren et al., 2016). However, research addressing the instability of drinking patterns, e.g., of light or moderate drinking, is scarce, though it seems unlikely that these patterns are static in nature.

Longitudinal studies on drinking patterns (Lee et al., 2013; Molander et al., 2010) mostly applied longer time intervals between measurements such as several months or even years. Short-term variations in alcohol consumption may have been missed. With regard to screening approaches, some persons with at-risk alcohol use may be overlooked. Focusing on a short time interval between measurements may provide the possibility to monitor and track these short-term variations that may elucidate recall bias in the assessment of alcohol consumption.

The aim of the present study was to investigate the intraindividual variability of seven-day drinking patterns over a period of four consecutive weeks.

2. Methods

Data were collected as part of a study that was conducted to explore health risk behavior patterns in an adult population. The ethics committee of the University Medicine Greifswald approved the study (protocol number BB 098/17). All participants provided informed written consent.

2.1. Participant recruitment and study procedure

Over five days in July and August 2017, participants were recruited at the registration office in Greifswald, Mecklenburg-Western Pomerania, Germany. The registration office is the public authority for registration, passport and vehicle admission issues in Germany. During opening hours, all clients 18 years or older who appeared in the waiting area were approached by study assistants. Clients who were cognitively or physically incapable, had insufficient language or reading skills, had been approached during an earlier visit, or who were employed at the conducting research institute were excluded. Eligible individuals were asked to participate in a longitudinal study on health behaviors (fruit and vegetable intake, physical exercise, alcohol use, and smoking). Those who agreed to participate in the baseline assessment and three follow-up assessments received a tablet computer and a brief introduction for the handling of the tablet-based, self-administered questionnaire. Following the baseline assessment at the registration office, participants were contacted every week for three consecutive weeks. At each follow-up, study assistants conducted computer-based telephone interviews. Participants received a voucher of 5€ for their participation in the baseline assessment and a voucher of 5€ for each completed follow-up assessment, respectively.

2.2. Participant flow

Of the 808 clients appearing in the waiting area during our study period, 423 (52%) participated in the study, 323 (40%) declined participation, and 62 (8%) were not approached by study staff due to short waiting time. Of the 423 baseline participants, 304 (72%) participated in the first, 294 (70%) in the second, and 286 (68%) in the third follow-up. Two hundred and twenty-nine (54%) completed all three follow-up assessments, 74 (18%) completed two follow-up assessments and 45 (11%) completed one follow-up assessment. For the current analysis, the final sample comprised 288 baseline participants who reported drinking alcohol at least once per month. Of those, 156 (54%) completed all follow-up assessments.

2.3. Measures

2.3.1. Seven-day drinking patterns

Participants who reported drinking alcohol at least once per month received timeline follow-back questions (TLFB; Sobell and Sobell, 1992). At first, participants were informed about standard drinks (i.e., the amount of beer, wine or spirits equal to 10 g of pure alcohol) and were then asked to indicate the number of standard drinks they had on each of the seven days prior to the interview. The same questions were presented at baseline and at each follow-up. Based on participants' responses to the TLFB items, three indicators of seven-day drinking patterns were calculated: total number of drinks per seven days, number of days with alcohol use, and number of days with HED. These three indicators were subsequently used for the characterization of seven-day drinking patterns.

2.3.2. Alcohol Use Disorders Identification Test Consumption (AUDIT-C; Bush et al., 1998)

The AUDIT-C served as a screening instrument and its score was used for descriptive purposes. It was administered at baseline only. The AUDIT-C comprises three items and is a reliable and valid screening tool to identify at-risk alcohol consumption (score of $\geq$ 4 for women and $\geq$ 5 for men; Reinert and Allen, 2007). The third item was adapted to the current limits for HED (National Institute on Alcohol Abuse and Alcoholism, 2010) and asked women for occasions with four or more alcoholic drinks and men for occasions with five or more alcoholic drinks.

2.3.3. Sociodemographic variables

Age, gender and educational background were assessed at baseline. Participants were asked to indicate their highest general educational degree. To ensure international comparability, the answers were transformed to: less than 10 years of school education; 10–11 years of school education; more than 11 years of school education.

2.4. Statistical analysis

To identify seven-day drinking patterns and to test the stability of seven-day drinking patterns over time, mixture modeling was used. Statistical analyses were carried out using Mplus version 7.4 (Muthén and Muthén, 1998-2015). All latent variable analyses were done with a full-information maximum likelihood estimator with robust standard errors. These models were estimated under a missing at random assumption using all available data.

Data were analyzed in two steps. In the first step, seven-day drinking patterns were identified. A single latent profile analysis (LPA) was conducted using baseline data (Fig. 1, left part) to determine the optimal number of seven-day drinking patterns in our sample. LPA is able to identify unobserved subgroups that are represented by a categorical latent variable. Manifest continuous indicators are used to estimate the number of latent classes that adequately represents the heterogeneity in a study population. Number of drinks per seven days, number of days with alcohol use, and number of days with HED were used as indicators for latent class membership.

The decision on the number of latent classes was guided by the (adjusted) Bayesian Information Criterion (BIC; Schwarz, 1978) and the Akaike Information Criterion (AIC; Akaike, 1998) that balance fit and parsimony of a model, with smaller values indicating better fit. Additionally, a bootstrapped likelihood-ratio test (BLRT; McLachlan and