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Concurrent versus simultaneous use of alcohol and non-medical use of prescription drugs: Is simultaneous use worse for mental, social, and health issues?

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Abstract

This study investigated the difference between concurrent and simultaneous use of alcohol and non-medical use of prescription drugs (NMUPD) in relation to mental, social, and health issues. The 544 study participants of the Swiss ongoing Cohort Study on Substance Use Risk Factors (C-SURF) had a combined use of alcohol with NMUPD during the previous 12 months. Alcohol-related problems (i.e., dependence and consequences), as well as mental, social, and health concerns (i.e., depression, general mental/physical health, and social/health consequences), were assessed. The simultaneous use of alcohol and NMUPD proved to be a greater risk factor for mental, social, and health issues than concurrent use. This study adds essential information regarding simultaneous polydrug use, which results in distinct effects compared to concurrent use, including important social, psychosocial, and health-related consequences.

Keywords: alcohol use; concurrent use; non-medical use of prescription drugs; simultaneous use

INTRODUCTION

Non-medical use of prescription drugs (NMUPD) is on the rise (Catalano et al. 2011; Grant et al. 2004; Rigg and Ibañez 2010) and has been shown to produce important detrimental effects, including mood and psychiatric disorders, accidental overdoses, and/or physical problems (Blanco et al. 2007; Davis and Johnson 2008; Ghandour, El Sayed, and Martins 2012; Huang et al. 2006; McCabe and Boyd 2005; McCabe, Cranford, and West 2008; Zullig and Divin 2012). In addition, some studies have reported the negative consequences of combining NMUPD with alcohol use (Barrett and Pihl 2002; Koski, Ojanperä, and Vuori 2002; Sellers et al. 1993; Sheehan et al. 1991; Watson et al. 2004). However, only a limited number of studies have focused on the differences between simultaneous and concurrent use of alcohol and NMUPD, even though alcohol may have important modifying or amplifying effects on prescription drugs. Therefore, this study investigated the effects and differences in these uses.

“Concurrent use” describes the use of alcohol and NMUPD within a given time period but not necessarily at the same time (Earleywine and Newcomb 1997), whereas “simultaneous use” refers to the use of these substances at the same time, on a single occasion (Martin 2008). Indeed, simultaneous use has been associated with more detrimental effects in comparison to concurrent polydrug use, including social, psychosocial, and health-related consequences (Martin 2008; Midanik, Tam, and Weisner 2007), as well as drug use-related problems (McCabe et al. 2006). For alcohol and NMUPD co-use, it was reported that simultaneous use of alcohol and ADHD prescription stimulants was associated with increased alcohol-related consequences, increased substance use, and lower academic performance (Egan et al. 2013). However, this study focused on one kind of NMUPD only. It was also demonstrated that college students engaging in simultaneous use of alcohol and NMUPD were more likely to report frequent binge drinking

(McCabe and Boyd 2005) and negative consequences (Hermos et al. 2009; McCabe, Cranford, and Boyd 2006; McCabe et al. 2006) than those engaging in concurrent use. Nevertheless, issues with other substances and consequences remain understudied. For example, to our knowledge, no study has described the association of simultaneous use with mental issues such as depression, health issues, or with social issues other than academic failure.

Therefore, the aim of this study was to investigate the relationship between patterns of alcohol and NMUPD co-use (i.e., simultaneous *versus* concurrent use) and mental, social, and health issues.

METHODS

Participants

The data are part of the Cohort Study on Substance Use Risk Factors (C-SURF), a study designed to assess substance use patterns and their related consequences in young Swiss men. Participant enrollment took place between August 23rd 2010 and November 15th 2011 in 3 out of 6 army recruitment centers covering 21 of 26 cantons in Switzerland, including all French-speaking cantons. There was no pre-selection for this conscription, and all young men around 20 years-old were evaluated to determine their eligibility for military, civil, or no service. Thus, all young Swiss men around 20 years-old were eligible for study inclusion. The recruitment centers were only used to enroll participants. Assessment was carried out outside of the army environment and independently of eligibility for military service.

Of the 13,245 conscripts informed about the study, 7,563 gave written consent to participate (57.1%), and 5,990 filled in the baseline questionnaire (79.2%). The present study focused on the 580 participants who had used both alcohol and NMUPD during the previous 12 months (9.7%

of the sample). Missing values were likewise deleted, ultimately resulting in 544 total participants (93.8% of the alcohol and NMUPD users). More information about the sampling and non-responses can be found elsewhere (Studer et al., 2013), including comparisons between respondents and non-respondents, because all conscripts filled in an anonymous five-minute questionnaire. In short, non-respondents were more likely to be substance users, but the non-response bias was small. Participants were more often German-speaking, had a higher level of education, and were older, but effect sizes were negligible ($\approx .10$ for language and education, $< .01$ for age).

Measures

Concurrent and simultaneous use of alcohol and NMUPD. Participants were asked if they had used alcohol along with NMUPD during the previous 12 months. The response to this question was based on a 6-point scale (“all the time”, “most of the time”, “half of the time”, “seldom”, “hardly ever”, or “never”). Participants who answered “hardly ever” and “never” were recorded as concurrent users, whereas all others were considered simultaneous users.

Alcohol. For the previous 12 months, alcohol dependence was assessed with the seven criteria of alcohol dependence from the Diagnostic and Statistical Manual of Mental Disorders (DSM IV) as in Knight et al. (2002). We used a continuous numbered scale of the seven criteria (from 0 to 7), instead of a cut-off, because current literature assumes a more continuous dimensional construct to alcohol dependence rather than a categorical model (Knight et al. 2002; Kerridge et al. 2013).

Nine alcohol-related consequences (i.e., drank/took medicine to get over a bad secondary effect, mental blackout, did something badly regretted later, unplanned sex, sex without a condom,

accident/injury, conflict with police/authorities more than once, argument/fight, and damaged property) were assessed and coded “0” if it had not taken place in the previous 12 months and “1” if it had occurred at least once. A sum score was then computed (0–9).

In addition, the quantity and frequency of alcohol use during the previous 12 months were assessed (i.e., average number of days per week in which alcohol was consumed and number of standard drinks consumed during those drinking days). The weekly volume of drinking was subsequently determined by multiplying the number of drinking days by the usual number of drinks on these days.

NMUPD. The frequency of NMUPD was assessed by inquiring how often participants used six types of prescription drugs (sleeping pills, anxiolytics, painkillers [excluding over the counter painkillers], antidepressants, stimulants, and beta-blockers) during the previous 12 months. The question dealt only with non-medical use (i.e., by choice, without a doctor’s prescription or for a reason other than a doctor’s prescription). Participants answered on an ordinal 8-point scale for each type of prescription drug (“never”, “once a year”, “2–3 time a year”, “4–9 times a year”, “1–2 times a month”, “3–4 times a month”, “2–3 times a week”, and “4 times per week or more”). A global score for the annual use of any prescription drug was computed, converting the ordinal scale into the corresponding number of days.

Depression. The Major Depressive Inventory was used to determine depression level (Bech et al. 2001; Olsen et al. 2003). This 10-item mood questionnaire allowed assessment for the presence of a depressive disorder according to the DSM-IV and included items such as “*Have you felt low in spirits or sad?*” and “*Have you felt subdued or slowed down?*”. Responses were given on a 6-point scale from “never” (0) to “all the time” (5). A sum score related to depression was computed based on the participants’ answers. In order to better capture the variability in the

range of depression symptoms, a continuous scale (ranging from 0 to 50) was used instead of a specific cut-off value.

Mental and physical health. Physical and mental health were assessed using the Short Form Health Survey (SF-12 version 2) (Ware, Kosinski, and Keller 1996), which contained two subscales: mental health composite scale and physical health composite scale. The subscales were computed according to a standard scoring procedure, giving two composite scores ranging from 0 (health problem) to 100 (no health problem) with a standardized mean of 50.

Consequences. Sixteen consequences, which were not explicitly substance related (Gmel et al. 2012), were selected from standard instruments (Bucholz et al. 1994; Hesselbrock et al. 1999; Hibell et al. 2012; Wechsler et al. 1994). Consequences were coded as “0” if they did not take place in the past 12 months and “1” if they had occurred at least once during the past 12 months. Two sum scores were computed: the first was for social consequences (i.e., physical fight, problems with family, problems with friends, poor performance at school/work, theft, trouble with police, regret over sexual intercourse, sexual intercourse without a condom, and damaged property), and the second was related to health consequences (i.e., accident/injury, admittance to an emergency room, attempted suicide, requirement for medical treatment, night spent in the hospital, outpatient surgery, and treatment in an emergency room because of an accident/injury).

Additional variables. We controlled for social and demographic variables that may influence young adults’ substance use. These included age, language (French- or German-speaking), level of education (lower secondary, upper secondary, or tertiary), parents’ level of education (lower secondary, upper secondary, or tertiary), perceived family income (“below-average income”, “average income”, or “above-average income”), and illicit drug use (coded 1 if participants used at least one illicit drug during the previous 12 months and 0 otherwise).

Statistical analyses

Descriptive statistics were computed in order to explore the prevalence rates associated with concurrent and simultaneous use of alcohol and NMUPD.

Concurrent and simultaneous users were then compared with 7 Generalized Linear Models (GLM) for linear (mental and physical health composite scores) and count (alcohol dependence, alcohol-related consequences, depression, health-related consequences, and social consequences) outcomes. All models were performed controlling for drinking volume, annual frequency of NMUPD, illicit drug use, age, linguistic region, level of education, parents' level of education, and perceived family income. Holm–Bonferroni correction (Holm 1979) was used to keep a significance threshold of $p < .05$.

RESULTS

The participants (mean age: 20.10 years old, $SD = 1.37$) who used both alcohol and NMUPD during the previous 12 months consisted mainly of concurrent users of the two substances (Table 1). Indeed, only 11.6% of the participants were simultaneous users. In the previous 12 months, the participants drank 11.04 weekly alcoholic drinks on average and engaged in NMUPD 34.71 times. Bivariate comparisons between concurrent and simultaneous users showed that simultaneous users reported more drug use and more mental, social, and health issues.

Insert Table 1 about here

GLM indicated significant differences between the simultaneous and concurrent users (Table 2). Indeed, simultaneous users reported more of the following: alcohol dependence (concurrent users [CU]: 1.12, simultaneous users [SU]: 1.92 , $p < .001$), alcohol-associated issues (CU: 1.71, SU: 2.50, $p < .001$), depression (CU: 10.25, SU: 19.17, $p < .001$), mental health issues (CU: 44.03, SU: 39.44, $p = .006$), physical health issues (CU: 52.22, SU: 48.87 $p < .001$), health-related consequences (CU: 1.89, SU: 2.39, $p = .011$), and social consequences (CU: 2.70, SU: 3.51, $p = .007$).

Insert Table 2 about here

DISCUSSION

This study investigated the differences between simultaneous and concurrent use of alcohol and NMUPD in relation to mental, social, and health issues. The results indicated that the simultaneous use of alcohol and NMUPD was associated with more detrimental issues than concurrent use, beyond socio-demographic substance use-related risk factors. We observed more alcohol-related problems (i.e., dependence and consequences; previously shown in Egan et al. 2012; McCabe et al. 2006), as well as increases in mental, physical, social, and health issues. Therefore, the findings are in agreement with other studies dealing with substances other than alcohol and NMUPD that have reported that simultaneous polydrug use is associated with more social consequences, psychosocial distress, and health problems than concurrent use (Martin 2008; Midanik, Tam, and Weisner 2007). Our results are particularly interesting because they concern legal drugs (i.e., alcohol and prescription drugs) that are widely used and easily available, especially in the case of alcohol. The observed effect sizes were lower for health-

related problems (mental and physical health, health consequences; partial η^2 : 2–3%) compared to other consequences (social and alcohol-associated issues, depression or alcohol dependence; partial η^2 : 6–8%).

Pharmacological studies have demonstrated that alcohol (ethanol) may enhance the effect of prescription drugs by increasing the bioavailability of stimulants (e.g., amphetamines) (Egan et al. 2012), augmenting the abuse liability-related subjective effects of prescription opioids (McCabe et al. 2012) and/or reducing the negative effects of alcohol (Egan et al. 2012). These factors might encourage the simultaneous use of alcohol and NMUPD. Although only a minority of the young Swiss men simultaneously used alcohol and NMUPD (21.5% of the subsample of alcohol and NMUPD co-users), this pattern of use may represent a major health concern due to the harmful effects, desirable pharmacological properties, and growing use of NMUPD.

This study has some limitations. In particular, the cross-sectional design did not allow us to investigate the causal relationship between simultaneous polydrug use and mental, social, or health issues. However, an upcoming follow-up of the C-SURF cohort will allow the study of the effect of previous drug co-use on later issues. A second limitation of this study relates to the exclusion of women. Therefore, a similar association study will need to be carried out to determine if these results are applicable to women who simultaneously use alcohol and NMUPD. One last shortcoming was that the data were self-reported. This could have introduced various forms of bias, including recall bias, pressure to give desirable answers, and non-response bias. However, self-reported data on risky behaviors and substance use are generally considered valid (Ford, 2008).

To conclude, this study identified patterns of alcohol and NMUPD use that are associated with increased vulnerability. We demonstrated that simultaneous use of alcohol and NMUPD was associated with more mental, social, and health issues than concurrent use of these substances. Our findings are particularly important because they concern legal substances that are often easily available, particularly in the case of alcohol. In addition, while simultaneous use of these substances may be encouraged due to enhanced effects, there are many detrimental consequences that need to be considered. This information will be valuable for healthcare, suggesting the need to take into account patterns of alcohol and NMUPD co-use for intervention and preventive programs.

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| | Overall | Concurrent users | Simultaneous users |
|--|----------------|------------------|--------------------|
| N (%) | 544 | 486 (88.4%) | 64 (11.6%) |
| Drug use | | | |
| Weekly volume of drinking ¹ | 11.04 (23.34) | 9.13 (12.57) | 25.6'' (57.48) |
| Annual frequency of NMUPD ¹ | 34.71 (136.55) | 18.94 (96.08) | 155.11 (274.20) |
| Illicit drug use ² | 46.0% (250) | 42.4% (204) | 73.0% (46) |
| Alcohol dependence (0-7) ¹ | 1.25 (1.54) | 1.11 (1.39) | 2.32 (2.15) |
| Alcohol use consequences (0-9) ¹ | 2.00 (2.06) | 1.84 (1.94) | 3.21 (2.49) |
| Mental, social, and health issues | | | |
| Depression (0-50) ¹ | 10.69 (9.62) | 9.53 (8.28) | 19.59 (13.73) |
| Mental health composite scale (0-100) ¹ | 43.74 (10.19) | 44.35 (9.89) | 39.03 (11.31) |
| Physical health composite scale (0-100) ¹ | 51.76 (6.76) | 52.18 (6.47) | 48.58 (8.09) |
| Health consequences (0-8) ¹ | 2.93 (2.10) | 1.95 (1.75) | 2.79 (2.35) |
| Social consequences (0-9) ¹ | 2.05 (1.85) | 2.77 (1.92) | 4.19 (2.53) |
| Socio-demographic characteristics | | | |
| Age ¹ | 20.10 (1.37) | 20.05 (1.28) | 20.53 (1.95) |
| Language² | | | |
| French-speaking | 51.8% (282) | 52.4% (252) | 47.6& (30) |
| German-speaking | 48.2% (262) | 47.6% (229) | 52.4% (33) |
| Level of education² | | | |
| Lower secondary | 49.4% (269) | 49.1% (236) | 52.41% (33) |
| Upper secondary | 25.7% (140) | 25.8% (124) | 25.4% (16) |
| Tertiary | 24.8% (135) | 25.2% (121) | 22.2% (14) |
| Parents' level of education² | | | |
| Lower secondary | 6.3% (34) | 5.8% (28) | 9.5% (6) |
| Upper secondary | 34.4% (187) | 35.6% (171) | 25.4% (16) |
| Tertiary | 59.4% (323) | 58.6% (282) | 65.1% (41) |
| Perceived family income² | | | |
| Below average | 15.8% (86) | 37.8% (182) | 30.2% (19) |
| Average | 36.9% (201) | 47.4% (228) | 46.0% (29) |
| Above average | 47.2% (257) | 14.8% (71) | 23.8% (15) |

Table 1. Participants' characteristics and comparison of concurrent versus simultaneous alcohol and NMUPD users

¹Mean and standard deviation under brackets are given.

²N and percentages under brackets are given. The columns' percentages are given for concurrent and simultaneous users, e.g., 73% of simultaneous users used illicit drugs, whereas 42.4% of concurrent users did so.

| | Concurrent users | | Simultaneous users | | Likelihood ratio Chi-square | p-value |
|--|------------------|-------------|--------------------|-------------|-----------------------------|---------|
| | Mean | 95% CI | Mean | 95% CI | | |
| Alcohol dependence (0-7) ¹ | 1.12 | 0.99-1.27 | 1.92 | 1.56-2.36 | 23.94 | < .001 |
| Alcohol use consequences (0-9) ¹ | 1.71 | 1.54-1.91 | 2.50 | 2.10-2.98 | 17.89 | < .001 |
| Depression (0-50) ¹ | 10.25 | 9.85-10.47 | 19.17 | 17.93-20.50 | 281.27 | < .001 |
| Mental health composite scale (0-100) ² | 44.03 | 42.69-45.37 | 39.44 | 36.74-42.13 | 10.80 | .006 |
| Physical health composite scale (0-100) ² | 52.22 | 51.31-53.14 | 48.87 | 47.03-50.71 | 12.30 | < .001 |
| Health consequences (0-8) ¹ | 1.89 | 1.71-2.09 | 2.39 | 2.00-2.86 | 6.53 | .011 |
| Social consequences (0-9) ¹ | 2.70 | 2.49-2.94 | 3.51 | 3.03-4.07 | 11.75 | .007 |

Table 2. Results of generalized linear models comparing concurrent *versus* simultaneous users of alcohol and NMUPD

Remarks: The analysis was performed controlling for volume of drinking, frequency of NMUPD, language, level of education, parents' level of education, perceived family income, age, and illicit drug use. Estimated marginal mean for volume of drinking = 11.04, frequency of NMUPD = 34.71, and age = 20.10 (mean scores) are given.

¹Count outcomes (Poisson regression), ² linear outcomes (linear regression).

A Holm-Bonferroni correction was applied.