

1 **Personal and perceived peer use and attitudes towards use of non-prescribed**
2 **prescription sedatives and sleeping pills among university students in seven**
3 **European countries**

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70 **Abstract**

71 **Introduction:** The use of non-prescribed prescription sedatives and sleeping pills (NPPSSP) among
72 university students has been described as an important public health issue. However, the impact of
73 perceived social norms on students' use and attitudes towards use of NPPSSP is still unclear. Our
74 aim was to investigate whether perceptions of peer use and approval of use are associated with
75 students' personal use and approval of NPPSSP use.

76 **Methods:** Cross-sectional data from the Social Norms Intervention for the Prevention of Polydrug
77 Use (SNIPE) project containing 4,482 university students from seven European countries were
78 analyzed to investigate self-other discrepancies regarding personal use and attitudes towards
79 NPPSSP use. Associations between personal and perceived peer use and between personal and
80 perceived approval of use were examined using multivariable logistic regression.

81 **Results:** The majority (51.0%) of students perceived their peers' NPPSSP use to be higher than
82 their personal use. 92.6% of students perceived their peers' approval of NPPSSP use to be identical
83 or higher than their personal approval. Students perceiving that the majority of peers had used
84 NPPSSP at least once displayed higher odds for personal lifetime use (OR: 1.95, 95% CI: 1.49-
85 2.55). Perceived peer approval of NPPSSP use was associated with higher odds for personal
86 approval (OR: 5.49, 95% CI: 4.63-6.51).

87 **Conclusions:** Among European university students, perceiving NPPSSP use and approval of use to
88 be the norm was positively associated with students' personal NPPSSP use and approval of use,
89 respectively. Interventions addressing perceived social norms may prevent or reduce NPPSSP use
90 among university students.

91 **Final trial registration number:** DRKS00004375 on the 'German Clinical Trials Register'.

92 **Keywords:** university students; non-medical use; sedatives; sleeping pills; perceptions; social
93 norms

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103 **1. Introduction**

104 The non-medical use of prescription drugs, particularly among young adults, has been recognized as
105 an important public health issue worldwide (Martins & Ghandour, 2017). The misuse of several
106 prescription drugs, such as stimulants, opioids, or tranquilizers, is associated with a high potential
107 for addiction and other serious physical and psychosocial consequences (United Nations Office on
108 Drugs and Crime, 2011). However, prescription drugs are often perceived to be safer, and more
109 socially acceptable than most illicit drugs, because they are produced by pharmaceutical companies
110 and usually prescribed by physicians (Bodenlos, Malordy, Noonan, Mayrsohn, & Mistler, 2014;
111 Compton & Volkow, 2006; Hildt, Franke, & Lieb, 2011; Martins & Ghandour, 2017).

112 The non-medical use of prescription drugs among university students may serve as a coping
113 strategy to manage the demands of university life and to achieve a better work-life balance (Hildt,
114 Lieb, & Franke, 2014; Jensen, Forlini, Partridge, & Hall, 2016; Maier, Liechti, Herzig, & Schaub,
115 2013). The phenomenon of taking prescription drugs for the purpose of improving cognitive
116 performance (e.g., alertness, concentration, or memory) has been termed *pharmacological cognitive*
117 *enhancement* or *brain doping* (Partridge, Bell, Lucke, Yeates, & Hall, 2011). Further, evidence
118 indicates that university students use sedatives to improve sleep or relax after stressful days, thus
119 aiming to improve cognitive performance the next day. This is also referred to as *indirect cognitive*
120 *enhancement* (Maier, et al., 2013; Maier & Schaub, 2015). Academic performance-enhancing drugs
121 and sedatives are often used in combination: while performance-enhancing drugs are used to
122 achieve the highest possible performance level during the day, sedatives are used to aid relaxation
123 (Maier, et al., 2013).

124 Typically, peers have a significant impact on young adults' behaviors and their attitudes, and people
125 tend to adapt their personal behavior to match that of their peers (Borsari & Carey, 2001). However,
126 a growing body of evidence indicates that young people's perceptions of their peers' behaviors
127 (*descriptive norms*) and attitudes towards behaviors (*injunctive norms*) are often inaccurate
128 (Berkowitz, 2005; Perkins, 2003). University students tend to falsely believe that their peers behave
129 or approve of behaviors differently from actual prevailing norms (*misperceptions*) (Berkowitz,
130 2005; Perkins, 2003), and from their personal behavior and approval of behavior (*self-other*
131 *discrepancies*) (Borsari & Carey, 2001). Young people generally overestimate how riskily their
132 peers behave. These misperceptions of other's behavior or attitudes towards behavior represent the
133 basis for the adaptation of personal behavior and attitude towards the perceived norm (Berkowitz,
134 2005). Most research on misperceptions of health-related behaviors among university students
135 originated in the U.S.A. and particularly refers to descriptive norms regarding alcohol consumption
136 (Borsari & Carey, 2001; Perkins, 2014). In recent years, these findings were replicated in Europe
137 (McAlaney, Bewick, & Hughes, 2011; McAlaney, et al., 2015). These studies show that

138 exaggerated perceptions of peer alcohol consumption are associated with increased personal alcohol
139 consumption among university students (Borsari & Carey, 2001; McAlaney, et al., 2011;
140 McAlaney, et al., 2015; Perkins, 2014). There is further evidence on university students'
141 misperceptions of their peers' use of tobacco and illicit substances (e.g., marijuana, cocaine,
142 ecstasy, and amphetamines) (Arbour-Nicitopoulos, Kwan, Lowe, Taman, & Faulkner, 2010;
143 Bertholet, Faouzi, Studer, Daepfen, & Gmel, 2013; Dempsey, et al., 2016; Helmer, et al., 2014;
144 Kilmer, et al., 2006; Martens, et al., 2006; Perkins, Meilman, Leichliter, Cashin, & Presley, 1999;
145 Pischke, et al., 2015), as well as regarding risky sexual behavior (Martens, et al., 2006).
146 Several studies have examined misperceptions or self-other discrepancies about the non-medical
147 use of prescription drugs, as well as associations between descriptive norms and personal use,
148 particularly regarding prescription stimulants (Helmer, et al., 2016; Kilmer, Geisner, Gasser, &
149 Lindgren, 2015; McCabe, 2008; Sanders, Stogner, Seibert, & Miller, 2014; Silvestri & Correia,
150 2016), with only one study, to date, investigating prescription sedative use (Sanders, et al., 2014).
151 Perceived approval among peers for the non-prescribed use of prescription stimulants at the same
152 university (Helmer, et al., 2016) and perceived approval among close friends, or by the typical
153 university student or parents (Silvestri & Correia, 2016), were positively associated with personally
154 approving such substances among university students. The role of perceived injunctive norms
155 regarding non-medical use of prescription sedatives, however, has not been investigated so far.
156 The present study aimed to investigate self-other discrepancies regarding the use and attitudes
157 towards using non-prescribed prescription sedatives and sleeping pills (NPPSSP) in a sample of
158 university students from seven European countries. We also aimed to investigate if perceptions of
159 peer use (perceived descriptive norm) and peer approval of use (perceived injunctive norm) were
160 associated with personal use and approval of NPPSSP use in our study population.
161 To clarify the terminology employed in this study, NPPSSP is used to describe the non-prescribed
162 use of sedatives and sleeping pills which are only available by prescription. This does not include
163 the use of non-prescription products, such as herbal sedatives, which can be acquired without
164 prescription.

165 **2. Material and Methods**

166 **2.1 Data**

167 This analysis is based on data from the 'Social Norms Intervention for the prevention of Polydrug
168 use' (SNIPE) project funded by the European Commission (LS/2009-2010/DPIP/AG). SNIPE was
169 a cross-national study including students from universities in Belgium, Denmark, Germany, the
170 Slovak Republic, Spain, Turkey, and the United Kingdom (UK). An overview of the SNIPE study
171 is provided by Pischke and colleagues (2012). In brief, SNIPE aimed to test the feasibility of a web-

172 based, personalized ‘social norms’-feedback for the prevention of licit and illicit substance use for
173 European university students. Participants were recruited from one or more designated intervention
174 and delayed-intervention control universities (21 sites in total) (McAlaney, et al., 2015).
175 Recruitment methods aimed at increasing students’ registrations on the survey website varied
176 between countries and included, inter alia, emails, classroom announcements, social media, and
177 printed flyers. Students who registered on the website received an email including a hyperlink to the
178 survey webpage. Study participation was voluntary, and participants’ information was
179 pseudonymized. For the analysis reported in this manuscript, baseline data from both, students at
180 intervention and students at delayed-intervention control universities, were considered. Statistical
181 analysis was conducted on an anonymized dataset. For each site participating in the SNIPE project,
182 ethical approval was obtained from the respective responsible authorities. Participants answered
183 questions on their personal use of licit (i.e., alcohol, tobacco), and illicit substances (e.g., cocaine,
184 ecstasy, amphetamines), as well as on their personal use of non-prescribed prescription substances
185 to improve academic performance and NPPSSP. Further questions related to the students’ personal
186 attitudes towards use of the aforementioned substances. Moreover, perceptions of peer substance
187 use and attitudes towards substance use were assessed. Demographic questions, such as on the
188 participants’ age, sex, migrant status, and living situation (living with or without other students),
189 were also included.

190 **2.2 Measurements**

191 Students’ personal use of NPPSSP was measured by asking how often they used sedatives or
192 sleeping pills which were not prescribed, followed by a list of registered local trade names of
193 prescription sedatives and sleeping pills as examples (e.g., diazepam, alprazolam, flunitrazepam,
194 midazolam, stilnoct). Perceptions of peer NPPSSP use (perceived descriptive norm) were assessed
195 by asking students how often in the last two months they think most (at least 51%) of the [female in
196 case of a female respondent/male in case of a male respondent] students at their university have
197 used sedatives or sleeping pills which were not prescribed, followed by a list of registered local
198 trade names of prescription sedatives and sleeping pills as examples (e.g., diazepam, alprazolam,
199 flunitrazepam, midazolam, stilnoct). These questions were tailored to the same sex and university of
200 the respondents. Response options for both questions were ‘Never in my/their life’, ‘Have used but
201 not in the last two months’, ‘Once in the last two months’, ‘Twice in the last two months’, ‘Once
202 every two weeks in the last two months’, ‘Weekly’, ‘Twice a week’, ‘Thrice a week’, ‘Four times a
203 week’, and ‘Every day or nearly every day’. Furthermore, information about students’ personal
204 attitude towards NPPSSP use was collected by asking: “Which of the following best describes your
205 attitude to using each of these substances?”. Concerning students’ perceptions of attitudes towards

206 using NPPSSP among their peers (perceived injunctive norm), respondents were asked: “Which of
207 the following do you think best describes the attitude of most (at least 51%) of the [female/male]
208 students at your university to the use of each of these substances?”. Response options for both
209 questions were ‘Never ok to use’, ‘Ok to use occasionally if it doesn’t interfere with work or study’,
210 ‘Ok to use frequently if it doesn’t interfere with work or study’, ‘Ok to use occasionally even if it
211 does interfere with work or study’, and ‘Ok to use frequently if that is what the person wants to do’.
212 Country, sex, age, year of study, and living situation were considered as potential determinants of
213 NPPSSP use/attitude towards NPPSSP use.

214 **2.3 Statistical analysis**

215 First, frequencies of personal NPPSSP use and attitudes towards NPPSSP use were calculated and
216 95% bootstrap confidence intervals based on 1,000 bootstrap samples were estimated for each
217 country, separately. Second, participants’ self-other discrepancies were classified into three groups
218 to differentiate between students who perceived the NPPSSP use and approval of NPPSSP use of
219 the majority of their same-sex peers as higher, identical or lower as their personal use and approval
220 of use. Third, two binary multivariable logistic regression analyses were conducted to examine
221 associations between perceived and personal NPPSSP use (descriptive norms model), and perceived
222 and personal attitudes towards NPPSSP use (injunctive norms model). In the descriptive norms
223 model, country, sex, age, year of study, living situation, perceived NPPSSP use, and personal
224 attitude towards NPPSSP use were included as independent variables. In the injunctive norms
225 model, all demographic variables, perceived attitude towards NPPSSP use, and personal NPPSSP
226 use were included as independent variables. In both models, all variables were entered
227 simultaneously (enter method). Age was included as a continuous variable, and all other variables
228 were considered as categorical variables. Categorical variables with more than two categories (i.e.,
229 country, year of study, living situation) were each converted into a set of dichotomous variables
230 using dummy coding. Both models were checked for the presence of multicollinearity. Tolerance
231 (TOL) values for both models ranged from 0.90 to 1.00 indicating absence of multicollinearity
232 between independent variables. To investigate whether sex or country moderates the associations
233 between perception and personal NPPSSP use/attitude towards NPPSSP use, the two relevant
234 interaction terms were added to both regression models. For significant interaction terms ($p < 0.05$),
235 stratified analyses were conducted. All statistical analyses were performed using SPSS for
236 windows, version 22.0.

237 **3. Results**

238 The SNIPE study included a total of 4,482 university students (71.4% female, mean age: 22.4
239 years). The Slovak Republic ($n=1,938$, 43.2%) contributed the highest number of students, followed

240 by Turkey (n=858, 19.1%), Germany (n=504, 11.2%), Denmark (n=464, 10.4%), Belgium (n=426,
241 9.5%), Spain (n=185, 4.1%), and the UK (n=107, 2.4%). A detailed description of the sample
242 characteristics is provided by Helmer et al. (2014). Information on sex and NPPSSP use was
243 provided by 4,412 students, and 4,284 additionally answered the question regarding their attitude
244 towards using NPPSSP.

245 Across all participating countries, 9.1% of the students reported having used NPPSSP at least once
246 in life. Lifetime prevalence rates of NPPSSP use varied from 4.0% of females and 2.3% of males in
247 Belgium to 12.5% of females and 18.2% of males in the UK. Across all countries, most students
248 stated that 'it is never okay to use' NPPSSP with rates varying from 56.8% of females in Germany
249 and 62.5% of males in the UK to 84.7% of females and 91.2% of males in Turkey (Table 1).

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275 **Table 1 Personal NPPSSP use and attitude towards NPPSSP use by country and sex (% and 95% bootstrap CI)**

	Belgium		Denmark		Germany		Slovak Republic	
<i>NPPSSP use (n=4,412)</i>	<i>Male (n=86)</i>	<i>Female (n=321)</i>	<i>Male (n=100)</i>	<i>Female (n=353)</i>	<i>Male (n=207)</i>	<i>Female (n=295)</i>	<i>Male (n=393)</i>	<i>Female (n=1,524)</i>
Used in the last two months	1.2 (0.0-3.8)	1.2 (0.3-2.6)	1.0 (0.0-3.3)	1.7 (0.6-3.3)	2.9 (0.9-5.4)	3.1 (1.2-5.2)	1.5 (0.5-2.9)	2.7 (1.9-3.5)
Used at least once in life	2.3 (0.0-5.8)	4.0 (2.1-6.3)	9.0 (3.6-14.7)	5.9 (3.4-8.6)	11.1 (6.7-15.6)	10.2 (6.6-13.7)	6.4 (3.9-8.9)	11.6 (10.0-13.2)
<i>Attitude towards NPPSSP use (n=4,284)</i>	<i>Male (n=85)</i>	<i>Female (n=316)</i>	<i>Male (n=95)</i>	<i>Female (n=348)</i>	<i>Male (n=203)</i>	<i>Female (n=292)</i>	<i>Male (n=384)</i>	<i>Female (n=1,489)</i>
Never ok to use	83.5 (75.0-91.5)	72.2 (67.1-77.1)	65.3 (55.9-74.0)	75.3 (70.7-79.6)	64.0 (57.1-70.4)	56.8 (51.0-62.6)	83.3 (79.4-86.9)	73.1 (70.8-75.4)
Ok to use if it doesn't interfere with work or study ^a	15.3 (7.9-23.5)	26.2 (21.6-31.6)	28.4 (20.6-37.5)	21.3 (17.3-25.9)	30.0 (23.9-37.0)	38.0 (32.4-43.7)	15.1 (11.7-18.8)	25.6 (23.4-27.8)
Ok to use ^b	1.2 (0.0-3.8)	1.3 (0.3-2.8)	6.3 (2.0-11.8)	3.4 (1.7-5.3)	5.9 (2.7-9.5)	5.1 (2.7-7.9)	1.6 (0.5-3.1)	1.3 (0.8-2.0)

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	Spain		Turkey		UK	
<i>NPPSSP use (n=4,412)</i>	<i>Male (n=52)</i>	<i>Female (n=132)</i>	<i>Male (n=398)</i>	<i>Female (n=446)</i>	<i>Male (n=33)</i>	<i>Female (n=72)</i>
Used in the last two months	1.9 (0.0-6.7)	4.5 (1.5-8.3)	2.0 (0.8-3.5)	2.5 (1.1-3.9)	12.1 (2.9-24.2)	4.2 (0.0-9.2)
Used at least once in life	11.5 (3.8-20.5)	12.1 (6.4-18.2)	5.5 (3.6-7.9)	9.9 (7.2-12.6)	18.2 (6.5-31.4)	12.5 (5.5-21.1)
<i>Attitude towards NPPSSP use (n=4,284)</i>	<i>Male (n=51)</i>	<i>Female (n=126)</i>	<i>Male (n=375)</i>	<i>Female (n=419)</i>	<i>Male (n=32)</i>	<i>Female (n=69)</i>
Never ok to use	64.7 (51.1-78.3)	65.9 (57.6-73.8)	91.2 (88.4-93.9)	84.7 (81.1-88.1)	62.5 (45.7-80.0)	73.9 (62.9-83.8)
Ok to use if it doesn't interfere with work or study ^a	33.3 (20.0-46.9)	31.7 (23.7-39.8)	6.1 (3.9-8.8)	13.6 (10.3-17.1)	34.4 (17.7-51.9)	24.6(15.2-34.8)
Ok to use ^b	2.0 (0.0-6.9)	2.4 (0.0-5.5)	2.7 (1.0-4.5)	1.7 (0.5-3.0)	3.1 (0.0-10.0)	1.4 (0.0-4.6)

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^a 'Ok to use occasionally if it doesn't interfere with work or study' and 'Ok to use frequently if it doesn't interfere with work or study' were collapsed into 'Ok to use if it doesn't interfere with work or study'.

^b 'Ok to use occasionally even if it does interfere with work or study' and 'Ok to use frequently if that is what the person wants to do' were combined into 'Ok to use'.

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287 In all countries, except for Denmark (45.4%) and Turkey (43.9%), more than half (54.8%) of the
 288 students thought that at least 51% of their same sex-peers had used NPPSSP at least once in their
 289 life. Overall, 51.0% perceived their peers' NPPSSP use to be higher than their personal NPPSSP
 290 use, 46.0% to be identical, and 3.0% to be lower. With regard to attitudes towards NPPSSP use,
 291 45.1% perceived that the majority of their peers approved of NPPSSP use. Overall, the majority of
 292 students perceived that the peer approval towards NPPSSP use was identical (62.9%) or higher
 293 (29.7%) than their personal approval (Table 2).

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295 **Table 2 Differences between personal NPPSSP use/attitude towards NPPSSP use and**
 296 **perceived NPPSSP use/ attitude towards NPPSSP use of the majority of peers of the same sex**
 297 **and university (self-other discrepancies)**

	Lifetime NPPSSP use (%) (n=4,310)	Positive attitude towards NPPSSP use ^a (%) (n=4,178)
Majority of same-sex peers < personal	3.0	7.4
Majority of same-sex peers = personal	46.0	62.9
Majority of same-sex peers > personal	51.0	29.7

298 ^a'Ok to use occasionally if it doesn't interfere with work or study', 'Ok to use frequently if it doesn't interfere with work or study', 'Ok to use
 299 occasionally even if it does interfere with work or study', and 'Ok to use frequently if that is what the person wants to do'.

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301 After controlling for students' country, sex, age, year of study, living situation, and attitude towards
 302 NPPSSP use, the perception that the majority of same-sex peers had used NPPSSP at least once in
 303 their life was significantly associated with a higher likelihood for personal lifetime NPPSSP use
 304 (OR: 1.95, 95% CI: 1.49-2.55) (Table 3). Moreover, after controlling for all demographic variables
 305 and NPPSSP use, perceived peer approval of NPPSSP use was associated with higher odds for
 306 personal approval of NPPSSP use (OR: 5.49, 95% CI: 4.63-6.51) (Table 4).

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319 **Table 3 Associations between personal NPPSSP use and perceived lifetime NPPSSP use of**
 320 **peers, personal attitude towards NPPSSP use, country, age, sex, year of study, and living**
 321 **situation – results of a binary logistic regression (descriptive norms model)**

Variables	Ever personally used NPPSSP	
	OR	(95% CI)
<i>Perceived peer NPPSSP use</i>		
Never used NPPSSP (reference)	1.00	
Ever used NPPSSP	1.95	(1.49-2.55)
<i>Personal attitude towards NPPSSP use</i>		
Never ok to use NPPSSP (reference)	1.00	
Ok to use NPPSSP ^a	7.42	(5.81-9.49)
<i>Country</i>		
Slovak Republic (reference)	1.00	
Belgium	0.24	(0.14-0.43)
Denmark	0.32	(0.20-0.52)
Germany	0.47	(0.32-0.70)
Spain	0.70	(0.41-1.22)
Turkey	0.99	(0.70-1.40)
UK	1.01	(0.52-1.94)
Age (in years)	1.04	(1.01-1.07)
<i>Sex</i>		
Female (reference)	1.00	
Male	0.82	(0.63-1.09)
<i>Year of study</i>		
1 st (reference)	1.00	
2 nd	0.78	(0.57-1.07)
3 rd	1.13	(0.83-1.54)
4 th	0.89	(0.60-1.31)
5 th	0.66	(0.39-1.10)
> 5 th	0.70	(0.35-1.41)
<i>Living situation</i>		
With other students (reference)	1.00	
Alone or with partner	2.04	(1.45-2.85)
With parents	1.06	(0.80-1.40)
Other	1.74	(0.94-3.23)

322 ^a 'Ok to use occasionally if it doesn't interfere with work or study', 'Ok to use frequently if it doesn't interfere with work or study', 'Ok to use
 323 occasionally even if it does interfere with work or study', and 'Ok to use frequently if that is what the person wants to do'.
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334 **Table 4 Associations between personal attitude towards NPPSSP use and perceived attitude of**
 335 **peers, personal NPPSSP use, country, age, sex, year of study, and living situation – results of a**
 336 **binary logistic regression (injunctive norms model)**

Variables	Positive attitude towards NPPSSP use ^a	
	OR	(95% CI)
<i>Perceived peer attitude towards NPPSSP use</i>		
Never ok to use NPPSSP (reference)	1.00	
Ok to use NPPSSP ^a	5.49	(4.63-6.51)
<i>Personal NPPSSP use</i>		
Never used NPPSSP (reference)	1.00	
Ever used NPPSSP	7.03	(5.45-9.06)
<i>Country</i>		
Slovak Republic (reference)	1.00	
Belgium	0.99	(0.74-1.30)
Denmark	2.04	(1.49-2.80)
Germany	2.59	(2.00-3.36)
Spain	1.59	(1.09-2.34)
Turkey	0.54	(0.41-0.71)
UK	1.20	(0.72-1.99)
Age (in years)	0.97	(0.95-0.99)
<i>Sex</i>		
Female (reference)	1.00	
Male	0.84	(0.70-1.02)
<i>Year of study</i>		
1 st (reference)	1.00	
2 nd	0.84	(0.68-1.04)
3 rd	0.99	(0.78-1.24)
4 th	1.02	(0.77-1.37)
5 th	1.04	(0.73-1.47)
> 5 th	0.97	(0.60-1.54)
<i>Living situation</i>		
With other students (reference)	1.00	
Alone or with partner	0.82	(0.64-1.06)
With parents	1.06	(0.87-1.28)
Other	0.63	(0.39-1.02)

337 ^a 'Ok to use occasionally if it doesn't interfere with work or study', 'Ok to use frequently if it doesn't interfere with work or study', 'Ok to use
 338 occasionally even if it does interfere with work or study', and 'Ok to use frequently if that is what the person wants to do'.
 339

340 Interaction terms in the descriptive norms model provided no evidence that the effect of perception
 341 on personal lifetime NPPSSP use was modified by country or sex. In terms of injunctive norms,
 342 significant interaction terms suggested that the effect of perception on personal attitude towards
 343 NPPSSP use was significantly modified by country, but not by sex. A stratified analysis of
 344 injunctive norms by country showed that the association between perception of peer approval and
 345 personal approval was significant for all countries, except for the UK (Table 5).

346

347

348

349 **Table 5 Association between personal attitude towards NPPSSP use and perceived attitude of**
 350 **peers stratified by country adjusted for personal NPPSSP use, age, sex, year of study, and**
 351 **living situation**

Country	Positive attitude towards NPPSSP use ^a	
	OR	(95% CI)
Slovak Republic	6.02	(4.64-7.81)
Belgium	2.79	(1.60-4.87)
Denmark	16.40	(9.37-28.73)
Germany	4.11	(2.69-6.29)
Spain	3.52	(1.66-7.47)
Turkey	6.41	(3.80-10.80)
UK	1.79	(0.52-6.10)

352 ^a ‘Ok to use occasionally if it doesn't interfere with work or study’, ‘Ok to use frequently if it doesn't interfere with work or study’, ‘Ok to use
 353 occasionally even if it does interfere with work or study’, and ‘Ok to use frequently if that is what the person wants to do’.

354 **4. Discussion**

355 In the present study with European students, we investigated self-other discrepancies regarding the
 356 use and attitudes towards the use of NPPSSP. In addition, we evaluated whether perceptions of peer
 357 use (perceived descriptive norm) and peer approval of use (perceived injunctive norm) were
 358 associated with personal use and approval of NPPSSP use. In our study, students on average
 359 perceived the NPPSSP use of their peers to be higher than their personal use and attitudes towards
 360 the use to be identical or more positive than their personal attitudes. Both, perceived descriptive and
 361 injunctive norms of peers, were associated with students' personal use and attitudes towards the use
 362 of NPPSSP, respectively.

363 To date, there are few studies on the use of NPPSSP among students. The only study that examined
 364 perceptions with respect to prescription sedatives by Sanders and colleagues (2014) found that
 365 65.7% of students perceived the recreational use of prescription sedatives to be the norm among
 366 their peers despite only 2.6% of the sample reporting recreational use of these substances during the
 367 last month. More than a third of participants overestimated (26.3%) or extremely overestimated
 368 (10.2%) their peers' use, and recreational users of prescription sedatives were more likely to
 369 overestimate their peers' use of these substances (Sanders, et al., 2014). These findings are in line
 370 with our study. The results reported by Sanders and colleagues (2014), however, are based on
 371 bivariate analyses and thus did not account for further potential determinants of students' personal
 372 prescription sedative use, such as sex or age.

373 Our study extends the limited evidence regarding the association of perceived descriptive norms of
 374 peers with university students' personal use of NPPSSP. Indeed, our study adds to the existing
 375 evidence by revealing self-other discrepancies regarding NPPSSP use in a large sample of
 376 university students from various universities across Europe. Across all countries participating in the
 377 SNIPE study, the majority of students perceived their peers' use to be higher than their personal

378 use. Furthermore, we demonstrated associations between perceived peer use and students' personal
379 use while controlling for other potential determinants of NPPSSP use ensuring further
380 methodological rigor to our study.

381 The present study is the first to demonstrate discrepancies between personal and perceived peer
382 injunctive norms regarding NPPSSP use by investigating self-other discrepancies and associations
383 between perceived injunctive norms and students' personal approval of NPPSSP use. To date,
384 associations between perceived injunctive norms and personal approval of using non-prescribed
385 prescription substances have only been investigated for stimulants (Helmer, et al., 2016; Silvestri &
386 Correia, 2016), not for sedatives or sleeping pills. Silvestri and Correia (2016), analyzing data from
387 959 U.S. undergraduate students, found that students' personal approval of non-medical
388 prescription stimulant use was positively correlated with perceived approval among what students
389 perceived to be a typical university student, close friends, as well as parents. However, the
390 correlations between perceived parental and close friend approval with personal approval were
391 moderate in strength with weak associations between perceived typical student approval and
392 personal approval. This suggests that more proximal referent groups, rather than students' broader
393 group affiliations, could be important in determining personal approval of stimulant use. Another
394 study by Helmer and colleagues (2016), also using data from the SNIPE study, found that 38.7% of
395 students perceived their peers to be more approving of using non-prescribed prescription stimulants
396 to improve their academic performance than themselves. Their multivariable analysis also revealed
397 an association between perceived peer and personal approval of using these substances. In our
398 study, an association between perceived injunctive norms of peers and students' personal approval
399 of using NPPSSP was found for all countries participating in the SNIPE project, except for the UK,
400 with its comparatively small sample size.

401 The findings of this study align with previous observations that university students' exaggerated
402 perceptions of peer norms also exist for prescription substances which are less commonly used and
403 socially accepted than, for example alcohol, tobacco, or cannabis (Helmer, et al., 2016; Kilmer, et
404 al., 2015; McCabe, 2008; Perkins, et al., 1999; Sanders, et al., 2014; Silvestri & Correia, 2016).
405 Increased interest in the non-medical use of prescription drugs to the public and the media
406 (Partridge, et al., 2011) may create the impression that approving and using these substances is
407 much more common than it is in reality (McCabe, 2008; Sanders, et al., 2014). Perceiving
408 prescription drugs to be safer, and socially acceptable because of their production by
409 pharmaceutical companies and their prescription by physicians (Bodenlos, et al., 2014; Compton &
410 Volkow, 2006; Hildt, et al., 2011; Martins & Ghandour, 2017) may also explain exaggerated peer
411 norms.

412 The identification of perceived descriptive and injunctive norms of peers as significant predictors of
413 students' NPPSSP use and approval of use provides empirical arguments for the important role of
414 social norms for personal behaviors and approval of behaviors. In line with social norms theory
415 (Berkowitz, 2005; Perkins, 2003), our findings may indicate that exaggerated perceptions of
416 descriptive norms of peers may increase students' willingness to use NPPSSP themselves.
417 Moreover, exaggerated perceptions of injunctive norms of peers may also lead to an increased
418 approval of using NPPSSP in order to match personal attitudes to the perceived peer norms. Social
419 norms interventions that challenge perceptions of descriptive and injunctive peer norms through, for
420 example, mass media campaigns, social marketing strategies or the provision of online personalized
421 feedback (McAlaney, et al., 2011; Perkins, 2003), may be a viable approach to prevent or reduce
422 NPPSSP use among European university students.

423 There are certain limitations to the present study. The analyses are based on self-reported data
424 collected via a confidential online survey. This is a commonly used survey technique in substance
425 use research among university students to minimize the risk of socially desirable response behavior
426 (Kypri, Gallagher, & Cashell-Smith, 2004). However, in general, an under- or overestimation of
427 NPPSSP use and approval of use due to social expectation bias cannot be ruled out. Moreover,
428 possible misunderstandings of the survey questions by survey participants, i.e., also considering the
429 use of drugs which are available without a prescription, may have led to an overestimation of
430 NPPSSP use and approval of use. However, since only registered local trade names of prescription
431 sedatives and sleeping pills were provided as examples in the survey questionnaire, and given that
432 use and approval rates of NPPSSP are in line with those for other illicit substances asked for in the
433 SNIPE study (Helmer, et al., 2014), the risk of having misunderstood the survey questions can be
434 considered low. On the other hand, the survey questions regarding NPPSSP may have led to an
435 underestimation of use and approval rates since only a selection of registered local trade names of
436 prescription sedatives and sleeping pills (e.g., diazepam, alprazolam, flunitrazepam, midazolam,
437 stilnoct) were included. Furthermore, it is to be noted that individual email addresses were collected
438 for the intervention provided within the study and students may have perceived that they can be
439 identified. In addition, the number of participating students differed between countries, ranging
440 from 107 individuals in the UK to 1,938 in the Slovak Republic. Therefore, selection bias may have
441 differentially affected the sample composition in different countries. Finally, since the analyses are
442 based on cross-sectional survey data, no causal relationships between perceived descriptive and
443 injunctive norms and personal behavior and attitudes towards behavior can be deduced.

444
445

446 **5. Conclusions**

447 This study suggests that European university students perceive the use of NPPSSP among their
448 peers to be higher than their personal use and peer attitudes towards the use to be identical or more
449 positive than their personal attitudes. Furthermore, both perceived descriptive and injunctive norms
450 of peers were shown to be associated with students' personal use and attitudes towards the use of
451 NPPSSP, respectively. Social norms interventions may be useful to change exaggerated perceptions
452 regarding the use and attitudes towards NPPSSP use and may prevent or reduce NPPSSP use
453 among European university students.

454 **Declarations of interest:** none

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