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Association between Non-Medical Prescription Drug Use and Personality traits among young Swiss men.

Running title: **Association NMPDU and personality traits**

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Abstract (245 words)

Aim To investigate the relationships between six classes of non-medical prescription drug use (NMPDU) and five personality traits.

Methods Representative baseline data on 5,777 Swiss men around 20 years old were taken from the Cohort Study on Substance Use Risk Factors.

NMPDU of opioid analgesics, sedatives/sleeping pills, anxiolytics, antidepressants, beta-blockers and stimulants over the previous 12 months was measured. Personality was assessed using the brief sensation seeking scale; attention-deficit hyperactivity (ADH) using the adult attention-deficit hyperactivity disorder self-report scale; and aggression/hostility, anxiety/neuroticism and sociability using the Zuckerman-Kuhlmann personality questionnaire.

Logistic regression models for each personality trait were fitted, as were seven multiple logistic regression models predicting each NMPDU adjusting for all personality traits and covariates.

Results Around 10.7% of participants reported NMPDU in the last 12 months, with opioid analgesics most prevalent (6.7%), then sedatives/sleeping pills (3.0%), anxiolytics (2.7%), and stimulants (1.9%). Sensation seeking (SS), ADH, aggressivity/hostility, and anxiety/neuroticism (but not sociability) were significantly positively associated with at least one drug class (OR varied between 1.24 [1.04-1.48] and 1.86 [1.47-2.35]).

Aggression/hostility, anxiety/neuroticism and ADH were significantly and positively related to almost all NMPDU.

Sociability was inversely related to NMPDU of sedatives/sleeping pills and anxiolytics (OR 0.70 [0.51-0.96] and 0.64 [0.46-0.90], respectively).

SS was only related to stimulant use (OR=1.74 [1.14-2.65]).

Conclusion: People with higher scores for ADH, aggression/hostility and anxiety/neuroticism are at higher risk of NMPDU. Sociability appeared to protect from NMPDU of sedatives/sleeping pills and anxiolytics.

Key words: NMPDU, personality traits, young men, Switzerland.

INTRODUCTION

Prescription drugs such as opioid analgesics, sedatives, anxiolytics and stimulants are essential pharmacological agents in the treatment of acute and chronic pain, insomnia, anxiety, attention-deficit hyperactivity disorder (ADHD) and other psychiatric disorders.[1] However, management of these medicines is complicated by their potential for abuse or dependence[1, 2]. Similarly, non-medical prescription drug use (NMPDU) can occur and may even outnumber illicit drug use, e.g. because NMPD may be easier available and people may – often wrongly - assume that their use is not illegal. For example NMPDU is positively associated with prescribing patterns[3, 4], which can be misperceived as a legal dispensation of these drugs.

NMPDU involves the use of prescription drugs without a prescription or in ways not recommended by a doctor.[1, 5] The motives of misuse are generally self-medication and recreational use (e.g. experimentation, 'getting high').[6] NMPDU is on the rise in the United States (US)[1, 2] and is becoming a growing public health problem.[7] Several forces are apparently driving increases of NMPDU: marked increases in the numbers of prescriptions; internet access to prescription drugs as an easy new source of supply; and changes in drug formulation and prescribing practices that may lead to a greater risk of diversion and abuse.[8] In 2007, non-medical prescription opioids were second only to cannabis as the most frequently used illegal drug in the US;[9] and in 2010, 3.6% of those aged 12 or older were current users of illicit drugs other than cannabis, with the majority of them being non-medical users of psychotherapeutic drugs.[9, 10] Young adults are now misusing prescription drugs at higher rates than all other illegal drugs with the exception of cannabis.[7]

Most research has been undertaken in the US and focused on the most misused drug classes (i.e. opioid analgesics, sedatives/sleeping pills, anxiolytics and stimulants). However, there are only few studies outside the US, particularly in Europe. For this reason, the present

study looks at NMPDU among twenty-year-old men in Switzerland, which may serve as a role country for established market economies in Europe.

A major aim of the present study is to look at personality traits of NMPD users. Personality traits (defined as "individual differences in the tendency to behave, think, and feel in certain consistent ways"[11]) have been shown to be associated with substance use.[10, 12] For example, anxiety and sensation seeking (SS) are related to high and problematic substance use behaviors[13, 14], and higher levels of SS seem to be associated with higher risks for an early onset of substance use and polysubstance use.[15] Little is known, however, about personality traits of NMPD users? Are NMPD users 'normal' individuals who overcome sometimes stressful situations with NMPDU, or do they show a profile that resembles users of other illicit substances? The answer to this question could enable early detection of particularly risky NMPDU.

A recent study [16] of the National Epidemiological Survey on Alcohol and Related Conditions (NESARC) indicated a shared, gender invariant liability to NMPDU and other forms of externalizing psychopathology such as other substance use disorders, as well as antisocial behaviors. It is crucial to identify the risk profiles of substance use or abuse.[12] Substance users' personalities form part of those risk profiles. Knowledge about personality factors can be used to design intervention and prevention strategies.[17] Thus, this study will provide information concerning personality traits and NMPDU.

The present study also goes beyond earlier studies by looking at drug classes commonly not under study: 1) beta blockers (which may be misused for their anti-tremor and, perhaps to a lesser degree, anti-anxiety effects)[18], and 2) the antidepressants widely used against symptoms of depressive disorders and increasingly to treat anxiety disorders.[19] Moreover, these two substances are among those used by healthy individuals in an attempt to enhance their cognitive function, such as increased concentration and focus for a specific task (or

reduce anxiety and fear), particularly by students in connection with exams.[20, 21] An association with a fear subfactor of internalizing behaviours has been shown for NESARC.[16]

Commonly, research focused only on personality traits that were known to show higher risks for substance use (e.g. SS, anxiety). Personality traits which may have protective effects have rarely been studied. In addition to SS and anxiety/neuroticism, the present study therefore includes sociability and aggression/hostility, which have been associated with substance use in adolescents and young adults.[22] It also includes attention deficit/hyperactivity (ADH) because sufferers of attention deficit/hyperactivity disorder (ADHD) were significantly more likely to develop disorders involving abuse/dependence for nicotine, alcohol, marijuana, cocaine, and other substances.[23] An aim of the present study therefore is to investigate whether these personality traits not only play a role in heavy legal substance use and illicit drug or polysubstance use of e.g. cannabis, cocaine, heroin, but also in NMPDU.

The few studies on NMPDU and personality factors have commonly looked at only one personality trait or on personality traits which were expected to have a detrimental impact on substance use. The link between a single personality trait and a single drug does not allow to study whether there is an overarching personality trait related to all non-medical prescription drugs, or whether different personalities choose different drugs. Furthermore, most studies on NMPDU focused on opioid analgesics, stimulants, sedatives and anxiolytics.[9, 10] and were conducted in the US, where factors such as availability and prescribing practices are different from those in Europe. Thus high and increasing prevalence rates may not be mirrored and be related to more particular or “extreme” personality profiles. The present study therefore aimed to assess the relationships between 5 specific personality traits (SS, attention-deficit/hyperactivity (ADH), anxiety/neuroticism, aggression/hostility and sociability) and 6 NMPDU (opioid analgesics, sedatives/sleeping

pills, anxiolytics, antidepressants, beta-blockers and stimulants) in Switzerland. We hypothesize that personality traits such as SS, ADH, anxiety/neuroticism, aggression/hostility and sociability would be significantly associated with NMPDU, but also that different personality traits would be related with different NMPDs.

METHODS

2.1. Sample

Data came from the Cohort Study on Substance Use Risk Factors (C-SURF), a longitudinal study designed to assess the substance use patterns of young Swiss men and the related consequences. Enrolment took place between August 2010 and November 2011 in 3 of 6 national Swiss army recruitment centers, located in Lausanne (French-speaking), Windisch and Mels (German-speaking). These cover 21 of 26 Swiss cantons. Attending army recruitment is compulsory, so virtually all men around 20 years-old (20±1.22) were available for inclusion in the study.

The study was conducted outside the army context. Questionnaires in French or German (cf http://www.c-surf.ch/en/30.html) were sent to the 7,563 private addresses of those who gave written consent to participate. Of these, 5,990 (79.2%) returned a completed baseline questionnaire. Participants (n = 213, 3.5%) who omitted variables of interest were excluded (final sample n = 5,777). As had been shown in a previous study[24], there was a certain amount of non-response bias, but this was often small and went in different directions. For the Francophone sample, for example, there were more alcohol abstainers among non-respondents (11.6%) than respondents (11.2%), but there were more non-smokers (63.4%) among respondents than non-respondents (49.8%), and this was found for cannabis non-users too (respondents, 64.8%; non-respondents, 58.0%)[24]. For the analysis of non-response bias, a very short five-minute questionnaire containing questions on demography, alcohol, tobacco and cannabis use was administered to all conscripts going through the recruitment procedures. It yielded a response rate of 94%. Unfortunately, the brevity necessary to ensure a high response rate from non-participants in the cohort study meant that no questions about NMPDU were asked in this very short questionnaire. Given the small differences for the others drugs assessed, we did not expect a major non-response bias for NMPDU.

2.2. Study protocol

The study protocol (Protocol No 15/07) was approved by Lausanne University Medical School's Clinical Research Ethics Committee.

2.3. Hypotheses

We hypothesized that personality traits such as SS, ADH, anxiety/neuroticism, aggression/hostility and sociability would be significantly associated with NMPDU in general, but not necessarily all traits with all types of NMPDU. We hypothesize that SS will be significantly associated with all NMPDU due to mainly recreational purposes (i.e. experimentation or getting high) for people high on SS. Other personality traits, however, may have differential associations with different types of drugs because of their use for self-medication, e.g. we hypothesize that anxiety/neuroticism is associated with anxiolytics and antidepressant but not with stimulants, whereas stimulants are more often used by people high on ADH.

2.4. Measurements

2.2.1. Non-Medical Prescription Drug Use (NMPDU)

NMPDU was described to participants as use of prescription drugs without a prescription or in ways not recommended by a doctor.

Frequency of NMPDU over the last 12 months was assessed for 6 drug classes (opioid analgesics, sedatives/sleeping pills, anxiolytics, antidepressants, beta blockers and stimulants). Examples were given for each class: a) sedatives/sleeping pills, e.g. benzodiazepines (Dalmadorm®, Rohypnol®), zopiclone or zolpidem (Imovane®, Stilnox®), chloral hydrate or barbiturates; b) anxiolytics, e.g. benzodiazepines (Valium®, Xanax®, Librax®) or muscle relaxants; c) opioid analgesics excluding aspirin and paracetamol, e.g. codeine (Benylin®), opiates (fentanyl, hydrocode) or buprenorphine (Tamgesic®); d) antidepressants, e.g. Fluoxetine®, Remeron®; e) stimulants, e.g.

amphetamine sulfate, atomoxetine or methylphenidate; and f) beta-blockers, e.g. propranolol, atenolol or metoprolol. Respondents answered on an eight-point scale (from 'never' to '4 times per week or more'). The frequency of NMPDU was dichotomized as use/no use in the past 12 months. NMPDU prevalence was first calculated for the use of (at least) any one class of drug and then separately for each of the 6 classes. These data were the dependent variables.

2.2.2. Personality traits

1) Sensation seeking (SS) has been defined as a strong need for varied, novel and stimulated experiences, and willingness to take risks for the sake of them[25]. This study used the brief sensation seeking scale (BSSS)[26] – an 8-item measurement of impulsive SS pertaining to the need for excitement, unpredictability and novelty, as well as the tendency to act quickly without thinking. Participants answered on a five-point scale (from 1 'strongly disagree' to 5 'strongly agree'). A SS global score was calculated by averaging the 8 items. Scores were dichotomized as below the median, or equal to the median of 3.12 or above, and coded 'low' or 'high', respectively. Cronbach's α of the present study was 0.81.

2) Adult Attention Deficit/Hyperactivity (ADH)

ADH was measured like the adult attention deficit/hyperactivity disorder (a disorder including symptoms of inattention, impulsivity, hyperactivity and associated impairments in multiple domains of functioning)[27], using a 6-item screener version of the attention deficit syndrome adult self-report scale (ASRS).[28] Participants answered on a five-point scale (from 0 'never' to 4 'very often'). Responses were summed to obtain a global score ranging from 0 to 24.[29] Scores were dichotomized as below the median, or equal the median of 5 or above, and coded 'low' and 'high', respectively. Our study did not use ADH as a disorder diagnosis, but as a screener of the attention deficit/hyperactivity personality trait. Cronbach's α of the present study was 0.80.

3) Aggression/hostility, anxiety/neuroticism and sociability

The 3 personality dimensions of aggression/hostility, anxiety/neuroticism and sociability were measured using the Zuckerman-Kuhlmann personality questionnaire. [30] Each dimension was assessed using a 10-item subscale in which participants answered true or false. For each of the 3 personality dimensions, the scale was first scored by summing the items ranging from 0 to 10 for each subscale. Again, for each subscale, scores were dichotomized as below the median, or equal to or above the median, and coded 'low' and 'high', respectively. The medians were 1 for anxiety/neuroticism, 4 for aggression/hostility and 6 for sociability. Cronbach's α of the present study were 0.62, 0.70 and 0.65 for aggression/hostility, anxiety/neuroticism and sociability, respectively.

2.2.3. Covariates

Demographic covariates included age, relationship status (coded 'single' or 'other'), educational level (coded 'primary', <10 years of schooling; 'secondary', 10–12 years; 'tertiary', 13 years or more), current living arrangements (coded 'living with family/couple' or 'alone/orphanage/foster home/homeless'), and financial independence, i.e. whether respondents were able to provide for themselves financially (coded 'totally independent', 'partially independent' and 'totally dependent').

2.2.4. Statistical analysis

All analyses were performed using Stata version 12. Analyses include descriptive demographic characteristics, followed by logistic regressions. First, associations between each personality trait and each type of NMPDU, and then with at least any one NMPDU, were presented by crude odds ratios (OR). The same models were repeated adjusting for other socio-demographic variables. Finally, we fitted 7 multiple logistic regression models, predicting each of the NMPDU and adjusting for all personality traits and covariates.

With regard to the sample size, we estimated that for a type 1 error of 5% and a power of 80%, 4,221 participants would be needed to detect an OR of 1.5. This OR corresponds to a small effect size[31] under the assumption that the response probability (dependent variable, i.e. NMPDU is around 5%) and the independent variable of interest (i.e. personality traits with a median split) are correlated with control variables by R-squared of 0.20. Thus, our sample size was more than sufficient to test small effect sizes given that the prevalence of the corresponding NMPDU was not too low.

For a dependent variable with a prevalence of 1%, only medium effect sizes (OR=2.5 [31]) can be tested. Under the same assumptions as above, 3,116 participants would be needed. Pass 11 software (PASS 11. NCSS, LLC. Kaysville, Utah, USA. www.ncss.com) was used to calculate sample sizes. Pass 11 uses the algorithm described by Hsieh, Block, and Larsen (1998).[32]

RESULTS

3.1. Descriptive data

Table 1 summarizes the demographic covariate study variables, descriptive data of each personality trait assessed and NMPDU. Mean age was 20 (SD 1.22).

A total of 51.8% of participants showed high for SS, 57.0% showed high for ADH, 57.9% showed for aggression/hostility, 75.1% showed high for anxiety/neuroticism and 61.8% showed high for sociability.

Of 5,777 participants, 616 (10.7%) reported at least one NMPDU in the last 12 months. More specifically, 389 (6.7%) respondents had used opioid analgesics, 171 (3.0%) sedatives/sleeping pills, 153 (2.7%) anxiolytics, 109 (1.9%) stimulants, 51 (0.9%) antidepressants and 30 (0.5%) beta blockers.

Insert Table 1 about here

3.2. Logistic regression of NMPDU on personality traits

Table 2 shows the association between personality trait and NMPDU adjusting for age, relationship status, educational level, current living arrangements and financial independence.

Concerning the association between each personality trait and each type of NMPDU, results (part a) showed that ADH, anxiety/neuroticism, aggression/hostility, and SS were significantly positively related with any NMPDU, but these associations varied with different drug classes. Adjustment by covariates did not change effects (data without covariates adjustment not shown).

Part b of Table 2 shows the models for each of the NMPDU adjusting of all personality traits and covariates simultaneously. Multiple adjustments of all personality traits did not alter the findings for models taking personality traits separately. ADH, anxiety/neuroticism and aggression/hostility are positively linked to almost each NMPDU (except ADH and anxiety/neuroticism for beta-blockers, and aggression/hostility for antidepressants). Only aggression/hostility was significantly and positively associated with beta blockers. Those who reported high ADH, anxiety/neuroticism and aggression/hostility, had ORs of 1.47 [1.22-1.76] to 1.86 [1.47-2.35] of reporting at least one NMPDU. SS was only significantly positively associated with any NMPDU and with NMPDU of stimulants with OR of 1.24 [1.04-1.48] and 1.74 [1.14-2.65], respectively. Sociability was significantly negatively associated with sedatives/sleeping pills and anxiolytics, with OR of 0.70 [0.51-0.96] and 0.64 [0.46-0.90], respectively.

Insert Table 2 about here

DISCUSSION

Our results showed a 10.7% prevalence for any NMPDU in the last 12 months (see Section 3.3 above for details), which seems to be lower than those in the US[10, 33] but were comparable to those in Ontario, Canada [34] at least as regards of opioid analgesics. Such differences observed in NMPDU rates between the US and our study could be influenced by differences in prescribing practices , drug access and availability, the distinct dynamics of adolescent drug cultures (e.g. as related to varying subcultural norms related to substance use), or potential substitution effects involving alternative (legal or illegal) drugs.

Nevertheless, Swiss prevalence rates are not negligible. For the 12 months prior to our study, the sample's prevalence for alcohol was 92.9%, followed by tobacco (45.7%) and cannabis (30.7%). After cannabis, the next highest prevalence for an illicit drug was ecstasy (3.7%), followed by cocaine (3.2%).[35] Our results confirm that NMPDU by males in Switzerland ranks just after alcohol, tobacco and cannabis use. Further, NMPDU of opioid analgesics alone had a higher prevalence than any illicit drug except cannabis. This indicates that NMPDU may become a growing public health concern that needs monitoring not only in the US, but also in Europe. Furthermore, several US studies showed that NMPDU was more prevalent in women than in men. Thus, prevalence rates may be underestimated in the present study which only included men.

Several studies[6, 7, 9, 36] including both men and women suggested that the ranking of NMPDU among other substances may hold for both genders. Therefore, the high prevalence of NMPDU among men compared with other illicit drugs coupled with the absence of women in the present study, for which often even higher prevalence rates of NMPDU (but lower rates for other illicit drugs) were found, may even mean that prevalence rates including both women and men could be closer to that of cannabis. However, clearly the

potential for gender differences needs confirmation by further studies in Switzerland including women.

The study's primary aim was to investigate whether personality traits (i.e. SS, ADH, aggression/hostility, anxiety/neuroticism and sociability) were related to NMPDU. Personality variables are important distal factors with direct and indirect effects on the development of substance use.[22, 37] Although significance levels were partly reduced in multiple trait comparison, the findings did not substantively change compared with models using only single personality traits. It is therefore possible to look at specific relationships between personality and NMPDU separately. This is important for studies that do not have multiple measures of personality at hand, which was the case with many earlier studies so far.

Our main findings were that individuals with high ADH, aggression/hostility and anxiety/neuroticism scores were more likely to be using non-medically prescribed opioid analgesics, sedatives/sleeping pills, anxiolytics or stimulants. Their use may therefore be more strongly linked to self-medication because of their anti-anxiety and anxiolytic/sedative effects than to recreational use. For example, pain relief, i.e. self-medication was the most reported motive for NMPDU of opioids in other studies.[38, 39] Although the present study did not measure motives for use, it indirectly supports the hypothesis of NMPDU being more strongly related to self-medication than solely recreational use (experimentation or 'getting high').[6, 39] NMPDU had a rather "problematic" personality profile, which is also consistent with the fact that self-medication occurs in a context of self-regulation of vulnerabilities – primarily difficulties in regulating effects, self-esteem, relationships and self-care.[38]

Many studies on substance use showed an association between heavy alcohol, tobacco or cannabis use, polysubstance use, and misuse among people high on SS[15]. Our results

showed that SS is solely associated with NMPDU for stimulants but not with other NMPDU, further strengthening our self-medication hypothesis for the other NMPDs. This is consistent with the finding *Low and Gendaszek* [40], that individuals with high levels of sensation-seeking were more likely to use stimulants. We assume that stimulants are used by sensation seekers in a more recreational way looking for higher arousal levels, whereas they do not use e.g., sedatives/sleeping pills or opioids analgesics to sedate their arousal, or to self-medicate their anxiety. Sensation seekers are generally interested in novel experiences which may be enhanced by stimulants. Further studies are needed to look more closely into the motives related with the use of different NMPD classes, and particularly among sensation seekers.

In contrast to other studies that have mostly looked at personality traits associated with higher risks of substance use, the present study found sociability to be negatively associated with NMPDU, specifically to sedatives/sleeping pills and anxiolytics. Due to the cross-sectional nature of this study, no causal conclusions can be drawn. We can only speculate about potential explanations of this negative association, because there are almost no studies on the association between sociability and NMPDU that could further substantiate our interpretation. Studies looking at the link between sociability and substance use other than NMPDU have not yielded consistent findings. Some studies reported positive associations, i.e. higher levels of sociability being associated with higher substance use levels;[37, 41] others have found that less sociability is related to more substance use.[42] In these studies, substance use has often been studied as a combination of alcohol, tobacco and cannabis. Therefore, neither could be determined whether associations varied across substances, nor was NMPDU included in these studies. Hampson and colleagues found that higher levels of sociability predicted the intention to use alcohol[43], but did not predict the intention to smoke cigarettes.[44] Alcohol use is more prevalent, and perceived to be a less deviant and more socially acceptable behavior, than using other substances. Although as stated above, we can

only speculate about findings due to the lack of research on NMPDU and sociability, NMPDU may be a less socially accepted behavior compared with alcohol use. It is clearly less prevalent than alcohol use or even tobacco use. Thus, particularly people high on sociability may disapprove NMPDU due to being a more deviant and socially unaccepted behavior. As this is only a statistical association, it does not mean that all people with medium or low sociability approve NMPDU use. They are just more likely to use NMPD compare with people high on sociability.

This study has several limitations. First, study data are self-reported and do not use an objective criterion such as a urine test to confirm findings. Although such data on risky behaviors and substance use are generally considered valid[4545], self-reported surveys could introduce various forms of bias, including recall bias, pressure to give desirable answers and non-response bias. Therefore, adding more objective measures like a urine test would have been good on the one hand. On the other hand people who want to avoid socially undesirable answers may also not be favorable to provide urine tests. Second, this study comprised only men and cannot therefore be generalized to women, although they are known to misuse prescription drugs too. Third, because the data are cross-sectional, causality cannot be determined. Fourth, we did not analyze the differences between poly- or single-substance users, but only assessed NMPDU differences between 1) NMPDU classes, and 2) any NMPDU across several NMPD classes. Poly- versus single-substance NMPD users may have different personality profiles. Finally, several research questions on motives for NMPDU could not be answered, because they were not measured. Particularly direct questions on whether substances were used for self-medication or just for ‘getting high’ were missing. More longitudinal data are needed, such as on whether NMPDU induces anxiety and neuroticism, or *vice versa.* Despite these limitations, this study is among the first to document associations between NMPDU and several personality traits, and this for a country outside the US.

This study found NMPDU prevalence lower than in the US; however, monitoring of NMPDU should be done in Switzerland because, as like the US, NMPDU prevalence rates are above those for all illicit drugs except cannabis and thus are already a significant public health theme. The present study used a wider spectrum of both NMPDU classes and personality traits than most other studies, thus extending prior research on the association of personality on the development of substance use to NMPDU providing more information about NMPDU. The study suggests that NMPDU was on the one hand consistently positively (though not always significantly so) associated with personality traits such as ADH, a more aggressive or hostile personality, or a more anxious personality. On the and sensation seeking was specifically positively associated with stimulant use and sociability showed even significant negative associations. This study suggests that potentially problematic users could be screened by personality traits. Thus, the present study has important clinical implications and could be used to inform intervention agencies to develop measures for preventing NMPDU in young adults.

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Conflict of interest

None.

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Table 1. Descriptive data (*n* = 5777)

Demographic variables		Independent: Personality traits		Dependent: NMPDU	
Variables	*n* (%)	Variables	*n* (%)	Variables	*n* (%)
Educational level		SS			
Primary (<10 years)	2780 (48.1)	Low	2786 (48.2)	Any drug	616 (10.7)
Secondary (10–12 years)	1530 (26.5)	High	2991 (51.8)	Opioid analgesics	389 (6.7)
Tertiary (≥13 years)	1467 (25.4)			Sedatives/sleeping pills	171 (3)
Relationship status		ADH		Anxiolytics	153 (2.7)
Single	5487 (95)	Low	2485 (43)	Stimulants	109 (1.9)
Other	290 (5)	High	3292 (57)	Antidepressants	51 (0.9)
Current living arrangements		Aggression/hostility		Beta-blockers	30 (0.5)
Family/couple	5313 (92)	Low	2434 (42.1)		
Other (alone/orphanage/foster home/homeless)	464 (8)	High	3343 (57.9)		
		Anxiety/neuroticism			
		Low	1440 (24.9)		
		High	4337 (75.1)		
		Sociability			
		Low	2208 (38.2)		
		High	3569 (61.8)		

ADH, attention deficit–hyperactivity; NMPDU, non-medical prescription drug use; SS, sensation seeking.

Table 2. Associations between personality traits and NMPDU (*n* = 5777)

	Associations between each personality trait and each NMPDU						
	Use of any drug	Sleeping pills	Painkillers	Stimulants	Anxiolytics	Antidepressants	Beta-blockers
Personality traits	AOR† (95%CI)	AOR† (95%CI)	AOR† (95%CI)	AOR† (95%CI)	AOR† (95%CI)	AOR† (95%CI)	AOR† (95%CI)
SS	1.34 (1.14–1.60)**	1.23 (0.90–1.67)	1.21 (0.98–1.49)	2.02 (1.34–3.04)**	1.25 (0.90–1.74)	1.04 (0.60–1.82)	0.71 (0.34–1.47)
ADH	1.65 (1.38–1.98)**	2.41 (1.69–3.44)**	1.41 (1.14–1.76)**	2.24 (1.45–3.46)**	2.50 (1.71–3.65)**	2.52 (1.31–4.85)**	1.79 (0.81–3.94)
Aggression/hostility	1.70 (1.42–2.04)**	1.90 (1.35–2.67)**	1.67 (1.33–2.09)**	2.88 (1.80–4.62)**	2.59 (1.76–3.81)**	2.11 (1.12–3.98)*	2.90 (1.18–7.11)*
Anxiety	2.03 (1.61–2.56)**	2.41 (1.52–3.82)**	2.00 (1.49–2.66)**	2.11 (1.22–3.65)**	2.37 (1.46–3.85)**	5.35 (1.66–17.21)**	3.00 (0.91–9.90)
Sociability	0.89 (0.75–1.06)	0.62 (0.46–0.85)**	1.04 (0.84–1.29)	0.86 (0.59–1.27)	0.58 (0.42–0.80)**	0.87 (0.49–1.52)	0.60 (0.29–1.24)
	Multiple logistic regression of NMPDU on personality traits modeled simultaneously						
	Any NMPDU	Sleeping pills	Painkillers	Stimulants	Anxiolytics	Antidepressants	Beta-blockers
Personality traits	AOR‡ (95%CI)	AOR‡ (95%CI)	AOR‡ (95%CI)	AOR‡ (95%CI)	AOR‡ (95%CI)	AOR‡ (95%CI)	AOR‡ (95%CI)
SS	1.24 (1.04–1.48)*	1.10 (0.80–1.52)	1.11 (0.90–1.38)	1.74 (1.14–2.65)**	1.11 (0.79–1.55)	0.88 (0.50–1.55)	0.64 (0.30–1.34)
ADH	1.47 (1.22–1.76)**	2.08 (1.45–3.00)**	1.29 (1.03–.61)*	1.84 (1.18–2.87)**	2.11 (1.44–3.11)**	2.26 (1.16–4.38)*	1.61 (0.72–3.60)
Aggression/hostility	1.54 (1.28–1.85)**	1.70 (1.21–2.40)**	1.54 (1.23–1.93)**	2.48 (1.54–4.00)**	2.32 (1.57–3.43)**	1.88 (0.99–3.56)	2.75 (1.11–6.79)*
Anxiety	1.86 (1.47–2.35)**	1.99 (1.25–3.17)**	1.88 (1.40–2.51)**	1.79 (1.03–3.21)*	1.87 (1.14–3.06)*	4.61 (1.42–14.92)*	2.37 (0.71–7.93)
Sociability	0.96 (0.80–1.14)	0.70 (0.51–0.96)*	1.13 (0.91–1.40)	0.90 (0.61–1.34)	0.64 (0.46–0.90)*	1.06 (0.60–1.88)	0.71 (0.34–1.48)

†Adjusted for age, relationship status, educational level, current living arrangements and financial independence, *$P < 0.05$, **$P < 0.01$. ‡Adjusted for age, relationship status, educational level, current living arrangements and financial independence with simultaneous personality traits, *$P < 0.05$, **$P < 0.01$. Non-users serve as the reference group. ADH, attention deficit–hyperactivity; AOR, adjusted odds ratio; CI, confidence interval; NMPDU, non-medical prescription drug use; SS, sensation seeking.