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Is Medicine Use for Nervousness Associated with Adolescent At-Risk or Problem Gambling?

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Health behaviour in school-aged children · Adolescents · Gambling · Problem gambling · Medicine use

Abstract
Objective: To examine the association between adolescent at-risk or problem gambling (ARPG) and medicine used to treat nervousness in a large-scale nationally representative sample of Italian adolescents. ***Study design:*** Data from the 2013/2014 Health Behaviour in School-aged Children Survey was used for cross-sectional analyses (a sample of 20,791 15-year-old students). Self-administered questionnaires were completed by a representative sample of high-school students. Respondents' ARPG, use of medicine for nervousness and potential confounding factors were assessed. Multilevel logistic regression analyses were used to test the association between medicine use to treat nervousness and ARPG. ***Results:*** The overall prevalence of adolescents reporting medicine use for nervousness in the last month was 6.3%. The odds of ARPG were 3 times higher among adolescents who used medicine for nervousness compared to that among adolescents who did not take such medicine (OR 2.96, 95% CI 2.07–4.25). Importantly, the association between medicine used to treat nervousness and ARPG did not vary significantly when viewed in light of psychological symptoms. ***Conclusions:*** Medicine use to treat nervousness is associated with increased risk of gambling-related harm.

Introduction

Recent population-based surveys have reported that many youths use medicine for common complaints such as stomach ache, headache, difficulty falling asleep and nervousness [1, 2]. State anxiety includes the emotional reaction that consists of subjective feelings of apprehension, tension, nervousness and worries [3]. Adolescents with higher levels of state and trait anxiety (e.g., feelings of apprehension, tension, nervousness and worry [4]) have more severe gambling problems [5, 6]. Anxiety-related manifestations (e.g., feelings of nervousness) frequently co-occur with gambling behaviours [5, 6] and may be treated with medicine, so it would be useful to

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determine if there is an association between medicine use to treat anxiety symptoms (e.g., medicine used to treat nervousness) and gambling severity.

Anxiety symptoms are often managed using prescription medicine (e.g., medicine for nervousness), and parents are inclined to provide these drugs to their children in an effort to ameliorate discomfort caused by anxiety-related problems [7]. Several nationally representative cross-sectional surveys have emphasised that the prevalence of medicine used to treat nervousness reaches 6–7% of 11- to 15-year-old adolescents, which is consistent across countries [8, 9]. Known side effects of medicine used to treat nervousness include impulsive behaviours and cognitive impairments [10]. These may increase the likelihood that a person will engage in risk-taking behaviours. In 2 experiments, Deakin et al. [10] showed that a prescribed anxiolytic (diazepam) impaired planning (e.g., subjects taking high-dose diazepam required more attempts to arrive at correct responses on harder problems) and risk-taking (subjects in the diazepam condition made riskier choices on a risk-taking task than subjects in the placebo condition). Additionally, they found that diazepam reduced discrimination sensitivity and increased the bias to respond in 2 tasks measuring sustained attention and response inhibition (rapid visual information processing task and go/no go task). The authors suggested that the potential mechanism by which the higher dose of the prescribed anxiolytic negatively impacted the performance of these processes is related to reduced inhibitory control. This is important because reduced inhibitory control is known to increase impulsivity or aggression in clinical and laboratory settings [11, 12].

Previous studies have found a robust pattern of association between risky behaviours (e.g., binge drinking and smoking) and medicinal treatment of nervousness [7, 9]. Hence, it is possible that the use of medicine for nervousness acts as a risk factor for developing risky behaviours. An alternative explanation could be that similar to the case of drugs used to reduce anxiety, non-substance-related addictive behaviours (e.g., excessive gambling, buying, or playing video games) are relied on to mitigate adverse emotional states [13]. In that respect, adolescent gambling can be seen as a candidate for a risky behaviour related to the use of medicine to treat nervousness. According to the pathways model of problem and pathological gambling [14], 3 distinct pathways are susceptible to promote problem gambling. Based on this model, some problem gamblers are "emotionally vulnerable" and are characterised by emotional instability as reflected by heightened depressive and anxiety symptoms. More broadly, such gamblers have greater vulnerability to negative affect. For these people, gambling can be viewed as a dysfunctional coping strategy to regulate aversive and negative emotional states [14]. Moreover, personality characteristics play an important role in the onset and maintenance of substance misuse [15, 16]. Personality traits such as neuroticism (a general vulnerability towards the experience of negative affect and emotional instability) or urgency (a tendency to act impulsively when faced with intense emotional states) have been found to be risk factors for gambling-related disorders [17].

As the aforementioned literature demonstrates, adolescent medication use has been found to be associated with other types of substance-related risky behaviours (i.e., smoking and alcohol use). Problem gambling has multiple related risk factors similar to those of other addictive behaviours [18, 19]. However, to date, no studies have been conducted to determine whether adolescent medicine used to treat nervousness acts as a risk factor promoting at-risk or problem gambling (ARPG). Therefore, we sought to explore this observation by examining the association between ARPG and medicine used to treat nervousness.

Methods

The data used in this study was obtained from the 2013/2014 "Health Behaviour in School-aged Children" (HBSC) Survey (http://www.hbsc.org for more details). Consent for adolescents to participate in the study was provided by both the school director and by participants' parents. The University of Turin's Ethics Committee granted ethical approval for the study. Self-administered questionnaires were completed by a representative sample of high school students (n = 20, 791 15-year-old students; boys [n = 10,456] and girls [n = 10,335] from 1, 050 different schools). Twenty-four per cent of survey respondents were "real smokers" (students who reported smoking at least 1 cigarette per week) [20, 21]. The same percentage of students was also categorised as "real drinkers" (students who reported having been drunk at least 2 or 3 times in their life) [20, 21]. This study was carried out in accordance with the Declaration of Helsinki.

Measurements

The dependent variable "ARPG" were measured with the South Oaks Gambling Screen-Revised for Adolescents (SOGS-RA; Italian version [22]). Participants were presented with 12 items assessing disordered gambling symptoms on a binary "yes-no" scale scored 1 or 0, respectively. To report prevalence rates for the last 12 months, Winters et al. [23] original scoring system was used. A SOGS-RA score of 0–1 corresponds to "no gambling problem", 2–3 corresponds to "at-risk gambling", and a score of 4 or more indicates "problem gambling". We relied on group distinctions made in other studies, namely, a dichotomisation of "at-risk-problematic gamblers" and "non-problematic gamblers" [24, 25]. The

Table 1. Percentage (%) of participant's characteristics by gender

	Total (n = 20,791)	Boys (n = 10,456)	Girls (n = 10,335)
Family structure			
Two biological or adoptive parents	70.9	68.1	73.8
Other family types	29.1	31.9	26.2
FAS			
Low	21.8	21.2	23.4
Medium	55.8	56.0	55.6
High	22.4	23.8	21.0
Somatic symptoms (last 6 months)			
Yes	15.8	7.9	23.9
No	84.2	92.1	76.1
Psychological symptoms (last 6 months)			
Yes	43.7	31.0	56.6
No	56.3	69.0	43.4
Medicine for nervousness (last month)			
Yes	6.3	4.7	8.0
No	93.7	95.3	92.0
Gambling severity (last 12 months)			
No problem gambling (SOGS-RA score: 0–1)	94.0	90.0	98.1
At risk/problem gambling (SOGS-RA score: ≥2)	6.0	10.0	1.9

instrument had adequate internal reliability (α = 0.78; 95% CI 0.78–0.80). An alpha value of 0.70 or above is considered an acceptable level of internal reliability [26]. In a recent systematic review, Edgren et al. [27] found that most studies evaluated the SOGS-RA as the primary adolescent ARPG instrument.

The independent variable "medicine use for nervousness" was measured with the following item: "during the past month, did you take any tablets or medicine for nervousness?" Consistent with previously used categories, response options "no", "yes, once", and "yes, more than once" were dichotomised into "yes" and "no" [9]. The medicine-use items within the HBSC survey focused on the behaviour of using medicines for specific symptoms but not the specific medicines; thus, the study is not constrained by the differences in national legislation, availability or temporal advances of specific medicines.

Several sociodemographic variables were measured, namely, gender (0 = female, 1 = male), family structure (0 = 2 biological or adoptive parents, 1 = other family types) and family affluence (measured with the Family Affluence Scale [28]; 0 = low, 1 = medium, 2 = high). Somatic symptoms (headache; stomach ache; backache) and psychological complaints (feeling low; irritability or bad temper; feeling nervous; difficulty falling sleep) were measured with the validated HBSC Symptom Checklist [29]. We relied on cut-off values used in other studies, namely, multiple somatic symptoms (in the last 6 months) and multiple psychological symptoms (in the last 6 months) when participants reported 2 or more symptoms more than once a week [30].

Statistical Analyses

The statistical analyses were performed in R [31]. Specifically, we used the function *glmer* in the *lme4* package [32]. We used multilevel logistic regression analyses to test the contribution of the medicine for nervousness to ARPG, adjusting for gender, family structure, Family Affluence Scale, somatic symptoms and psychological symptoms [Odds Ratios (ORs) with 95% CI]. These adjustments ensured that the association captured between medicine use to treat nervousness and ARPG was verifiable and not attributable to one or more confounding factors. Note that it was beyond the scope of the current study to analyse the variance of ARPG across schools. Therefore, we used multilevel regression analyses to only account for the data's hierarchical structure (students clustered within schools). Moreover, we did not attempt to statistically account for school-level variances.

Results

Table 1 shows sample's characteristics categorised by gender. The overall prevalence of students reporting psychological and somatic symptoms was 44 and 16% respectively. More girls than boys reported somatic (24 and 8% respectively) and psychological symptoms (57 and 31% respectively). Concerning the overlap between symptoms, 12% of the sample reported experiencing psychological and somatic symptoms simultaneously. The overall prevalence of students reporting medicine use to treat nervousness in the last month was 6% (5% for boys and 8% for girls). Finally, the overall ARPG prevalence rate among 15-year-old Italian students was 6.0% (10% for boys and 2% for girls).

Table 2 displays the results of the multilevel logistic regressions. The odds of ARPG were 3 times higher among adolescents who used medicine to treat nervousness compared to the odds of ARPG among adolescents who did not use such medicine (ORs 2.96 [95% CI 2.07–4.25]). Importantly, the interaction between psychological symptoms and medicine use to treat nervousness was not significant. This suggests that the association between medicine use to treat nervousness and ARPG did not vary significantly when accounting for psychological symptoms.

Discussion

This study is the first national-prevalence survey to examine the rates of ARPG among youths who used medicine to treat nervousness in the previous month. The prevalence of medication use to treat nervousness among 15-year-old adolescents was approximately 6%. However, medicine use to treat nervousness was significantly associated with in-

Table 2. ORs (95% CI) for ARPG (0 = non-problematic gamblers, 1 = at-risk or problematic gamblers) according to medicine use for nervousness (model 1), adjusted for gender, family structure, FAS, somatic and psychological symptoms (model 2)

	At-risk/problem gambling (SOGS-RA score: ≥2) (n = 1158)	
	model 1	model 2
Intercept	0.04 (0.03–0.05)***	0.01 (0.01–0.02)***
Medicine use for nervousness (reference = no)	2.44 (2.01–2.97)***	2.96 (2.07–4.25)***
Males (reference = females)		8.57 (7.04–10.43)***
Other family types (reference = 2 biological or adoptive parents)		1.25 (1.08–1.44)**
FAS medium (reference = low)		0.64 (0.55–0.76)***
FAS high (reference = low)		0.68 (0.56–0.84)***
Somatic symptoms (reference = no)		1.91 (1.57–2.31)***
Psychological symptoms (reference = no)		1.64 (1.40–1.91)***
Psychological symptoms X Medicine use for nervousness		0.76 (0.48–1.22)

*** $p < 0.001$; ** $p < 0.01$.

creased problem-gambling severity; specifically, the rates of ARPG were 3 times higher among adolescents who used medicine to treat nervousness than the rates that prevailed among adolescents who did not use such medicine. This result is in line with previous findings on adolescent substance use [7, 9]. However, it extends previous research to the context of ARPG. Crucially, this result was found while controlling for potential cofounding sociodemographic and psychosocial factors. The association between gambling severity and the use of medicine to treat nervousness still needs to be clarified. This study is cross-sectional and does not reveal how medicine consumption may contribute to gambling severity; further, there are several possible explanations for this association.

Although there is no information reported on specific medicines for nervousness in this study, it should be noted that benzodiazepines (BZs) are widely used to treat anxiety problems such as nervousness. In Italy, the consumption of BZs increased between 2004 and 2013 (50.7 in 2004 and 53.7 in 2013; data is expressed as defined daily dose/1000 inhabitants/day [33]). Most BZs in Italy are used as anxiolytics [33]. Thus, our measure of medicine for nervousness probably captures the use of BZs. Our results are consistent with the previous research linking medicine use to treat nervousness (i.e., BZs) with reduced self-control (e.g., inhibitory control) and heightened impulsivity, engendering hazardous involvement in risky activities [34] such as gambling. Neuropharmacological evidence also supports such an explanation. Indeed, cerebral responses to probabilistic outcomes have been found to be modulated by dopaminergic circuits in the midbrain that can be activated by changes in the $GABA_A$ receptor system [35]. Given the action of BZs on $GABA_A$ receptors, BZs may reduce inhibitory control and influence sensitivity to reward and punishment, eventually leading to deregulated gambling behaviours as suggested by psychopharmacological models of problem gambling [36]. In addition, our results are also in accordance with one of the most influential theories in the field of addiction, namely, Jacobs' general theory of addictions [37]. Thus, it is possible that using medicine to treat nervousness constitutes a strategy to escape from the strain caused by gambling (e.g., high anxiety and psychological distress), for medicine use is a behaviour that, in addition to formal therapeutic indications, represents a general coping strategy used to overcome health complaints (somatic and psychological symptoms) and daily stressors stemming from risky behaviours.

Although the strengths of this study include the use of a large sample representative of the Italian high-school population, one limitation is the lack of information regarding the specific drugs taken by participants. Medicine use is measured based on what adolescents perceive to be medicine (responses may exclude the use of legal medicine and include the use of products not legally or medically recognised as medicines). In addition, a significant limitation of the current study was the cross-sectional design. Consequently, no causality statements can be assumed between medicine use to treat nervousness and greater risk of a gambling disorder. In fact, it is likely that individual differences in personality (e.g., impulsivity traits) increase the risk of gambling [17] and that the use of medication to alleviate nervousness constitutes the

consequence of excessive gambling. Examining the relationships between medicine use to treat nervousness and gambling in a longitudinal study would allow for a clearer causal understanding of the predictive role of medicine consumption on gambling severity in young people. Finally, another limitation is related to the HBSC protocol. All participants were 15-year-old students, and adolescent brain development during the investigated age range may be considered a potential factor of influence. In fact, teens are more impulsive and prone to risk because their brain (in particular, the frontal regions involved in executive control) is still developing [38]. Future studies should include students of different ages. In addition, potential bias related to prohibited behaviours also needs to be considered, for the minimum legal age to gamble in Italy is 18.

In conclusion, this study clearly demonstrated that medicine use to treat nervousness is associated with increased problem-gambling severity. The findings from this study suggest that policymakers and healthcare professionals should be aware of the following 2 possible scenarios: (i) that increased medication use for nervousness/anxiety is associated with increased gambling severity and (ii) that youths prone to develop maladaptive behaviours resembling addiction (e.g., gambling disorder) may be at increased risk for abusing prescription drugs such as tranquillisers. For this reason, one avenue for future gambling-related prevention is to consider that using prescribed drugs to treat nervousness acts as a potential risk factor for adolescent risky gambling.

Disclosure Statement

The authors have no conflicts of interest to disclose.

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Author Contribution

Dr. Natale Canale conceptualized and designed the study, carried out the initial analyses, drafted the initial manuscript and approved of the final manuscript as submitted. Dr. Alessio Vieno designed the data-collection instruments, coordinated and supervised data collection, critically reviewed the manuscript and approved of the final manuscript as submitted. Dr. Joël Billieux reviewed and revised the manuscript and approved of the final manuscript as submitted. Drs. Giacomo Lazzeri and Patrizia Lemma designed the data-collection instruments, coordinated and supervised data collection, critically reviewed the manuscript and approved of the final manuscript as submitted. Massimo Santinello reviewed and revised the manuscript and approved of the final manuscript as submitted.

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