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Nonmedical use of prescription opioids and heroin use among adolescents involved in competitive sports

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Abstract

Purpose—Examine the past-year prevalence of nonmedical use of prescription opioids (NUPO), heroin use, and the concurrent NUPO and heroin in a sample of 12th graders involved in sixteen different sports.

Methods—A secondary analysis of nationally representative data from 9 cohorts (2006–2014) of the Monitoring the Future study (n = 21,557).

Results—No differences were found between 12th graders who participated in at least one competitive sport and nonparticipants with respect to past-year NUPO, heroin use, and concurrent NUPO and heroin use. Most of the sixteen sports analyzed were not associated with the three drug use outcomes. However, 12th graders who participated in ice hockey had substantially greater odds of both past-year heroin use and concurrent NUPO and heroin, while those who participated in weightlifting (NUPO and heroin) and wrestling (NUPO) had slightly higher odds of using these drugs.

Conclusions—The study provides critical information to inform physicians, parents, and school officials of the risks associated with participating in certain high contact sports, particularly ice hockey.

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Carol J. Boyd: Dr. Boyd reviewed and revised the manuscript, added comments to the first draft and approved the final manuscript as submitted.

Sean Esteban McCabe: Dr. McCabe helped analyze and interpret the data, reviewed and revised the manuscript, and approved the final manuscript as submitted.

Implication and Contribution While the majority of sports adolescents participate in during high school are not associated with heroin use and/or nonmedical use of prescription opioids (NUPO), certain high contact sports like ice hockey increase the risk for concurrent heroin use and NUPO among participants.

Introduction

Recent research shows that youth athletes in high contact sports (i.e., wrestling and football) are at greater risk to engage in nonmedical use of prescription opioids (NUPO).¹⁻² While it is speculated that injury may be a key force driving this association,²⁻³ normative behaviors among some athletes, or the stress associated with high-level competition may also play a role in understanding why these types of athletes are at a greater risk to engage in NUPO.⁴⁻⁵

NUPO among youth athletes is currently a major public health concern given that prescription opioid misuse is a strong risk factor for heroin use.⁶⁻⁷ Although it is hard to determine whether NUPO is a significant cause of eventual heroin use,⁶ it is clear that the majority of heroin users have used opioids in a nonmedical context.⁸ Unfortunately, no studies have assessed the potential overlapping use of opioids and heroin among youth athletes, including those involved in different competitive sports.⁹ Accordingly, toward the goal of better understanding adolescents' use of prescription opioids and heroin, the objective of this study was to examine the past-year prevalence of NUPO, past-year heroin use, and the concurrent NUPO and heroin use during the past-year across sixteen different youth sports, with a specific focus on high contact sports (i.e., football, lacrosse, ice hockey, and wrestling) where serious sport related injury are more likely.

Methods

Study design

The present study uses nine cross-sections of the Monitoring the Future (MTF)¹⁰ study between 2006 and 2014. MTF has surveyed nationally representative samples of approximately 15,000 U.S. high school seniors each year since 1975, with response rates ranging from 79% to 85% between 2006 and 2014. It should be highlighted that analyses used secondary data from 12th graders who were randomly assigned to complete Form 5 between 2006 and 2014 in the MTF study. The 2006 school year was chosen as the first year to include in this study due to the addition of questions on Form 5 that measure different types of competitive sport participation. The project design and sampling methods are described in greater detail elsewhere.¹⁰

Measures

Past-year heroin use and NUPO was based on three separate questions that asked respondents to report on past-year heroin use with a needle, past-year heroin use without using a needle, and past-year nonmedical use of prescription opioids (i.e., used “narcotics other than heroin, such as methadone, opium, morphine, codeine, Demerol, Vicodin, OxyContin, and Percocet...without a doctor telling you to take them”).

Past-year participation in different types of competitive sports was the key set of independent variables used in the analyses. The primary question provided to respondents was: “In which competitive sports (if any) did you participate in during the LAST 12 MONTHS? Include school, community, and other organized sports. (Mark all that apply).” The competitive sports that respondents were able to select across all the survey years included: baseball, basketball, cross-country, field hockey, football, gymnastics, ice hockey,

lacrosse, soccer, swimming, tennis, track and field, volleyball, weightlifting, wrestling, and 'other' sports.

Control variables were included in the analyses to account for potentially confounding factors that are known to be associated with NUPO and heroin use within the MTF sample (see Table 1).^{2,8-9}

Analysis

Multiple logistic regression was used to examine the odds of past-year heroin use, NUPO, and concurrent NUPO and heroin use among respondents involved in the sixteen different types of sports when controlling for potentially confounding factors. STATA 14.0 was the software used to estimate the models outlined above; all analyses used the weights provided by the MTF to account for the probability of selection into the sample. Given missing data within the MTF sample, multiple imputation was used to impute missing observations (see Table 1). Finally, design effects reflecting the cluster sampling were not available from the public use MTF study. Accordingly, results at the .01 alpha level or lower were given serious consideration.²

RESULTS

Among the sample of 12th grade respondents, 8.3% indicated nonmedical use of prescription opioids and .9% indicated heroin use during the past year. Roughly .6% of respondents indicated concurrent heroin and nonmedical use of prescription opioids during the past year. With respect to past-year involvement in competitive sports, 69.3% of 12th grade respondents indicated participating in at least one competitive sport (30.4% - one sport only, 17.7% - two sports only, 21.2% three or more sports). In particular, the sports with the highest percentage of participants included 'other' sports (26%), basketball (20.2%), football (15.8%), baseball (14.5%), and soccer (12.9%). Refer to Table 1 for further results.

Table 2 shows that involvement in weightlifting and wrestling were associated with slightly higher odds of past-year NUPO, while involvement in soccer was modestly associated with lower odds of past-year NUPO, when compared to respondents who did not participate in these sports during the past-year. Involvement in both ice hockey and weightlifting were significantly associated with greater odds of past-year heroin use when compared to respondents who did not participate in these two sports. Finally, the odds of concurrent use of heroin and NUPO were higher among those involved in both ice hockey and weightlifting when compared to their peers who did not participate in either one of these sports during the past year.

In additional analyses that included the control variables (listed in Table 1), we found no difference in the odds of past-year NUPO, heroin use or concurrent heroin and NUPO when we compared nonparticipants and respondents who participated in at least one sport. Moreover, no statistically significant differences were found between nonparticipants and respondents who indicated participating in only one sport, two sports, and three or more sports (results not presented).

DISCUSSION

This is the first national study to examine the prevalence of past-year NUPO, heroin use, and concurrent NUPO and heroin use among U.S. high school seniors who participated in different types of competitive sports. In general, no differences in heroin and/or NUPO were found between 12th graders who participated in sports and 12th graders who did not participate in sports. Moreover, only a few sports were found to be weakly associated with greater or lesser heroin and/or NUPO. However, 12th graders who participated in ice hockey had substantially greater odds of both past-year heroin use and past-year concurrent NUPO and heroin use. Based on these findings, greater awareness and prevention efforts should be targeted toward youth involved in ice hockey to reduce the potential misuse of both prescription opioids and heroin.

Despite many of the strengths of the current study, several limitations must be considered. In particular, certain variables that measure medical use of prescription opioids, injuries relating to specific types of sport participation, and whether the athletes' motives to engage in NUPO were influenced by pain associated with their participation in sports were not included in the MTF study. While these variables are not measured on the MTF, the findings from the current study provide critical information to inform physicians and parents of the potential risks associated with participating in certain high contact sports and the need to monitor the use and misuse of prescription drugs that have high abuse potential.

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Abbreviations

(NUPO)	Nonmedical Use of Prescription Opioids
(MTF)	Monitoring the Future

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Table 1

Sample characteristics (unweighted n = 21,557 / weighted n=21,611)

Control Variables	MI(1)			Sample with listwise deletion			MI(1)			Sample with listwise deletion		
	%	SE	% missing	%	SE	% missing	%	SE	%	SE	% missing	
Male (ref.)	49.4%	0.004	48.3%	0.005	8.3%	0.002	8.5%	0.003	8.5%	0.003	3.70%	
Female	50.6%	0.004	51.7%	0.005	0.9%	0.001	0.7%	0.001	0.7%	0.001	3.00%	
White (ref.)	58.3%	0.004	63.5%	0.004	0.6%	0.001	0.6%	0.001	0.6%	0.001	3.80%	
Non-White	41.7%	0.004	36.5%	0.004	Major Independent Variables (2)							
Did not cut class (ref.)	69.4%	0.004	70.2%	0.004	Does not participate in sport							
Cut class	30.6%	0.004	29.8%	0.004	Participates in Baseball							
Has an average grade of B- or higher (ref.)	82.6%	0.003	84.4%	0.003	Participates in Basketball							
Has an average grade of C+ or lower	17.4%	0.003	15.6%	0.003	Participates in Cross Country							
Goes out at most 2 nights a week (ref.)	54.5%	0.004	54.2%	0.005	Participates in Field Hockey							
Goes out 3 or more times a week	45.5%	0.004	45.8%	0.005	Participates in Football							
Does not have a job (ref.)	36.9%	0.004	35.9%	0.004	Participates in Gymnastics							
Works 1 to 20 hours a week	42.3%	0.004	43.8%	0.005	Participates in Ice Hockey							
Works 21 or more hours a week	20.8%	0.004	20.3%	0.004	Participates in Lacrosse							
Both parents have a BA or higher (ref.)	49.9%	0.004	47.7%	0.005	Participates in Swimming							
At least one parent has a BA	50.1%	0.004	52.3%	0.005	Participates in Soccer							
Respondent lives in a Non MSA (ref.)	21.1%	0.003	22.2%	0.004	Participates in Tennis							
Respondent lives in a MSA	48.6%	0.004	49.1%	0.005	Participates in Track							
Respondent lives in a Large MSA	30.4%	0.004	28.7%	0.004	Participates in Volleyball							
Respondent lives in the Northeast (ref.)	18.5%	0.003	16.4%	0.003	Participates in Weightlifting							
Respondent lives in the Midwest	23.5%	0.003	25.5%	0.004	Participates in Wrestling							
Respondent lives in the South	36.0%	0.004	35.6%	0.004	Participates in Other Sport							
Respondent lives in the West	22.0%	0.003	22.4%	0.004								
Cohort years (2006 to 2008) (ref.)	34.5%	0.004	34.5%	0.004								
Cohort years (2009 to 2011)	34.2%	0.004	33.9%	0.004								
Cohort years (2012 to 2014)	31.3%	0.004	31.6%	0.004								
No lifetime cigarette use (ref.)	58.2%	0.004	59.0%	0.004								
Lifetime cigarette use	41.8%	0.004	41.0%	0.004								
No lifetime alcohol use (ref.)	30.1%	0.004	29.8%	0.004								

Control Variables	MI(1)			Sample with listwise deletion			MI(1)			Sample with listwise deletion		
	%	SE	%	% missing	SE	%	%	SE	%	SE	% missing	
Lifetime alcohol use	69.9%	0.004	70.2%	0.004	0.004							
No lifetime marijuana use (ref.)	56.3%	0.004	57.1%	0.005							3.90%	
Lifetime marijuana use	43.7%	0.004	42.9%	0.005								

MI = Multiple Imputation; Ref. = reference group in the multiple logistic regression analysis; % = Percent; SE = Standard Error.

Note (1) sequential regression imputation was used to impute missing values on all the variables used in the analyses; several separate imputations with the full MTF sample used chained multinomial, logistic, and ordered logit models in STATA's "mi impute chained" procedure (10 imputations, 5 burn-in iterations each; "augment" option was used in the presence of perfect prediction).

Note (2) roughly 69.3% of respondents participated in at least one competitive sport. The majority of respondents participated in only one sport (30.4%), followed by respondents who participated in 3 or more sports (21.2%) and 2 sports only (17.7).

Logistic regression examining athletic participation and past-year prevalence of heroin and NUPO (all respondents).

Table 2

Sport Participation (1)	Past-year NUPO			Past-year Heroin Use			Past-year Heroin and NUPO		
	%	AOR	95% CI	%	AOR	95% CI	%	AOR	95% CI
Baseball	9.6%	1.04	.850, 1.29	1.0%	.865	.532, 1.41	0.7%	.843	.495, 1.44
Basketball	8.7%	.93	.766, 1.14	1.1%	.907	.551, 1.49	0.8%	.857	.487, 1.51
Cross Country	6.0%	.995	.687, 1.44	1.5%	1.97	.941, 4.12	0.9%	2.07	.834, 5.14
Field Hockey	9.1%	.889	.477, 1.66	2.8%	1.43	.349, 5.82	1.7%	1.56	.327, 7.47
Football	11.4%	1.11	.915, 1.34	1.4%	.815	.482, 1.38	1.1%	1.04	.570, 1.91
Gymnastics	10.9%	1.28	.831, 1.97	1.5%	.818	.211, 3.16	0.6%	.420	.066, 2.67
Ice Hockey	14.0%	1.11	.762, 1.63	4.4%	3.00	1.47, 6.10	3.4%	3.74	1.66, 8.40
Lacrosse	11.8%	.888	.646, 1.22	1.8%	.801	.299, 2.15	0.8%	.435	.099, 1.91
Swimming	9.1%	1.01	.795, 1.28	1.3%	.968	.518, 1.81	0.8%	.784	.335, 1.83
Soccer	6.9%	.748**	.608, .919	1.2%	1.10	.697, 1.74	0.8%	1.16	.663, 2.02
Tennis	7.3%	1.00	.743, 1.36	0.8%	.731	.325, 1.65	0.5%	.711	.250, 2.02
Track	6.6%	.912	.730, 1.14	0.9%	.945	.511, 1.75	0.5%	.813	.387, 1.71
Volleyball	7.7%	1.00	.776, 1.29	1.2%	1.42	.782, 2.60	0.8%	1.67	.873, 3.20
Weightlifting	12.3%	1.22*	1.009, 1.48	2.0%	1.81*	1.13, 2.91	1.5%	1.91*	1.11, 3.28
Wrestling	14.6%	1.33*	1.004, 1.76	2.4%	1.25	.674, 2.33	2.0%	1.61	.823, 3.16
Other Sport	8.1%	.950	.806, 1.12	1.1%	1.46	.983, 2.16	0.7%	1.12	.688, 1.82

% = Percent (i.e., prevalence rate); AOR = Adjusted Odds Ratio; CI = Confidence Interval

All analyses control for sex, race, skipping class, average grades in school, nights out during a typical week, work status, parental education, urbanicity (e.g., does respondent live in a metropolitan statistical area [MSA]), region of the country (e.g., does respondent live in the Northeast), cohort year, life time cigarette use, lifetime alcohol use, and lifetime marijuana use. Please refer to Table 1 for more details on these variable control variables.

Note (1) variance inflation factors for all 16 sports ranged from a low of 1.05 to a high of 1.70 in each of the three models.

* p<.05,

** p<.01,

*** p<.001