Differences in Prescription Stimulant Misuse Motives Across Adolescents and Young Adults in the United States

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ABSTRACT

Objective: While prescription stimulant misuse (PSM) is common in adolescents and young adults (AYAs), PSM motives are poorly understood. This study examined a number of PSM motives across the AYA age spectrum using the 2015–2018 National Survey on Drug Use and Health.

Methods: In all, 86,918 AYAs (aged 14–25 years) were included. Individual PSM motives (eg, to study) and motive categories (ie, cognitive enhancement only, recreational only, weight loss only, and combined motives) were examined by age. Logistic regression models examined links between individual motives or motive categories and educational status, substance use, *DSM-IV* substance use disorders (SUD), and mental health correlates.

Results: Significant differences were found across AYAs in cognitive enhancement only (14 years = 40.4%; 24 and 25 years = 71.2%; $P < .0001$) and recreational only (14 years = 25.8%; 24 and 25 years = 9.8%; $P < .0001$) or combined PSM motives, (14 years = 32.3%; 24 and 25 years = 18.0%; $P = .008$); college students and graduates had particularly high rates of cognitive enhancement only (college = 78.2%; graduates = 74.7%; non-college = 63.5%). Recreational-only and combined motives were significantly elevated in AYAs with any past-year SUD, especially to get high (78%–136% higher in those with SUD; $P \leq .001$). While any PSM was associated with higher odds of SUD and mental health outcomes, including suicidal ideation, odds were highest for recreational or combined motives.

Conclusions: Cognitive enhancement with PSM occurs more often in young adults compared to adolescents, college students endorse more cognitive enhancement than those not in school, and the presence of any PSM in AYAs is linked to more substance use, suicidal ideation, and other psychopathology. PSM prevention in adolescents as well as screening and intervention among AYA is highly recommended.

J Clin Psychiatry 2020;81(6):20m13302

To cite: Schepis TS, Ford JA, Wilens TE, et al. Differences in prescription stimulant misuse motives across adolescents and young adults in the United States. *J Clin Psychiatry*. 2020;81(6):20m13302.

To share: https://doi.org/10.4088/JCP.20m13302

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Prescription stimulant misuse (PSM), defined as use of another's controlled stimulant medication or use of one's own medication in ways not intended by the prescriber, is common in adolescents and young adults (AYAs). The US Monitoring the Future (MTF) study found that 11.0% of college students engaged in past-year Adderall misuse, with high rates in non-college young adults (9.1%).[1] While lower in adolescents (< 5%), past-year PSM in AYAs exceeds most other drug use prevalence, with the exceptions of alcohol, tobacco, cannabis, and opioid misuse for adolescents.[1,2] PSM is associated with concerning correlates in AYAs, including other substance use, psychopathology, and criminal offending.[3–9] Identification of modifiable factors associated with PSM is an important goal for research, and motives, or underlying reasons, for PSM are such a factor. Cannabis use motives covary with changes in use,[10] and alcohol use interventions targeting motives promote significant use reductions.[11,12] Understanding PSM motives in AYAs could direct prevention, screening, and treatment to limit PSM.

PSM motives among AYAs have been most studied in local samples of US undergraduate college students. In undergraduates, PSM is primarily motivated by cognitive enhancement,[13–19] typically motives aimed at improving studying, concentration, and alertness. Recreational motives, aimed at enhancing positive affect (eg, "to get high"), altering other drug effects, and experimentation, are also common, with "to get high" usually the most common recreational motive.[13,14] Weight loss motives are more infrequent, though somewhat common in female undergraduates.[14,20]

Using MTF data, McCabe and Cranford[21] found that the most common adolescent PSM motive was "to get more energy," followed by experimentation, "to get high," and "to stay awake," with each near or above 50% endorsement. Weight loss was more common in adolescents (36%). PSM only to study is rare in adolescents (7.4%), and 51.2% endorsed non-study motives,[22] suggesting that recreational motives may be more prominent in adolescents.

Thus, preliminary evidence suggests that cognitive enhancement–related PSM motives are more common in young adults. This suggestion corresponds to the increased academic demands among young adults in school-based samples, but exclusive use of school-based samples may bias conclusions across all AYAs.

Clinical Points

- Prescription stimulant misuse (PSM) motives differ over the age span from 14 to 25 years, with increasing cognitive enhancement (eg, to study or concentrate) and decreasing recreational motives (eg, to get high); young adults in college had higher rates of cognitive enhancement than those not in school.
- Any PSM, regardless of motive, was associated with significantly higher odds of other substance use, any substance use disorder, suicidal ideation, and other psychopathology, with the highest odds in those with recreational motives.
- Clinicians are likely to encounter different PSM motive profiles at different ages and in different educational attainment groups, with prevention and intervention targets varying by age and education.

School enrollment and engagement covary with PSM prevalence in AYAs,[23] and motives may as well. The lack of research on PSM motives in AYAs not in school is a major limitation of the literature. AYAs not in school are heterogeneous, including both college graduates and those who dropped out of high school, and these disparate groups have different PSM profiles.[23,24] Local samples reflect the idiosyncratic norms of that university's environment, as PSM varies with university characteristics,[25] suggesting a need for studies using nationally representative data. Finally, research examining PSM motive differences through the AYA age spectrum is missing, and such research could direct prevention, screening, and intervention in a developmentally appropriate way.

This research uses 4 aggregated years of data (2015–2018) from the nationally representative US National Survey on Drug Use and Health (NSDUH), aiming to (1) examine age-based differences in PSM motives and motive categories (ie, cognitive enhancement only, recreational only, weight loss only, and combined motives), (2) investigate whether motives vary by educational status, (3) link motives to past-year substance use disorder (SUD) prevalence, and (4) examine the sociodemographic, substance use, and mental health correlates of motive categories.

METHODS

The NSDUH is an annual survey of US residents aged 12 years and older.[26,27] Sampling used an independent, multistage area probability design weighted for population-based estimates. Sensitive topics were assessed by audio computer-assisted self-interviewing (ACASI) to maximize honesty, with skip-outs and consistency checks to maximize data completeness and accuracy. For 2015–2018, the weighted screening response rate ranged from 79.7% to 73.31%, and the weighted interview rate ranged from 69.7% to 66.6%, similar to other nationally representative studies.[28] The Research Triangle International institutional review board (IRB) approved the NSDUH,[29] and the first author's IRB exempted this research from further oversight.

Participants

For 2015–2018, 86,918 AYAs 14–25 years of age, of 93,039 possible (93.4%; Table 1), composed the analytic sample,. Twelve- and 13-year-old adolescents were excluded because of very low PSM rates. AYAs were also excluded if they were (1) homeschooled adolescents (n = 184), (2) young adults in secondary school (n = 2,958), or (3) missing educational or motive data (n = 2,979). Homeschooled adolescents were excluded due to sample size, and young adults in secondary school were excluded because of developmental[30,31] and stimulant PDM prevalence[23] differences from other young adults. In addition, young adults in secondary school often have less responsibility for stimulant management than other young adults,[32] influencing PSM.

Measures

Participants were asked about lifetime stimulant use (which includes PSM), and those with lifetime use were then asked about lifetime PSM. PSM is defined as stimulant use "in any way a doctor did not direct: using it without a prescription . . . in greater amounts, more often, or longer than you were told to take it; using it in any other way a doctor did not direct . . . ." Those with lifetime PSM were also asked about past-year PSM. The PSM assessment included a variety of trade (eg, Adderall, Ritalin) and generic names (eg, dextroamphetamine, methylphenidate) and pictures of assessed medications to improve recall.

In those with past-year PSM, motives at the most recent PSM episode were queried via the question "What were the reasons you used [specific stimulant] the last time in any way a doctor did not direct you to use it/them?" Participants selected as many motives as applied from the following: lose weight, concentrate, be alert, study, experiment, get high, and alter other drug effects; "because I'm hooked" and other were also included. Answers were dichotomous (yes/no). PSM motives were grouped into 4 categories: weight loss only, cognitive enhancement only (ie, concentrate, be alert, and/or study), recreational only (ie, experiment, get high, alter other drug effects, and/or "because I'm hooked"), and combined (ie, motives from multiple categories). Categories came from past research that categorized motives based on US Food and Drug Administration stimulant indications and face validity, with "other" excluded.[15,21,33]

Educational status was also assessed. Adolescent participants were in school and at low risk for dropout, in school and at risk for dropout, or not in school. Dropout risk was based on 3 characteristics associated with dropout: grades ≤ D+ at the last grading period, being at least 1 year older than typical for grade, and the adolescent stating that s/he "hated going to school."[34] Young adults were in college, college graduates, not in school and high school graduate, and not in school and dropped out of high school.

Sociodemographics were race/ethnicity, sex, grades of C+ or worse at last grading period (only adolescents in school), uninsured status, and past-year offending behavior. Past-year offending behavior was 1 or more of past-year illegal drug sales, attempted theft of anything worth $50

Table 1. Sociodemographic Characteristics of the Analytic Sample[a]

Variable	Adolescents (n = 35,732), % (95% CI)	Young Adults (n = 51,186), % (95% CI)	Total (n = 86,918), % (95% CI)
Prevalence of PSM	2.3 (2.1–2.5)	7.4 (7.0–7.7)	5.6 (5.4–5.9)
Male	50.5 (49.8–51.3)	49.5 (48.9–50.1)	49.8 (49.5–50.3)
Age, y			
14	24.8 (24.2–25.4)	NA	8.5 (8.2–8.7)
15	25.0 (24.5–25.6)	NA	8.5 (8.3–8.8)
16	25.5 (24.9–26.0)	NA	8.7 (8.5–8.9)
17	24.7 (24.1–25.3)	NA	8.4 (8.2–8.7)
18	NA	8.9 (8.5–9.3)	5.9 (5.6–6.1)
19	NA	12.2 (11.8–12.7)	8.0 (7.7–8.4)
20	NA	12.4 (12.0–12.8)	8.2 (7.9–8.5)
21	NA	12.9 (12.5–13.4)	8.5 (8.2–8.8)
22	NA	12.9 (12.5–13.3)	8.5 (8.3–8.7)
23	NA	13.5 (13.1–14.0)	8.9 (8.6–9.2)
24 or 25	NA	27.1 (26.4–27.9)	17.9 (17.4–18.3)
Race/ethnicity			
White	53.5 (52.6–54.3)	55.1 (54.2–55.9)	54.5 (53.7–55.2)
Black	13.5 (12.9–14.1)	13.8 (13.3–14.3)	13.7 (13.3–14.2)
Hispanic/Latinx	23.4 (22.7–24.1)	21.5 (20.8–22.3)	22.2 (21.6–22.8)
Asian American	5.5 (5.1–5.9)	6.2 (5.9–6.6)	6.0 (5.7–6.3)
American Indian	0.5 (0.4–0.6)	0.6 (0.5–0.7)	0.6 (0.5–0.7)
Hawaiian/Pacific Islander	0.4 (0.3–0.6)	0.4 (0.3–0.5)	0.4 (0.4–0.5)
Multiracial	3.2 (3.0–3.4)	2.4 (2.2–2.5)	2.6 (2.5–2.8)
Household Income, $			
< 20,000	15.1 (14.4–15.8)	28.0 (27.1–28.9)	23.6 (22.9–24.3)
20,000–49,999	27.4 (26.7–28.1)	32.2 (31.6–32.9)	30.6 (30.0–31.2)
50,000–74,999	14.2 (13.6–14.7)	13.9 (13.4–14.3)	14.0 (13.6–14.3)
≥ 75,000	43.4 (42.3–44.4)	25.9 (25.2–26.7)	31.9 (31.1–32.6)
Population density			
CBSA ≥ 1 million persons	54.9 (53.9–55.8)	53.8 (52.9–54.7)	54.2 (53.5–54.9)
CBSA < 1 million persons	39.4 (38.5–40.3)	41.6 (40.7–42.6)	40.9 (40.1–41.6)
Not in a CBSA	5.7 (5.2–6.3)	4.5 (4.2–4.9)	4.9 (4.6–5.4)

[a]Data from the 2015–2018 National Survey on Drug Use and Health (https://www.datafiles.samhsa.gov/study-series/national-survey-drug-use-and-health-nsduh-nid13517).
Abbreviations: CBSA = core-based statistical area, NA = not applicable, PSM = prescription stimulant misuse.

or more, and attacks with intent to seriously harm someone else.

Substance use correlates were past-year prescription opioid misuse, past-year prescription benzodiazepine misuse, past-month binge alcohol use, past-year cannabis use, and past-year substance use disorder (SUD). Past-year SUD is *DSM-IV* substance abuse or dependence from alcohol, marijuana, cocaine, heroin, hallucinogen, inhalant, methamphetamine, or prescription opioid use and prescription tranquilizer, sedative, or stimulant misuse. Per National Institute on Alcohol Abuse and Alcoholism guidelines,[35] past-month binge drinking is 4 or 5 alcoholic drinks (for females and males, respectively) on one occasion.

Mental health correlates were (all past-year) major depressive episode (*DSM-IV*), mental health treatment, serious psychological distress (SPD), and suicidal ideation. SPD was from the K6 assessment of nonspecific psychological distress,[36] and SPD and suicidal ideation were assessed only in young adults.

Data Analyses

Analyses were performed in STATA 16.0 (2019; StataCorp; College Station, Texas), incorporating the NSDUH complex survey features. Given use of 4 years of data, an adjusted person-level weight was used (weight/4), per guidelines.[37] Cross-tabulations estimated prevalence and 95% confidence intervals of PSM motives and motive categories by age, educational status, and past-year SUD (the last two separately in adolescents and young adults). For age-based analyses, linearized estimates of difference by year of age were performed, using the *margins* command. For educational and past-year SUD status, logistic regression models estimated differences between groups, with Bonferroni corrections for multiple comparisons. Finally, logistic regression and multinomial logistic regression models (for race/ethnicity only) examined the relationship between motive category (excluding weight loss only, due to sample size) and the sociodemographic, substance use, and mental health correlates. All regression models controlled for age, race/ethnicity, sex, population density, and household income.

RESULTS

Overall, 5.6% of participants engaged in past-year PSM; young adult (7.4%) was more common than adolescent PSM (2.3%; Table 1). Motive differences by age are listed in Table 2. Four PSM motives differed significantly: to be alert, to experiment, to get high, and other reasons. While PSM for alertness was 2.2% greater per year ($P < .0001$), from 33.6% at 14 years to 53.7% at 24 and 25 years, the other 3 motives were more prevalent at younger ages, with smaller

Table 2. Individual Prescription Stimulant Misuse (PSM) and PSM Motive Categories by Age Group Among Those With Past-Year PSM[a]

Variable	14 y (n = 70), % (95% CI)	15 y (n = 149), % (95% CI)	16 y (n = 263), % (95% CI)	17 y (n = 368), % (95% CI)	18 y (n = 253), % (95% CI)	19 y (n = 421), % (95% CI)	20 y (n = 506),% (95% CI)	21 y (n = 547), % (95% CI)	22 y (n = 546), % (95% CI)	23 (n = 509), % (95% CI)	24 and 25 y (n = 790), % (95% CI)
Individual motives											
To lose weight	12.2 (5.1–26.3)	3.6 (1.6–8.2)	10.2 (5.2–19.2)	3.3 (1.7–6.3)	8.1 (5.3–12.3)	5.1 (3.1–8.1)	4.6 (2.8–7.5)	5.9 (3.8–8.9)	8.1 (5.6–11.6)	5.9 (3.8–9.1)	5.9 (4.1–8.5)
To concentrate	59.8 (46.0–72.2)	41.6 (31.3–52.5)	56.6 (48.0–64.9)	59.8 (52.9–66.3)	58.7 (51.9–65.1)	61.3 (55.4–67.0)	61.1 (56.4–65.6)	61.2 (56.1–66.7)	58.1 (52.5–63.5)	55.7 (51.1–60.3)	56.2 (51.7–60.5)
To be alert	33.6 (20.6–49.8)	36.5 (27.0–47.1)	30.9 (23.9–39.0)	43.0 (37.5–48.6)	40.7 (34.4–47.4)	39.8 (34.4–45.4)	41.4 (35.5–47.6)	46.1 (41.2–51.1)	46.1 (41.1–51.2)	53.4 (48.4–58.4)	53.7 (48.4–58.9)
To study	38.0 (25.7–52.1)	38.7 (28.3–50.3)	39.7 (32.5–47.4)	40.9 (34.7–47.3)	47.4 (39.4–55.5)	56.1 (50.1–62.0)	53.4 (49.2–57.7)	57.8 (53.0–62.4)	52.0 (46.0–57.9)	49.3 (44.5–54.1)	38.4 (33.9–43.1)
To experiment	19.8 (10.7–33.8)	26.7 (19.3–35.8)	27.1 (20.3–35.3)	17.9 (13.5–23.4)	13.3 (9.3–18.5)	9.7 (6.5–14.2)	13.1 (9.7–17.5)	9.3 (6.7–12.8)	9.7 (6.8–13.5)	7.5 (5.5–10.3)	9.4 (7.3–11.9)
To get high	27.6 (18.0–39.9)	33.8 (23.5–45.9)	23.9 (18.0–30.9)	22.6 (17.6–28.7)	15.8 (11.3–21.5)	13.8 (9.9–18.9)	12.4 (9.5–16.1)	13.7 (10.8–17.1)	10.9 (8.1–14.5)	14.0 (10.6–18.2)	14.1 (11.2–17.7)
To alter other drug effects	2.0 (0.3–11.1)	3.4 (1.2–9.6)	3.1 (1.5–6.5)	3.2 (1.5–6.6)	1.7 (0.7–3.9)	3.5 (1.7–6.9)	3.1 (1.8–5.4)	3.2 (1.7–5.9)	3.2 (2.0–5.3)	3.7 (2.3–6.1)	3.9 (2.6–6.0)
"Because I'm hooked"	0.1 (0.01–0.5)	1.9 (0.6–6.0)	1.0 (0.2–3.7)	0.3 (0.1–1.1)	1.6 (0.6–4.5)	0.2 (0.03–1.7)	1.2 (0.5–2.8)	0.2 (0.04–0.9)	0.8 (0.2–2.4)	1.5 (0.5–4.4)	1.6 (0.8–3.2)
Other reason	10.3 (4.9–20.4)	9.6 (4.8–18.3)	3.5 (1.8–6.9)	7.0 (4.6–10.6)	1.3 (0.5–3.2)	3.7 (1.9–7.4)	2.7 (1.5–4.8)	2.4 (1.2–4.9)	0.9 (0.4–2.0)	2.9 (1.4–6.0)	3.5 (2.2–5.4)
Motive categories[b]											
Weight loss only	1.5 (0.3–7.1)	1.8 (0.4–8.1)	1.3 (0.3–4.7)	0.4 (0.1–1.6)	1.3 (0.5–3.4)	1.0 (0.3–3.5)	1.9 (0.8–4.7)	1.4 (0.6–3.2)	1.4 (0.5–3.7)	0.5 (0.1–1.9)	1.0 (0.5–2.0)
Cognitive enhancement	40.4 (27.2–55.1)	47.5 (38.1–57.0)	53.1 (45.6–60.5)	62.0 (55.7–67.9)	67.6 (60.9–73.7)	73.4 (66.8–79.1)	70.9 (65.3–76.0)	74.7 (69.8–79.1)	71.9 (67.1–76.3)	74.7 (70.1–78.8)	71.2 (66.6–75.3)
Recreational	25.8 (15.9–39.1)	27.5 (20.0–36.7)	22.5 (16.4–30.0)	14.6 (11.0–19.1)	12.6 (8.9–17.5)	8.5 (5.8–12.4)	8.5 (6.2–11.6)	5.7 (3.5–9.0)	8.6 (6.1–12.1)	8.5 (6.3–11.6)	9.8 (7.7–12.4)
Combined	32.3 (20.1–47.4)	23.2 (15.4–33.5)	23.2 (16.4–31.7)	23.0 (17.9–29.2)	18.5 (14.1–23.8)	17.1 (12.4–23.2)	18.6 (14.9–23.0)	18.2 (14.1–23.2)	18.1 (14.3–22.7)	16.3 (13.1–20.1)	18.0 (14.6–22.0)

[a]Data from the 2015–2018 National Survey on Drug Use and Health (https://www.datafiles.samhsa.gov/study-series/national-survey-drug-use-and-health-nsduh-nid13517).
[b]"Cognitive enhancement only" is composed of "to concentrate," "to be alert" and "to study"; "recreational" comprises "to experiment," "to get high," "to alter other drug effects," and "because I'm hooked."

prevalence rates associated with aging: experiment by 1.4% (14 years: 19.8%, 24 and 25 years: 9.4%; $P<.0001$), to get high by 1.2% (14 years: 27.6%, 24 and 25 years: 14.1%; $P<.0001$), and other reasons by 0.3% (14 years: 10.3%, 24 and 25 years: 3.5%; $P=.007$). Also, study-related motives peaked in the college years, though age-based differences were nonsignificant. PSM for cognitive enhancement only was 1.8% greater per year (14 years: 40.4%, 24 and 25 years: 71.2%; $P<.0001$), while recreational-only (14 years: 25.8%, 24 and 25 years: 9.8%; $P<.0001$) and combined motives (14 years: 32.3%, 24 and 25 years: 18.0%; $P=.008$) were 1.1% and 0.6% smaller per year, respectively.

Educational status had no relationship with PSM motives or categories in adolescents (Supplementary Table 1), but motives differed significantly by educational status in young adults (Table 3). Young adults in college had the highest rate of study-related motives (66.6%) and lowest rate of to get high (9.3%); both differed significantly from young adults not in school (maximum significant P value = .0083 given correction for multiple comparisons). College students also had the highest rate of to concentrate (63.7%) and lowest of weight loss (3.9%), and young adults not in school were significantly more likely to endorse weight loss motives (maximum significant P value = .0083 given multiple corrections). Those not completing high school had the lowest rates of to concentrate (47.9%), to study (15.4%), and to be alert (41.8%), but the highest rates of weight loss (11.8%) and to get high (24.8%). Rates for college graduates and high school graduates not in school were generally intermediate, with elevated rates of PSM for alertness in both.

Table 4 captures PSM motive and category differences by past-year SUD status, with 3 similar outcomes across age groups. First, AYAs with past-year SUD had significantly higher rates of PSM to get high (adolescents: 32.2%, young adults: 18.9%) than those without SUD (adolescents: 18.1%, young adults: 8.0%; both P values ≤ .001). Second, AYAs with SUD had a higher prevalence of recreational-only versus cognitive enhancement motives (adolescents: 23.8%, young adults: 10.5%) than those without SUD (adolescents: 15.9%, young adults: 6.5%; P values ≤ .001). Third, AYAs with SUD had a higher prevalence of combined motives (adolescents: 30.0%, young adults: 23.5%) than those without SUD (adolescents: 17.3%, young adults: 12.7%; P values ≤ .001) versus the difference in prevalence of cognitive enhancement motives among those with and without SUD. Also, young adults with SUD were more likely to endorse to lose weight, to be alert, to experiment, to alter other drug effects, and "because I'm hooked" than those without past-year SUD. In contrast, young adults with SUD had lower rates of study-related PSM than those without SUD.

Finally, all substance use and mental health correlates were more likely in those with any PSM than those without PSM, though odds were generally lowest for cognitive enhancement only (Table 5). To illustrate, the odds ratio for any past-year SUD (versus no PSM) was 6.29 for cognitive enhancement, but 14.77 and 16.08 for recreational or combined motives, respectively. Odds of past-year suicidal ideation were 54%, 202%, and 252% higher in those with cognitive enhancement, recreational, or combined motives, respectively, versus no PSM. PSM across motive categories was associated with adolescent grades of C+ or lower. Differences by

Table 3. Individual Prescription Stimulant Misuse (PSM) and PSM Motive Categories by Educational Characteristic in Young Adults (18–25 Years) With Past-Year PSM[a]

Variable	In College (1)[b] (n = 1,686), % (95% CI)	College Graduates (2)[b] (n = 534), % (95% CI)	Not in School and High School Graduate (3)[b] (n = 1,179), % (95% CI)	Not in School and Dropped out of High School (4)[b] (n = 173), % (95% CI)	Entire Sample (n = 3,572), % (95% CI)
Individual motives					
To lose weight	3.9 (3.0–5.1)[3,4]	4.5 (2.8–7.0)[3,4]	9.4 (7.3–12.0)[1,2]	11.8 (6.2–21.1)[1,2]	6.0 (5.1–7.1)
To concentrate	63.7 (61.0–66.4)[2,3]	53.2 (48.5–57.8)[1]	55.5 (52.3–58.8)[1]	47.9 (37.5–58.6)	58.8 (57.0–60.6)
To be alert	42.2 (39.4–45.0)[3]	54.7 (49.0–60.2)	52.6 (48.4–56.8)[1]	41.8 (34.3–49.8)	47.4 (45.1–49.7)
To study	66.6 (63.6–69.5)[3,4]	53.9 (48.9–58.9)[3,4]	27.2 (24.2–30.4)[1,2,4]	15.4 (9.7–23.6)[1–3]	50.4 (48.2–52.6)
To experiment	9.5 (7.8–11.6)	7.1 (5.0–9.9)	12.0 (9.3–15.2)	10.1 (6.4–15.5)	9.9 (8.7–11.3)
To get high	9.3 (7.7–11.3)[3,4]	13.4 (9.9–17.9)	18.2 (15.2–21.6)[1]	24.8 (18.7–32.0)[1]	13.4 (12.0–14.8)
To alter other drug effects	3.3 (2.4–4.6)	5.2 (3.3–8.1)	2.8 (1.8–4.2)	2.3 (0.8–6.7)	3.4 (2.8–4.2)
"Because I'm hooked"	0.8 (0.4–1.5)	1.6 (0.6–3.8)	1.2 (0.6–2.2)	no cases	1.0 (0.6–1.6)
Other reason	1.3 (0.8–2.2)[3,4]	2.5 (1.2–5.4)	4.1 (2.9–5.9)[1]	6.4 (3.5–11.6)[1]	2.6 (2.0–3.4)
Motive categories[c]					
Weight loss only	0.5 (0.2–1.0)[3,4]	0.2 (0.02–1.3)	2.4 (1.4–4.1)[1]	3.9 (1.5–10.0)[1]	1.1 (0.8–1.7)
Cognitive enhancement only	78.2 (75.1–81.0)	74.7 (69.8–78.9)	64.7 (60.5–68.6)	55.4 (45.6–64.7)	72.6 (70.5–74.6)
Recreational only	5.0 (3.8–6.5)[3,4]	8.6 (5.8–12.5)	11.9 (9.6–14.6)[1]	21.4 (14.8–30.0)[1]	8.4 (7.3–9.5)
Combined	16.4 (13.8–19.3)	16.6 (13.3–20.6)	21.1 (17.7–24.9)	19.3 (13.6–26.7)	17.9 (16.3–19.7)

[a]Data from the 2015–2018 National Survey on Drug Use and Health (https://www.datafiles.samhsa.gov/study-series/national-survey-drug-use-and-health-nsduh-nid13517).
[b]Superscript numbers denote differences from the group with the letter (ie, superscript "1" denotes a significant difference from young adults in college), with all comparisons adjusted for age, race/ethnicity, sex, household income, and population density and Bonferroni corrected for multiple comparisons (ie, *P* value for significance is .0083, or .05/6 comparisons).
[c]"Cognitive enhancement only" is composed of "to concentrate," "to be alert" and "to study"; "recreational" comprises "to experiment," "to get high," "to alter other drug effects," and "because I'm hooked." "Cognitive enhancement only" was set as the reference in multinomial logistic regressions. Significant comparisons for motive categories are set at an a priori *P* value of .0001 or less, given the large number of comparisons.

Table 4. Individual Prescription Stimulant Misuse (PSM) and PSM Motive Categories by Past-Year Substance Use Disorder (SUD) Status in Adolescents and Young Adults With Past-Year PSM[a]

	Adolescents			Young Adults		
Variable	Without SUD[b] (n = 428), % (95% CI)	With SUD[b] (n = 452), % (95% CI)	*P* Value[c]	Without SUD[b] (n = 1,811), % (95% CI)	With SUD[b] (n = 1,761), % (95% CI)	*P* Value[c]
Individual motives						
To lose weight	4.7 (2.7–8.0)	8.9 (5.9–13.1)	.27	5.1 (3.7–6.8)	7.2 (5.8–8.9)	.024
To concentrate	59.2 (53.8–64.3)	50.1 (42.8–57.5)	.078	59.8 (57.1–62.5)	57.9 (54.9–60.9)	.35
To be alert	34.5 (29.5–39.8)	40.4 (33.7–47.5)	.43	44.4 (41.6–47.3)	49.9 (46.5–53.3)	.002
To study	40.1 (34.8–45.6)	37.9 (31.7–44.7)	.42	53.8 (50.9–56.6)	46.6 (43.4–50.0)	.001
To experiment	19.2 (15.1–24.2)	25.4 (20.6–30.9)	.12	8.0 (6.6–9.7)	11.9 (10.2–13.9)	.002
To get high	18.1 (13.6–23.5)	32.2 (25.8–39.4)	.001	8.0 (6.6–9.7)	18.9 (16.7–21.4)	< .001
To alter other drug effects	2.7 (1.2–6.4)	3.3 (1.8–6.0)	.96	1.8 (1.2–2.7)	5.1 (3.9–6.5)	< .001
"Because I'm hooked"	0.5 (0.1–1.8)	0.9 (0.3–2.7)	.99	0.1 (0.01–0.5)	1.9 (1.2–3.1)	.002
Other reason	7.9 (5.4–11.4)	6.6 (4.0–10.7)	.17	2.2 (1.5–3.2)	3.0 (2.2–4.1)	.15
Motive categories[d]						
Weight loss only	1.7 (0.7–4.2)	1.7 (0.8–3.3)	.21	0.8 (0.5–1.5)	1.5 (0.9–2.5)	.022
Cognitive enhancement only	65.1 (59.6–70.2)	44.6 (38.6–50.7)	Base outcome	80.0 (77.5–82.2)	64.6 (61.3–67.8)	Base outcome
Recreational only	15.9 (12.4–20.3)	23.8 (18.1–30.6)	.001	6.5 (5.1–8.2)	10.5 (9.0–12.1)	< .001
Combined	17.3 (13.2–22.5)	30.0 (25.1–35.3)	.001	12.7 (10.9–14.9)	23.5 (20.6–26.6)	< .001

[a]Data from the 2015–2018 National Survey on Drug Use and Health (https://www.datafiles.samhsa.gov/study-series/national-survey-drug-use-and-health-nsduh-nid13517).
[b]Past-year SUD is based on the DSM-IV definition for substance abuse or dependence from alcohol, cannabis, cocaine, heroin, methamphetamine, inhalants, hallucinogens, prescription opioids, prescription tranquilizers, prescriptions sedatives, and/or prescription stimulants.
[c]*P* values are from logistic or multinomial logistic models, controlling for age, race/ethnicity, sex, household income, and population density.
[d]"Cognitive enhancement only" is composed of "to concentrate," "to be alert" and "to study"; "recreational" comprises "to experiment," "to get high," "to alter other drug effects," and "because I'm hooked."

race/ethnicity were mainly driven by higher rates of PSM in white and multiracial AYAs, primarily within cognitive enhancement only, given significantly higher rates versus other groups. Past-year offending behavior was higher in those with any PSM, though rates were highest in those with recreational or combined motives. Post hoc sensitivity analyses found no outcome differences when alertness was classified as a recreational motive instead of as a cognitive enhancement motive.

DISCUSSION

There were 4 key findings: one, PSM motives differ significantly over the AYA age range, with lesser endorsement

Table 5. Univariable Outcomes by Prescription Stimulant Misuse (PSM) Motive Category, Among Those With Past-Year PSM[a]

Variable	No Past-Year PSM (n = 98,438), RRR (95% CI)	Cognitive Enhancement–Only PSM (n = 3,002), RRR (95% CI)	Recreational-Only PSM (n = 542), RRR (95% CI)	Combined PSM (n = 852), RRR (95% CI)
Sociodemographic Outcomes				
Race/ethnicity				
White, non-Hispanic	1.00 (Reference)	1.00 (Reference)	1.00 (Reference)	1.00 (Reference)
Black, non-Hispanic	1.00 (Reference)	0.21 (0.16–0.26)***	0.23 (0.14–0.38)***	0.22 (0.16–0.32)***
Indigenous, non-Hispanic	1.00 (Reference)	0.21 (0.12–0.39)***	0.78 (0.33–1.84)	0.68 (0.59–0.69)
Asian-American, non-Hispanic	1.00 (Reference)	0.40 (0.32–0.51)***	0.64 (0.31–1.35)	0.26 (0.16–0.43)***
Multiracial, non-Hispanic	1.00 (Reference)	0.90 (0.70–1.15)	0.86 (0.55–1.34)	1.04 (0.71–1.54)
Hispanic/Latinx	1.00 (Reference)	0.45 (0.39–0.52)***	0.49 (0.34–0.72)***	0.36 (0.25–0.50)***
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Male	1.00 (Reference)	1.33 (1.20–1.46)***	1.19 (0.95–1.49)	1.08 (0.92–1.28)
Current grades C+ or lower[b]	1.00 (Reference)	1.39 (1.04–1.84)*	1.74 (1.13–2.67)*	1.91 (1.27–2.87)**
Uninsured status	1.00 (Reference)	1.70 (1.44–2.01)***	1.04 (0.77–1.40)	1.45 (1.05–2.00)*
Past-year offending behavior[c]	1.00 (Reference)	4.01 (3.57–4.50)***	7.89 (6.29–9.90)***	8.33 (6.71–10.34)***
Substance Use Outcomes				
Past-year prescription opioid misuse	1.00 (Reference)	6.17 (5.55–6.86)***	14.89 (11.90–18.63)***	12.83 (10.88–15.13)***
Past-year benzodiazepine misuse	1.00 (Reference)	11.17 (9.88–12.63)***	20.82 (15.96–27.16)***	17.28 (14.18–21.06)***
Past-month binge alcohol use	1.00 (Reference)	7.68 (6.73–8.77)***	7.25 (5.39–9.76)***	6.39 (5.18–7.89)***
Past-year cannabis use	1.00 (Reference)	9.94 (8.88–11.11)***	19.33 (13.20–28.31)***	17.74 (13.22–23.80)***
Past-year any substance use disorder[d]	1.00 (Reference)	6.29 (5.64–7.01)***	14.77 (11.42–19.11)***	16.08 (13.28–19.47)***
Mental Health Outcomes				
Past-year major depressive episode	1.00 (Reference)	1.77 (1.53–2.05)***	3.23 (2.49–4.19)***	3.87 (3.21–4.67)***
Past-year mental health treatment	1.00 (Reference)	1.49 (1.35–1.66)***	2.85 (2.19–3.69)***	2.67 (2.22–3.20)***
Past-year serious psychological distress[e]	1.00 (Reference)	1.44 (1.28–1.61)***	3.12 (2.40–4.04)***	3.32 (2.62–4.22)***
Past-year suicidal ideation[e]	1.00 (Reference)	1.54 (1.30–1.83)***	3.02 (2.36–3.87)***	3.52 (2.83–4.38)***

[a]Data from the 2015–2018 National Survey on Drug Use and Health (https://www.datafiles.samhsa.gov/study-series/national-survey-drug-use-and-health-nsduh-nid13517). All analyses control for age, sex (when applicable), race/ethnicity (when applicable), population density and household income.
[b]Analysis only among adolescents in school (n = 49,049).
[c]Past-year offending behavior is 1 or more of past-year illegal drug sales, attempted theft of anything worth $50 or more, and attacks with intent to seriously harm someone else.
[d]Past-Year substance use disorder is based on the *DSM-IV* definition for substance abuse or dependence from alcohol, cannabis, cocaine, heroin, methamphetamine, inhalants, hallucinogens, prescription opioids, prescription tranquilizers, prescriptions sedatives, and/or prescription stimulants.
[e]Analyses only in young adults, aged 18 years and older (n = 55,646 and 55,121, respectively).
*$P \leq .05$.
**$P \leq .01$.
***$P \leq .001$.
Abbreviations: OR = odds ratio, RRR = relative risk ratio.

of recreational and greater endorsement of cognitive enhancement motives in young adults versus adolescents. Two, while motives do not correspond to adolescent educational status, young adults in college have greater relative endorsement of cognitive enhancement motives over young adults not in school. Three, recreational and combined motives are strongly linked to past-year any SUD across AYAs, with a striking link between to get high and past-year SUD in AYAs—32.2% of adolescents and 18.9% of young adults with SUD endorsed to get high. Put differently, endorsement of to get high was 78% and 136% higher in adolescents and young adults, respectively, in those with any past-year SUD. Four, any PSM in AYAs is linked to greater odds of concurrent substance use, suicidal ideation, and other psychopathology, though odds were highest with recreational-only or combined PSM motives.

For individual motives, to be alert was more frequently endorsed with age, from 33.6% in 14-year-olds to 53.7% in 24- and 25-year-olds. Despite this finding, the prevalence of PSM to concentrate did not differ across the AYA age span, and PSM to study was less common after the traditional college graduation age of 22 or 23 years. The discrepancy between alertness and concentration-related motives warrants further investigation, as do the specific goals motivating young adults to engage in PSM for alertness. Alertness is heterogeneous and may not represent cognitive enhancement, and future studies using latent class models could evaluate this in more detail. In contrast to alertness, experiment and to get high became less common with aging, as did recreational-only and combined PSM motives.

Young adults in college had a greater prevalence of cognitive enhancement motives than young adults not in school. This finding was particularly driven by PSM for concentration- and study-related motives. College graduates were intermediate, but they had rates of cognitive enhancement motives generally closer to those of young adults in college. Cognitive enhancement may underlie the higher PSM prevalence rates in college students and graduates,[23] corresponding to the belief in the academic/cognitive benefits of PSM,[38] despite limited evidence of such benefits.[3] Alternatively, cognitive enhancement may reflect self-treatment of attention-deficit/hyperactivity disorder

symptoms and/or underlying neurocognitive deficits, both elevated in young adults engaged in PSM.[39] Young adults not in school endorsed recreational PSM motives much more frequently, particularly PSM to get high among those who dropped out of high school. Given the odds of SUD associated with PSM to get high, this finding may mark young adults who dropped out of high school as a particularly vulnerable group. Finally, while the finding was still infrequent, young adults not in school had higher rates of weight loss motives, warranting replication and further study.

Notably, recreational motives were associated with any past-year SUD across AYAs. Presence of euphoria-seeking may signal elevated SUD in AYAs, providing a helpful tool to guide prevention, screening, and intervention. While study-related motives were less common in young adults with SUD, any PSM is associated with higher SUD rates, as shown in Table 5 and by Compton et al.[40] Thus, while its relative risk is lower than those of other motives, PSM for study-related motives is still associated with other substance use and SUD, and those engaged in PSM only for cognitive enhancement had over 6 times greater odds of SUD than AYAs without past-year PSM. This finding is consistent with research in adolescents[22] highlighting that all PSM is associated with increased substance use and psychopathology. Finally, the elevations found in suicidal ideation across PSM motives warrant further attention and add to compelling evidence of a link between prescription drug misuse and suicidality across the lifespan.[41–45]

Limitations

Given the cross-sectional data, no causal inference can be made. The self-report data and refusal of participation by some potential participants resulted in response and selection bias. Nonetheless, self-report substance use data are very likely valid,[46,47] and ACASI methods and use of both medication pictures and trade and generic medication names limit self-report bias.[48] Available variables are limited by the survey, particularly mental health and dropout risk variables here. PSM motives were captured only at the most recent episode, obscuring within-person variance over time. Finally, exclusion of young adults still in secondary school excludes a smaller, but important, group from analyses. This choice was made based on developmental and stimulant-related evidence[23,30–32] but remains a limitation.

Summary and Clinical Implications

PSM motives vary significantly over the 14- to 25-year age span, with lesser endorsement of recreational and greater endorsement of cognitive enhancement motives in young adults relative to adolescents. This finding may reflect increasing academic or work demands, given the perception of academic benefits from PSM.[38] Longitudinal research extending past young adulthood could clarify if recreational motives increase after 25 years of age; similarly, longitudinal studies could link baseline motives to likelihood of ongoing PSM at follow-up assessment and frequency and consequences of such misuse. Cognitive enhancement–only motives may be more likely in white and multiracial AYAs, though future research is needed to examine PSM prevalence and motives in AYAs by race/ethnicity. Future research using latent class analysis is also needed to further validate the motive categories.

PSM rates were significantly higher in young adults, suggesting that prevention[49–51] may be more productive in adolescents whereas screening/intervention may be more fruitful in young adults. Furthermore, PSM motive differences across AYAs and by educational level highlight that prevention, screening, and treatment may need to focus on unique motivational profiles at different ages and educational levels. To illustrate, efforts to combat perceptions of academic benefit from PSM and improve academic skills could lower college student PSM. Finally, any PSM at any age is linked to elevated odds of substance use, SUD, and psychopathology, highlighting the significant risk of PSM. PSM to get high can be employed as a screening tool, as it suggests much greater SUD likelihood. AYAs engaged in PSM to get high are likely to need more intensive interventions, and presence of any PSM suggests a need for further screening for concurrent substance use and psychopathology. Prevention, screening, and intervention programs for PSM are needed, especially in college settings, and research on such programs would have great public health impact.

Submitted: February 18, 2020; accepted May 26, 2020.

Published online: November 3, 2020.

Potential conflicts of interest: **Dr Wilens** is or has been a consultant for Alcobra, Neurovance/Otsuka, and Ironshore; has a published the books *Straight Talk About Psychiatric Medications for Kids* (Guilford Press) and co-edited books *ADHD in Adults and Children* (Cambridge University Press), *Massachusetts General Hospital Comprehensive Clinical Psychiatry* (Elsevier), and *Massachusetts General Hospital Psychopharmacology and Neurotherapeutics* (Elsevier); is co-owner of a copyrighted diagnostic questionnaire (Before School Functioning Questionnaire [BSFQ]); has a licensing agreement with Ironshore (BSFQ); and serves as a clinical consultant to the US National Football League (ERM Associates), US Minor/Major League Baseball, Phoenix/Gavin House, and Bay Cove Human Services. **Drs Schepis**, **Ford**, **Teter**, and **McCabe** have no potential conflicts of interest relevant to the subject of this article.

Funding/support: The National Survey on Drug Use and Health (NSDUH) is funded by the Substance Abuse and Mental Health Services Administration (SAMHSA), and this work was supported by the National Institutes of Health (NIH) via R01DA043696, R01DA031160, UH3DA050173, and UG3DA050252.

Role of the sponsor: Neither SAMHSA nor NIH had any role in this study's design; the collection, analysis or interpretation of data; the writing of the report; or the decision to submit the paper for publication.

Disclaimer: The content is the authors' responsibility and does not necessarily represent the views of NIDA or SAMHSA.

Additional information: The NSDUH datasets are available from the SAMHSA data archive: https://www.datafiles.samhsa.gov/study-series/national-survey-drug-use-and-health-nsduh-nid13517.

Supplementary material: Available at PSYCHIATRIST.COM.

REFERENCES

1. Schulenberg JE, Johnston LD, O'Malley PM, et al. *Monitoring The Future National Survey Results On Drug Use, 1975–2018: Volume Ii, College Students And Adults Ages 19–60.* Ann Arbor, MI: Institute for Social Research, The University of Michigan; 2019.
2. Substance Abuse and Mental Health Services Administration. *Results from the 2018 National Survey on Drug Use and Health: Detailed Tables.* Rockville, MD: Center for Behavioral Health Statistics and Quality, Substance Abuse and Mental Health Services Administration; 2019.
3. Wilens TE, Kaminski TA. Prescription stimulants: from cognitive enhancement to misuse. *Pediatr Clin North Am.* 2019;66(6):1109–1120.
4. Weyandt LL, Marraccini ME, Gudmundsdottir

BG, et al. Misuse of prescription stimulants among college students: a review of the literature and implications for morphological and cognitive effects on brain functioning. *Exp Clin Psychopharmacol*. 2013;21(5):385–407.
5. Ford JA, Sacra SA, Yohros A. Neighborhood characteristics and prescription drug misuse among adolescents: the importance of social disorganization and social capital. *Int J Drug Policy*. 2017;46:47–53.
6. Benson K, Flory K, Humphreys KL, et al. Misuse of stimulant medication among college students: a comprehensive review and meta-analysis. *Clin Child Fam Psychol Rev*. 2015;18(1):50–76.
7. McCabe SE, Teter CJ. Drug use related problems among nonmedical users of prescription stimulants: a web-based survey of college students from a Midwestern university. *Drug Alcohol Depend*. 2007;91(1):69–76.
8. McCabe SE, Teter CJ, Boyd CJ. The use, misuse and diversion of prescription stimulants among middle and high school students. *Subst Use Misuse*. 2004;39(7):1095–1116.
9. Schepis TS, Krishnan-Sarin S. Characterizing adolescent prescription misusers: a population-based study. *J Am Acad Child Adolesc Psychiatry*. 2008;47(7):745–754.
10. Blevins CE, Banes KE, Stephens RS, et al. Change in motives among frequent cannabis-using adolescents: predicting treatment outcomes. *Drug Alcohol Depend*. 2016;167:175–181.
11. Carey KB, Scott-Sheldon LA, Carey MP, et al. Individual-level interventions to reduce college student drinking: a meta-analytic review. *Addict Behav*. 2007;32(11):2469–2494.
12. Canale N, Vieno A, Santinello M, et al. The efficacy of computerized alcohol intervention tailored to drinking motives among college students: a quasi-experimental pilot study. *Am J Drug Alcohol Abuse*. 2015;41(2):183–187.
13. Teter CJ, McCabe SE, Cranford JA, et al. Prevalence and motives for illicit use of prescription stimulants in an undergraduate student sample. *J Am Coll Health*. 2005;53(6):253–262.
14. Teter CJ, McCabe SE, LaGrange K, et al. Illicit use of specific prescription stimulants among college students: prevalence, motives, and routes of administration. *Pharmacotherapy*. 2006;26(10):1501–1510.
15. McCabe SE, Boyd CJ, Teter CJ. Subtypes of nonmedical prescription drug misuse. *Drug Alcohol Depend*. 2009;102(1-3):63–70.
16. Garnier-Dykstra LM, Caldeira KM, Vincent KB, et al. Nonmedical use of prescription stimulants during college: four-year trends in exposure opportunity, use, motives, and sources. *J Am Coll Health*. 2012;60(3):226–234.
17. Ross MM, Arria AM, Brown JP, et al. College students' perceived benefit-to-risk tradeoffs for nonmedical use of prescription stimulants: implications for intervention designs. *Addict Behav*. 2018;79:45–51.
18. Smith TE, DeSantis AD, Martel MM. Gender differences in nonprescribed psychostimulant use in young adults. *Subst Use Misuse*. 2018;53(4):622–628.
19. Thiel AM, Kilwein TM, De Young KP, et al. Differentiating motives for nonmedical prescription stimulant use by personality characteristics. *Addict Behav*. 2019;88:187–193.
20. Kilwein TM, Goodman EL, Looby A, et al. Nonmedical prescription stimulant use for suppressing appetite and controlling body weight is uniquely associated with more severe eating disorder symptomatology. *Int J Eat Disord*. 2016;49(8):813–816.
21. McCabe SE, Cranford JA. Motivational subtypes of nonmedical use of prescription medications: results from a national study. *J Adolesc Health*. 2012;51(5):445–452.
22. Teter CJ, DiRaimo CG, West BT, et al. Nonmedical use of prescription stimulants among US high school students to help study: results from a national survey. *J Pharm Pract*. 2020;33(1):38–47.
23. Schepis TS, Teter CJ, McCabe SE. Prescription drug use, misuse and related substance use disorder symptoms vary by educational status and attainment in US adolescents and young adults. *Drug Alcohol Depend*. 2018;189:172–177.
24. Ford JA, Pomykacz CR, Ortiz K, et al. Educational attainment and prescription drug misuse: the importance of push and pull factors for dropping out. *J Crim Justice*. 2020;66:101636.
25. McCabe SE, Knight JR, Teter CJ, et al. Non-medical use of prescription stimulants among US college students: prevalence and correlates from a national survey. *Addiction*. 2005;100(1):96–106.
26. Center for Behavioral Health Statistics and Quality. *2016 National Survey on Drug Use and Health: Methodological Summary and Definitions*. Rockville, MD: Substance Abuse and Mental Health Services Administration; 2017.
27. US Department of Health and Human Services, Substance Abuse and Mental Health Services Administration. *Reliability of Key Measures in the National Survey on Drug Use and Health*. Office of Applied Studies, Methodology series M-8, HHS Publication No. SMA 09-4425. Rockville, MD: Substance Abuse and Mental Health Services Administration; 2010.
28. Grant BF, Chu A, Sigman R, et al. *Source and Accuracy Statement: National Epidemiologic Survey on Alcohol and Related Conditions-III (NESARC-III)*. Rockville, MD: National Institute on Alcohol Abuse and Alcoholism; 2014.
29. Center for Behavioral Health Statistics and Quality. *2016 National Survey on Drug Use and Health: Methodological Resource Book*. (Section 8, data collection final report). Rockville, MD: Substance Abuse and Mental Health Services Administration; 2017.
30. Schulenberg JE, Sameroff AJ, Cicchetti D. The transition to adulthood as a critical juncture in the course of psychopathology and mental health. *Dev Psychopathol*. 2004;16(4):799–806.
31. Astin AW. Student involvement: a developmental theory for higher education. *Journal of college Student Personnel*. 1984;25(4):297–308.
32. Gray WN, Kavookjian J, Shapiro SK, et al. Transition to college and adherence to prescribed attention deficit hyperactivity disorder medication. *J Dev Behav Pediatr*. 2018;39(1):1–9.
33. Schepis TS, Wastila L, Ammerman B, et al. Prescription opioid misuse motives in US older adults [published online ahead of print December 9, 2019]. *Pain Med*. 2019;pnz304.
34. DuPont RL, Caldeira KM, DuPont HS, et al. *America's Dropout Crisis: The Unrecognized Connection to Adolescent Substance Use*. Rockville, MD: Institute for Behavior and Health, Inc.; 2013.
35. National Institute on Alcohol Abuse and Alcoholism. *NIAAA Newsletter, Winter 2004*. Bethesda, MD: Office of Research Translation and Communications, NIAAA; 2004.
36. Kessler RC, Barker PR, Colpe LJ, et al. Screening for serious mental illness in the general population. *Arch Gen Psychiatry*. 2003;60(2):184–189.
37. Center for Behavioral Health Statistics and Quality. *2016 National Survey on Drug Use and Health: Methodological Resource Book*. (Section 13: Statistical Inference Report). Rockville, MD: Substance Abuse and Mental Health Services Administration; 2017.
38. Arria AM, Geisner IM, Cimini MD, et al. Perceived academic benefit is associated with nonmedical prescription stimulant use among college students. *Addict Behav*. 2018;76:27–33.
39. Wilens TE, Carrellas NW, Martelon M, et al. Neuropsychological functioning in college students who misuse prescription stimulants. *Am J Addict*. 2017;26(4):379–387.
40. Compton WM, Han B, Blanco C, et al. Prevalence and correlates of prescription stimulant use, misuse, use disorders, and motivations for misuse among adults in the United States. *Am J Psychiatry*. 2018;175(8):741–755.
41. Schepis TS, Simoni-Wastila L, McCabe SE. Prescription opioid and benzodiazepine misuse is associated with suicidal ideation in older adults. *Int J Geriatr Psychiatry*. 2019;34(1):122–129.
42. Ford JA, Perna D. Prescription drug misuse and suicidal ideation: findings from the National Survey on Drug Use and Health. *Drug Alcohol Depend*. 2015;157:192–196.
43. Ashrafioun L, Bishop TM, Conner KR, et al. Frequency of prescription opioid misuse and suicidal ideation, planning, and attempts. *J Psychiatr Res*. 2017;92:1–7.
44. Ashrafioun L, Heavey S, Canarapen T, et al. The relationship between past 12-month suicidality and reasons for prescription opioid misuse. *J Affect Disord*. 2019;249:45–51.
45. Davis RE, Doyle NA, Nahar VK. Association between prescription opioid misuse and dimensions of suicidality among college students. *Psychiatry Res*. 2020;287:112469.
46. O'Malley PM, Bachman JG, Johnston LD. Reliability and consistency in self-reports of drug use. *Int J Addict*. 1983;18(6):805–824.
47. Johnston LD, O'Malley PM. Issues of validity and population coverage in student surveys of drug use. *NIDA Res Monogr*. 1985;57:31–54.
48. Center for Behavioral Health Statistics and Quality. *National Survey on Drug Use and Health (NSDUH): Summary of Methodological Studies, 1971–2014*. Rockville, MD: Substance Abuse and Mental Health Services Administration; 2014.
49. Spoth R, Trudeau L, Redmond C, et al. Replicating and extending a model of effects of universal preventive intervention during early adolescence on young adult substance misuse. *J Consult Clin Psychol*. 2016;84(10):913–921.
50. Spoth R, Trudeau L, Shin C, et al. Longitudinal effects of universal preventive intervention on prescription drug misuse: three randomized controlled trials with late adolescents and young adults. *Am J Public Health*. 2013;103(4):665–672.
51. Spoth R, Trudeau L, Shin C, et al. Long-term effects of universal preventive interventions on prescription drug misuse. *Addiction*. 2008;103(7):1160–1168.

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CLINICAL PSYCHIATRY
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Supplementary Material

Article Title: Differences in Prescription Stimulant Misuse Motives Across Adolescents and Young Adults in the United States

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DOI Number: https://doi.org/10.4088/JCP.20m13302

List of Supplementary Material for the article

1. Table 1 — Individual Prescription Stimulant Misuse (PSM) and PSM Motive Categories by Educational Characteristic in Adolescents (12-17 years) with Past-Year PSM

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Supplementary Table 1: Individual Prescription Stimulant Misuse (PSM) and PSM Motive Categories by Educational Characteristic in Adolescents (12-17 years) with Past-Year PSM

	In School, Low Risk for Dropout	In School, High Risk for Dropout	Not in School	Entire Sample
Sample Size	589	169	122	880
	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)
Individual Motives				
To Lose Weight	7.1 (4.7-10.8)	3.2 (1.2-8.5)	6.8 (2.7-16.1)	6.4 (4.5-9.1)
To Concentrate	57.3 (51.8-62.6)	54.1 (44.3-63.5)	44.5 (33.2-56.4)	55.1 (50.6-59.5)
To Be Alert	38.7 (34.5-43.2)	37.1 (27.4-48.0)	34.6 (24.6-46.0)	37.9 (34.2-41.8)
To Study	41.9 (36.4-47.6)	34.1 (25.3-44.1)	37.3 (28.2-47.5)	40.0 (35.7-44.4)
To Experiment	23.5 (19.3-28.4)	21.0 (14.1-30.2)	19.3 (11.1-31.5)	22.6 (19.1-26.5)
To Get High	23.9 (19.3-29.3)	30.0 (22.0-39.3)	22.6 (12.2-38.0)	24.8 (20.8-29.3)
To Alter Other Drug Effects	2.4 (1.1-5.1)	3.0 (1.1-8.2)	6.1 (2.2-15.5)	3.0 (1.8-5.0)
"Because I'm Hooked"	0.5 (0.1-1.8)	1.5 (0.4-5.3)	0.8 (0.2-3.7)	0.7 (0.3-1.6)
Other Reason	8.1 (5.6-11.5)	5.1 (2.2-11.2)	4.7 (1.7-12.5)	7.1 (5.1-9.8)
Motive Categories[a]				
Weight Loss Only	1.5 (0.7-3.1)	0.6 (0.1-2.8)	2.4 (0.4-12.8)	1.4 (0.7-2.8)
Cognitive Enhancement Only	55.1 (49.8-60.2)	53.2 (43.5-62.6)	59.5 (42.9-74.2)	55.3 (50.9-59.6)
Recreational-Only	19.2 (15.7-23.3)	20.6 (15.0-27.8)	20.4 (10.2-36.9)	19.6 (16.3-23.4)
Combined	24.3 (20.0-29.2)	25.6 (17.7-35.5)	17.7 (9.2-31.2)	23.7 (20.2-27.6)

Data: 2015-18 NSDUH

[a]Cognitive Enhancement Only is composed of To Concentrate, To Be Alert and To Study; Recreational is To Experiment, To Get High, To Alter Other Drug Effects and "Because I'm Hooked".