Published in final edited form as:

Addict Behav. 2017 February ; 65: 269–274. doi:10.1016/j.addbeh.2016.08.017.

Adolescents' Future Orientation and Nonmedical Use of Prescription Drugs

Rena M. Steiger^a, Sarah A. Stoddard^b, and Jennifer Pierce^c

^aDepartment of Epidemiology, University of Michigan School of Public Health, 1415 Washington Heights, Ann Arbor, MI 48109-2029, USA. renastei@umich.edu

^bDepartment of Systems Leadership and Effectiveness, University of Michigan School of Nursing, 400 North Ingalls Building, Ann Arbor, MI 48109-5482, USA. sastodda@umich.edu

^cDepartment of Systems Leadership and Effectiveness, University of Michigan School of Nursing, 400 North Ingalls Building, Ann Arbor, MI 48109-5482, USA. ed1051@wayne.edu

Abstract

Introduction—How adolescents think about their future (i.e., future orientation) impacts their risk-taking behavior. The purpose of the present analysis was to explore whether future orientation (future planning, perceived risk to future goals, and positive future expectations) was associated with nonmedical use of stimulants and analgesics in a sample of high school students.

Methods—Information on future orientation and nonmedical use of prescription drugs (NMUPD) were collected using a paper-and-pencil survey from a sample of 9th-12th grade students in a Midwestern school.

Results—Higher perceived risk to future goals and positive future expectations were associated with a lower likelihood of self-reported nonmedical use of stimulants ($n = 250$; OR = 0.46, 95% CI: 0.26, 0.83; OR = 0.15, 95% CI: 0.05, 0.47, respectively). Only higher perceived risk to future goals was associated with a lower likelihood of self-reported nonmedical use of analgesics ($n = 250$; OR = 0.40, 95% CI: 0.24, 0.68). In a follow-up analysis limited to students who endorsed alcohol or marijuana use, perceived risk to future goals remained associated with a lower likelihood of nonmedical use of stimulants and analgesics.

Conclusions—Results suggest that risk perception might be a salient protective factor against both nonmedical use of stimulants and analgesics. Overall, the differential impact of conceptualizations of future orientation might depend on the class of prescription drug used, demonstrating a need to consider prescription drugs individually in the development of future studies and interventions.

Corresponding author: Sarah A. Stoddard.

Publisher's Disclaimer: This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Keywords

future orientation; stimulants; analgesics; high school

1. Introduction

Nonmedical use of prescription drugs (NMUPD) is a serious problem facing American adolescents. In 2015, approximately one out of twenty high school seniors reported nonmedical use of stimulants or analgesics (National Institute on Drug Abuse [NIDA], 2016). Research has shown that adolescents who delay the onset of NMUPD are less likely to be diagnosed with prescription drug abuse or dependence in their lifetime (McCabe, West, Morales, Cranford, & Boyd, 2007). These findings suggest that adolescence is a crucial time to avert NMUPD; thus, identification of factors that protect against such behaviors is a priority (Egan, Van Horn, Monahan, Arthur, & Hawkins, 2011; Piko & Kovács, 2010). One potential protective factor is future orientation, generally described as “individuals’ tendency to engage in future thinking” (Seginer, 2009, p. 3). Previous research suggests that adolescents’ planning for the future and sense of internal control over the future increases from early to middle adolescence, supporting the notion that future orientation is a growing concern during this developmental period (Nurmi, 1989).

Future orientation, however, is a broad term associated with many conceptualizations (Johnson, Blum, & Cheng, 2014). The present study focuses on three different conceptualizations: future planning, perceived risk to future goals, and positive future expectations. Future planning is the extent to which an individual plans for their future and strives toward future goals (Zimbardo & Boyd, 1999). This might focus individuals’ resources on goal-oriented positive activities and, in turn, might lessen the appeal of engaging in risk behaviors. Alternatively, considering future consequences of behavior helps individuals link the present with the future (Strathman et al., 1994). Understanding how potentially enjoyable risk behavior in the present can damage future goals might focus attention on consciously avoiding these negative behaviors. This might be particularly critical during the period of adolescence when contextual circumstances (e.g., encouraging peers) often make risk behavior appealing. Finally, positive future expectations are the perceived likelihood of attaining specific objectives in life (e.g., have a happy life; Dubow, Arnett, Smith, & Ippolito, 2001). Positive future expectations provide a thematic vision of what an individual’s future could be and might deter risk behaviors that put this vision in jeopardy.

Indeed, previous research suggests that these conceptualizations of future orientation might be protective against substance use in adolescence. For example, future planning and positive future expectations are associated with lower levels of tobacco, alcohol, and marijuana use during adolescence and young adulthood (Apostolidis, Fieulaine, & Soulé, 2006; Barnett et al., 2013; Henson, Carey, Carey, & Maisto, 2006; Dunn, Kitts, Lewis, Goodrow, & Scherzer, 2011). Similarly, perceived risk to future goals has been linked to a lower likelihood of engaging in dangerous alcohol use in adolescents (McKay, Percy, &

Cole, 2013). To our knowledge, however, researchers have not yet explored how NMUPD is related to future orientation and, in particular, its various conceptualizations.

The present study sought to explore whether future planning, perceived risk to future goals, and positive future expectations were differentially associated with the nonmedical use of stimulants and analgesics in a sample of high school students. Although future planning might focus individuals' activities on behavior that will advance them toward future goals, it does not necessarily preclude risky behavior. Indeed, highly-motivated adolescents engage in NMUPD (Veliz, Boyd, & McCabe, 2013). Alternatively, perceived risk to future goals focuses on risk perception and links current, specific behavior with future consequences. Previous research suggests that risk perception is a powerful key to lower tobacco and alcohol use among adolescents (McKay, Percy, & Cole, 2013; Virgili, Owen, & Severson, 1991). Furthermore, although future planning might focus on positive motivation, perceived risk to future goals highlights negative potential outcomes. For adolescents, recognizing negative effects of certain behaviors might especially motivate avoidance of those actions (Reynolds et al., 2015). Finally, positive future expectations might be only weakly associated with current behavior because they are merely anticipated events rather than outcomes that individuals have to strive toward.

The motivation for using analgesics and stimulants differs, potentially resulting in opposing directions of association. Previous research suggests that one of the primary motivations for the nonmedical use of analgesics is sensation-seeking (McCabe, Boyd, Cranford, & Teter, 2009). Alternatively, stimulants might be used by highly motivated adolescents to excel in various activities, including school (King, Jennings, & Fletcher, 2014; Veliz et al., 2013). Thus, although future orientation might be associated with lower nonmedical use of analgesics, it might instead be associated with higher nonmedical use of stimulants. This possibility was explored in the present study.

Previous studies have shown that adolescents who engage in NMUPD are also significantly more likely to use other substances, most often alcohol and marijuana (McCabe, Boyd, & Teter, 2005; McCabe, West, Schepis, & Teter, 2015). For example, McCabe, Teter and Boyd (2009) found that approximately 86% of middle and high school students who reported nonmedical use of stimulants also reported alcohol use in the past year and 69% reported marijuana use in the past year. On the contrary, only 37% and 14% of adolescents who reported no stimulant use reported alcohol use in the past year and marijuana use in the past year, respectively. We, therefore, explored the relationship between future orientation and NMUPD in the context of polysubstance use. Specifically, we explored whether adolescents reporting lifetime use of alcohol or marijuana in addition to NMUPD report differential levels of future planning, perceived risk to goals, and positive future expectations compared to adolescents who report lifetime use of alcohol or marijuana alone.

2. Methods

2.1 Participants and Procedure

This secondary data analysis is based on data collected in one Midwestern high school in Fall 2014. The parent study was aimed at developing school curricula to improve positive

future orientation and decrease substance use. All students were invited to complete a paper-and-pencil survey administered by trained school staff during students' homeroom class. Electronically mailed letters with information about the study were sent to parents by the PI and School Principal. Parents were instructed to contact the PI or School Principal to exclude their student; student assent was obtained prior to survey administration. The study was reviewed by the University of Michigan Institutional Review Board and received exemption (Exemption number: HUM00090000).

Approximately 86% of 9th through 12th grade students participated in the survey ($n = 408$, $M_{age} = 15.36$, $SD = 1.21$; 50% female; 72% White). Nonparticipation was due to lack of parental consent or student assent, or school absence at the time of survey administration. Students were given instructions on how to develop a personal identification code for the survey to maintain anonymity. The survey was completed by most students in approximately 33 minutes.

For the present analysis, we excluded students who did not respond to all measures of interest. Table 1 shows the sample demographics for both the stimulant and analgesic models ($n = 250$). Participants that were included and participants that were excluded from analyses did not significantly differ according to gender, grade, ethnicity, or parent education.

2.2 Measures

Nonmedical use of prescription drugs—Nonmedical use of stimulants and analgesics was assessed using modified items from the Monitoring the Future survey (Bachman, Johnston, & O'Malley, 2014). *Lifetime nonmedical use of stimulants* was assessed with a single item: "In your lifetime, on how many occasions (if any) have you taken a prescription drug to stay awake/alert without a doctor's prescription (i.e., a stimulant)?" *Lifetime nonmedical use of analgesics* was also assessed with a single item: "In your lifetime, on how many occasions (if any) have you taken prescription painkillers without a doctor's prescription?" Response options ranged from 0 to 40+ occasions. Each item was dichotomized as 0 (*Never*) or 1 (*1 or more occasions*).

Future orientation—We assessed three conceptualizations of future orientation. *Future planning* was assessed with five items adapted from the Zimbardo Time Perspective Inventory (e.g., "I finish work that is due tomorrow before playing today"; Zimbardo & Boyd, 1999; Kruger et al., 2015). Responses ranged from 1 (*Agree a lot*) to 4 (*Disagree a lot*). Scores were averaged and reverse scored so that higher scores indicated higher future planning ($\alpha = 0.72$).

Perceived risk to future goals was assessed using two items (Arthur, Hawkins, Pollard, Catalano, & Baglioni, 2002; Michigan Department of Education [MDE], 2014). Participants were asked how much they think people risk not accomplishing their future goals if they: "Take a prescription drug to stay awake/alert (i.e., a stimulant not prescribed to them)" and "Take pain medication not prescribed to them." Response options ranged from 1 (*No risk*) to 4 (*Great risk*). Higher scores indicated greater perceived risk. Each item was matched to its corresponding outcome variable.

Positive future expectations were assessed with six items (e.g., “I will be able to handle the problems that come up in my life”; Wyman, Cowen, Work, & Kerley, 1993). Responses ranged from 1 (*Agree a lot*) to 4 (*Disagree a lot*). Scores were averaged and reversed scored so that higher scores indicated higher positive future expectations ($\alpha = 0.82$).

Alcohol or marijuana use—*Lifetime use of alcohol or marijuana* was assessed with three items: “In your lifetime, on how many occasions (if any) have you: 1) had at least one drink of alcohol (more than just a few sips)? 2) had five or more drinks of alcohol in a row, that is, within a couple hours? and 3) used marijuana?” Response options ranged from 0 to 40+ *occasions*. Each item was dichotomized as 0 (*Never*) or 1 (*1 or more occasions*). The three dichotomous items were then combined, such that an affirmative response to any of the three items was coded as the presence of lifetime use of alcohol or marijuana (0 = *No lifetime use of alcohol or marijuana*; 1 = *Lifetime use of alcohol or marijuana*) for analysis.

Demographic variables—Participants were asked to indicate their age, gender, grade, and ethnicity. Participants were also asked about each parent: “How far did your [mom or dad] or the person that is like a [mom or dad] to you get in school?” The highest level of education reported across parents was used in analyses. If information was not available on both parents, the available parent’s educational information was used.

2.3 Data Analysis

Data were analyzed using SAS 9.4® (Cary, NC). Bivariate relationships between outcome and demographic variables were assessed with χ^2 tests of association. Logistic regression was used to assess the relationship between future orientation and lifetime nonmedical use of stimulants, and future orientation and lifetime nonmedical use of analgesics. We first examined unadjusted models for each outcome. Unadjusted models were also used to evaluate multicollinearity of the three independent variables. The variance inflation factor of each independent variable was examined and no evidence of multicollinearity was found. We then examined two adjusted models that included the three future orientation variables and four demographic variables predicting 1) lifetime nonmedical use of stimulants and 2) lifetime nonmedical use of analgesics. Finally, follow-up analyses were performed in which we examined the same models in a sample restricted to students who endorsed lifetime use of alcohol or marijuana.

3. Results

3.1 Descriptive Statistics

Table 1 shows the association between lifetime nonmedical use of stimulants and analgesics and each demographic variable.

3.2 Stimulants

Twenty-four participants (9.6%) reported nonmedical use of stimulants in their lifetime. As seen in Table 2, both higher perceived risk to future goals (OR = 0.46; 95% CI: 0.26, 0.83) and higher positive future expectations (OR = 0.15; 95% CI: 0.05, 0.47) were associated with a lower likelihood of nonmedical use of stimulants.

3.3 Analgesics

Twenty-six participants (10.4%) reported nonmedical use of analgesics in their lifetime. As seen in Table 2, higher perceived risk to future goals ($OR = 0.40$; 95% CI: 0.24, 0.68) was associated with a lower likelihood of nonmedical use of analgesics.

3.4 Follow-up Analysis

In our sample, 95.8% ($n=23$) of adolescents who endorsed lifetime nonmedical use of stimulants and 96.2% ($n=25$) of those who endorsed lifetime nonmedical use of analgesics reported also having used alcohol or marijuana in their lifetime ($p<0.0001$; Table 1). Additionally, when regression models were limited to students who endorsed alcohol or marijuana use ($n = 141$), perceived risk to future goals remained associated with a lower likelihood of nonmedical use of stimulants ($OR=0.41$; 95% CI: 0.21, 0.78; Appendix) and nonmedical use of analgesics ($OR=0.37$; 95% CI: 0.20, 0.67; Appendix).

4. Discussion

The present study suggests that, in general, higher levels of future orientation were associated with a lower likelihood of NMUPD, yet these relationships depend on the conceptualization of future orientation and the class of prescription drug examined. Specifically, perceived risk to future goals was associated with a lower likelihood of both nonmedical use of stimulants and analgesics. This indicates that risk perception might be particularly important in focusing adolescents' attention on specific behavior that impedes goal attainment. Past research suggests that recognizing negative consequences might be especially helpful in reducing problem behavior during adolescence (Reynolds et al., 2015). Furthermore, previous research suggests that adolescents can, indeed, recognize behavior as risky (Beyth-Marom, Austin, Fischhoff, Palmgren, & Jacobs-Quadrel, 1993). Thus, educating adolescents about risk and the consequences of their actions might be a fruitful avenue for prevention. Brief motivational interventions have shown promise for reducing alcohol and tobacco use among adolescents (Patnode, O'Connor, Rowland, et al., 2014). These interventions often incorporate the discussion of consequences of substance use (Cunningham et al., 2015). Therefore, applying these interventions to NMUPD prevention may be beneficial.

Interestingly, higher positive future expectations were associated with lower nonmedical use of stimulants, but not nonmedical use of analgesics. While this relationship was unexpected, it highlights the possible difference between stimulant and analgesic users. For individuals high in positive future expectations, who are ultimately optimistic about their future, stimulants might be viewed as unnecessary. Stimulant use, although often motivated by a desire to achieve high academic grades (Garnier-Dykstra et al., 2012), has been shown to be more likely in participants with low self-efficacy about their academic abilities (Looby, Beyer, & Zimmerman, 2015).

Finally, future planning was not associated with the nonmedical use of stimulants or analgesics. Although future planning can help focus attention on positive behavior and motivate future-oriented action, this might correlate poorly with negative behavior. Previous

research suggests that adolescents are less likely than adults to simultaneously consider the risks, benefits, and options of a scenario (Halpern-Felsher & Cauffman, 2001). Thus, perceptions of risk and reward might not coalesce into overarching purposeful behavior until later in life. Instead, as indicated above, focusing specifically on perceiving the risks associated with behavior may be particularly important for preventing NMUPD, rather than simply encouraging future-oriented goal-setting broadly.

It is noteworthy that nearly all of the adolescents who endorsed lifetime nonmedical use of stimulants and lifetime nonmedical use of analgesics reported also having used alcohol or marijuana in their lifetime. These results demonstrate the pervasiveness of polysubstance use (McCabe et al., 2005; McCabe et al., 2015) and the difficulty of examining a single form of substance use. Interestingly, results of the follow-up analysis suggest that perceived risk to future goals remained associated with a lower likelihood of nonmedical use of stimulants and nonmedical use of analgesics when the sample was restricted to only individuals reporting lifetime use of alcohol or marijuana. It appears that perceived risk to future goals related to stimulant and analgesic use specifically remains an important deterrent for use. Thus, even when the use of other substances is not perceived as risky or might even be appealing, recognizing why one should not engage in use of a different substance can be important for prevention. Indeed, perceived risk to future goals associated with the nonmedical use of stimulants and analgesics was only moderately correlated with the perceived risk to future goals associated with occasional alcohol and marijuana use ($r = .32$ to $r = .40$). Therefore, though perceptions of risk related to different substances are associated, they are not synonymous. This suggests that future intervention work should carefully address specific risks associated with the use of different substances. Future research should continue to explore common factors between various types of substances and consider approaches that might be effective for polysubstance use.

4.1 Limitations

The sample included students from a single high school. Only 5% of the student population was considered economically disadvantaged (MDE, 2015) and most had highly-educated parents. Therefore, the findings are not generalizable to all youth and should be explored in more diverse samples. The cross-sectional design of the study precludes making statements about causality. Additionally, our outcome measures present limitations. First, the scope of our self-report measure does not allow us to differentiate between use and abuse or determine the impact that the substance use or abuse had on an adolescent's functioning. Although the items assess the use of a prescription drug not prescribed to the adolescent, we are unable to ascertain if it was provided by a trusted individual in the adolescent's life, such as a parent or friend (Schepis & Krishnan-Sarin, 2009). We are also unable to determine the motive for NMUPD use (McCabe et al., 2009); an adolescent who uses a non-prescribed analgesic provided by a parent for pain might exhibit different characteristics compared to one who purchases it from a friend and uses it for sensation-seeking motives. Future research should explore these factors in relation to future orientation. Additionally, NMUPD and lifetime use of alcohol or marijuana were self-reported, which might be influenced by recall or social desirability bias. Students were also not provided with examples of

medications that would fall into the specific NMUPD classes (i.e., brand names of medications), which might have influenced their ability to answer the questions accurately.

4.2 Conclusions

Notwithstanding study limitations, our findings suggest that leveraging adolescents' future thinking might be important in preventing NMUPD. Educating adolescents about the risks that specific substances pose to their future goals might be especially effective in curtailing NMUPD. Results of the present study suggest that the relationship between future orientation and NMUPD depends on both the conceptualization of future orientation and the class of prescription drug. Additionally, our work suggests a need to consider intervention strategies effective in the context of polysubstance use.

Acknowledgments

This work was supported by the National Institute on Drug Abuse [grant number 1K01 DA 034765]. The authors wish to thank the students, faculty, and staff who participated in the study. The authors also wish to thank Michelle Silver, MPH for assistance with data collection.

References

- Apostolidis T, Fieulaine N, Soulé F. Future time perspective as predictor of cannabis use: Exploring the role of substance perception among French adolescents. *Addictive behaviors*. 2006; 31(12): 2339–2343. [PubMed: 16626883]
- Arthur MW, Hawkins JD, Pollard JA, Catalano RF, Baglioni AJJ. Measuring risk and protective factors for use, delinquency, and other adolescent problem behaviors the communities that care youth survey. *Evaluation Review*. 2002; 26(6):575–601. [PubMed: 12465571]
- Bachman, JG.; Johnston, LD.; O'Malley, PM. *Monitoring the Future: Questionnaire responses from the nation's high school seniors*, 2012. Ann Arbor, MI: Institute for Social Research; 2014.
- Barnett E, Spruijt-Metz D, Unger JB, Rohrbach LA, Sun P, Sussman S. Bidirectional associations between future time perspective and substance use among continuation high-school students. *Substance use & misuse*. 2013; 48(8):574–580. [PubMed: 23750661]
- Beyth-Marom R, Austin L, Fischhoff B, Palmgren C, Jacobs-Quadrel M. Perceived consequences of risky behaviors: adults and adolescents. *Developmental psychology*. 1993; 29(3):549.
- Cunningham RM, Chermack ST, Ehrlich PF, Carter PM, Booth BM, Blow FC, Walton MA. Alcohol interventions among underage drinkers in the ED: a randomized controlled trial. *Pediatrics*. 2015; 136(4):e783–e793. [PubMed: 26347440]
- Dubow EF, Arnett M, Smith K, Ippolito MF. Predictors of future expectations of inner-city children: A 9-month prospective study. *The Journal of Early Adolescence*. 2001; 21(1):5–28.
- Dunn MS, Kitts C, Lewis S, Goodrow B, Scherzer GD. Effects of youth assets on adolescent alcohol, tobacco, marijuana use, and sexual behavior. *Journal of Alcohol and Drug Education*. 2011; 55(3): 23–40.
- Egan EA, Van Horn ML, Monahan K, Arthur M, Hawkins D. Community-level effects of individual and peer risk and protective factors on adolescent substance use. *Journal of community psychology*. 2011; 39(4):478–498.
- Garnier-Dykstra LM, Caldeira KM, Vincent KB, O'Grady KE, Arria AM. Nonmedical use of prescription stimulants during college: Four-year trends in exposure opportunity, use, motives, and sources. *Journal of American College Health*. 2012; 60(3):226–234. [PubMed: 22420700]
- Halpern-Felsher BL, Cauffman E. Costs and benefits of a decision: Decision-making competence in adolescents and adults. *Journal of Applied Developmental Psychology*. 2001; 22(3):257–273.
- Henson JM, Carey MP, Carey KB, Maisto SA. Associations among health behaviors and time perspective in young adults: Model testing with bootstrapping replication. *Journal of behavioral medicine*. 2006; 29(2):127–137. [PubMed: 16421652]

- Johnson SRL, Blum RW, Cheng TL. Future orientation: A construct with implications for adolescent health and wellbeing. *International journal of adolescent medicine and health*. 2014; 26(4):459–468. [PubMed: 24523304]
- King MD, Jennings J, Fletcher JM. Medical adaptation to academic pressure schooling, stimulant use, and socioeconomic status. *American Sociological Review*. 2014; 79(6):1039–1066.
- Kruger DJ, Carrothers J, Franzen SP, Miller AL, Reischl TM, Stoddard SA, Zimmerman MA. The role of present time perspective in predicting early adolescent violence. *Journal of interpersonal violence*. 2015
- Looby A, Beyer DL, Zimmerman L. Nonmedical prescription stimulant use: Investigating modifiable risk factors. *Addiction Research & Theory*. 2015; 23(2):143–147.
- McCabe SE, Boyd CJ, Cranford JA, Teter CJ. Motives for nonmedical use of prescription opioids among high school seniors in the United States: self-treatment and beyond. *Archives of pediatrics & adolescent medicine*. 2009; 163(8):739–744. [PubMed: 19652106]
- McCabe SE, Boyd CJ, Teter CJ. Illicit use of opioid analgesics by high school seniors. *Journal of substance abuse treatment*. 2005; 28(3):225–230. [PubMed: 15857722]
- McCabe SE, Teter CJ, Boyd CJ. The use, misuse and diversion of prescription stimulants among middle and high school students. *Substance Use & Misuse*. 2004; 39(7):1095–1116. [PubMed: 15387205]
- McCabe SE, West BT, Morales M, Cranford JA, Boyd CJ. Does early onset of non-medical use of prescription drugs predict subsequent prescription drug abuse and dependence? Results from a national study. *Addiction*. 2007; 102(12):1920–1930. [PubMed: 17916222]
- McCabe SE, West BT, Schepis TS, Teter CJ. Simultaneous co-ingestion of prescription stimulants, alcohol and other drugs: a multi-cohort national study of US adolescents. *Human Psychopharmacology: Clinical and Experimental*. 2015; 30(1):42–51. [PubMed: 25370816]
- Mckay MT, Percy A, Cole JC. Consideration of future consequences and alcohol use among Northern Irish adolescents. *Journal of Substance Use*. 2013; 18(5):377–391.
- Michigan Department of Education. MI school data. 2015 Retrieved from <https://www.mischooldata.org/Default.aspx>.
- Michigan Department of Education. Michigan Profile for Healthy Youth. 2014. http://www.michigan.gov/mde/0,1607,7-140-28753_38684_29233_44681---,00.html
- National Institute on Drug Abuse. Drug Facts: High school and youth trends. 2016 Jun. Retrieved from <http://www.drugabuse.gov/publications/drugfacts/high-school-youth-trends>
- Nurmi JE. Development of orientation to the future during early adolescence: a four-year longitudinal study and two cross-sectional comparisons. *International Journal of Psychology*. 1989; 24(1–5): 195–214. [PubMed: 23336772]
- Patnode CD, O'Connor E, Rowland M, Burda BU, Perdue LA, Whitlock EP. Primary care behavioral interventions to prevent or reduce illicit drug use and nonmedical pharmaceutical use in children and adolescents: a systematic evidence review for the US Preventive Services Task Force. *Annals of internal medicine*. 2014; 160(9):612–620. [PubMed: 24615613]
- Piko BF, Kovács E. Do parents and school matter? Protective factors for adolescent substance use. *Addictive behaviors*. 2010; 35(1):53–56. [PubMed: 19720468]
- Reynolds CM, Gradisar M, Kar K, Perry A, Wolfe J, Short MA. Adolescents who perceive fewer consequences of risk-taking choose to switch off games later at night. *Acta paediatrica*. 2015; 104(5):e222–e227. [PubMed: 25603718]
- Schepis TS, Krishnan-Sarin S. Sources of prescriptions for misuse by adolescents: differences in sex, ethnicity, and severity of misuse in a population-based study. *Journal of the American Academy of Child & Adolescent Psychiatry*. 2009; 48(8):828–836. [PubMed: 19564803]
- Seginer, R. Future orientation: Developmental and ecological perspectives. Saklofske, DH.; Zeidner, M., editors. New York, NY: Springer; 2009.
- Strathman A, Gleicher F, Boninger DS, Edwards CS. The consideration of future consequences: Weighing immediate and distant outcomes of behavior. *Journal of personality and social psychology*. 1994; 66(4):742.

- Veliz P, Boyd C, McCabe SE. Adolescent athletic participation and nonmedical Adderall use: an exploratory analysis of a performance-enhancing drug. *Journal of studies on alcohol and drugs*. 2013; 74(5):714–719. [PubMed: 23948530]
- Virgili M, Owen N, Severson HH. Adolescents' smoking behavior and risk perceptions. *Journal of substance abuse*. 1991; 3(3):315–324. [PubMed: 1821288]
- Wyman PA, Cowen EL, Work WC, Kerley JH. The role of children's future expectations in self-system functioning and adjustment to life stress: A prospective study of urban at-risk children. *Development and Psychopathology*. 1993; 5(04):649–661.
- Zimbardo PG, Boyd JN. Putting time in perspective: A valid, reliable individual-differences metric. *Journal of personality and social psychology*. 1999; 77(6):1271.

Appendix

Logistic regression models predicting lifetime nonmedical use of stimulants and analgesics among adolescents who reported lifetime use of alcohol or marijuana.

	Stimulants				Analgesics			
	Unadjusted Estimates ^a		Adjusted Estimates ^b		Unadjusted Estimates ^a		Adjusted Estimates ^b	
	<i>B</i> (S.E.)	<i>Odds ratio</i> (95% CI)	<i>B</i> (S.E.)	<i>Odds ratio</i> (95% CI)	<i>B</i> (S.E.)	<i>Odds ratio</i> (95% CI)	<i>B</i> (S.E.)	<i>Odds ratio</i> (95% CI)
<i>Future Planning</i>	0.12 (0.54)	1.13 (0.39, 3.26)	−0.37 (0.62)	0.69 (0.20, 2.34)	0.30 (0.52)	1.35 (0.49, 3.74)	−0.11 (0.59)	0.90 (0.28, 2.83)
<i>Perceived Risk to Future Goals</i>	−0.80 (0.30)	0.45 (0.25, 0.80)	−0.90 (0.33)	0.41 (0.21, 0.78)	−0.82 (0.27)	0.44 (0.26, 0.74)	−1.01 (0.31)	0.37 (0.20, 0.67)
<i>Positive Future Expectations</i>	−1.41 (0.57)	0.24 (0.08, 0.75)	−1.19 (0.66)	0.31 (0.08, 1.12)	0.07 (0.57)	1.07 (0.35, 3.25)	0.51 (0.65)	1.66 (0.47, 5.94)
<i>Gender</i>	--	--	1.88 (0.71)	6.54 (1.64, 26.07)	--	--	1.72 (0.63)	5.61 (1.63, 19.26)
<i>Ethnicity</i>	--	--	−0.17 (0.74)	0.84 (0.20, 3.62)	--	--	0.30 (0.57)	1.35 (0.44, 4.15)
<i>Grade</i>								
<i>10th</i>	--	--	0.12 (1.09)	1.13 (0.13, 9.52)	--	--	−0.16 (0.84)	0.86 (0.17, 4.45)
<i>11th</i>	--	--	1.54 (0.93)	4.66 (0.76, 28.65)	--	--	−0.39 (0.81)	0.68 (0.14, 3.33)
<i>12th</i>	--	--	1.38 (0.98)	3.96 (0.58, 27.03)	--	--	0.12 (0.81)	1.13 (0.23, 5.58)
<i>Parent education</i>	--	--	−0.24 (0.61)	0.78 (0.24, 2.58)	--	--	−1.67 (0.53)	0.19 (0.07, 0.54)

^aN = 141. Results significant at the 0.05 significance level are indicated in bold.

^bN = 141. Adjusted for participants' gender, ethnicity, grade level, and parents' highest level of education. Results significant at the 0.05 significance level are indicated in bold. Reference groups are 'Male' for gender variable, 'White' for the ethnicity variable, '9th' for the grade variable, and '4 year college or less' for parent education variable.

Highlights

- Future orientation might play a role in adolescents' NMUPD
- Perceived risk to future goals was associated with a lower likelihood of NMUPD
- Education about the risks of NMUPD shows potential for future intervention work

Table 1

Sample characteristics and differences between adolescents who did and did not endorse lifetime nonmedical use of prescription stimulants or analgesics.

	Stimulants		Analgesics		χ^2
	Full Sample (N = 250) % (n) ^a	Use (N = 24) % (n) ^b	Full Sample (N = 250) % (n) ^a	Use (N = 26) % (n) ^b	
<i>Gender</i>					6.3[*]
Male	46.4 (116)	3.5 (4)	46.4 (116)	5.2 (6)	
Female	53.6 (134)	14.9 (20)	53.6 (134)	14.9 (20)	
<i>Ethnicity</i>					0.83
White	76.4 (191)	11.0 (21)	76.4 (191)	9.4 (18)	
Non-white	23.6 (59)	5.1 (3)	23.6 (59)	13.6 (8)	
<i>Grade</i>					0.98
9 th	25.2 (63)	4.8 (3)	25.2 (63)	7.9 (5)	
10 th	25.2 (63)	4.8 (3)	25.2 (63)	9.5 (6)	
11 th	24.4 (61)	18.0 (11)	24.4 (61)	13.1 (8)	
12 th	25.2 (63)	11.1 (7)	25.2 (63)	11.1 (7)	
<i>Parent education</i>					0.04
College or less	35.2 (88)	9.1 (8)	35.2 (88)	18.2 (16)	8.8^{**}
Graduate or professional	64.8 (162)	9.9 (16)	64.8 (162)	6.2 (10)	
<i>Lifetime use of alcohol or marijuana</i>	56.6 (141)	16.3 (23)	56.6 (141)	17.7 (25)	18.5^{***}

^a Percentages are calculated within column.

^b Percentages are calculated within row.

^c N = 249

^{*} $p < .05$.

^{**} $p < .01$.

^{***} $p < .001$. Note. Significant omnibus χ^2 tests are boldfaced.

Table 2

Logistic regression models predicting lifetime nonmedical use of stimulants and analgesics.

	Stimulants			Analgesics		
	Unadjusted Estimates ^a	B (S.E.)	Adjusted Estimates ^b	Unadjusted Estimates ^a	B (S.E.)	Adjusted Estimates ^b
		Odds ratio (95% CI)			Odds ratio (95% CI)	
<i>Future Planning</i>	0.20 (0.50)	1.22 (0.46, 3.22)	-0.07 (0.56)	0.93 (0.31, 2.78)	0.13 (0.46, 2.79)	1.14 (0.46, 2.65)
<i>Perceived Risk to Future Goals</i>	-0.73 (0.27)	0.48 (0.28, 0.82)	-0.78 (0.30)	0.46 (0.26, 0.83)	-0.70 (0.23, 0.79)	0.50 (0.32, 0.79)
<i>Positive Future Expectations</i>	-1.96 (0.52)	0.14 (0.05, 0.39)	-1.91 (0.58)	0.15 (0.05, 0.47)	-0.37 (0.49, 1.80)	0.69 (0.27, 1.80)
<i>Gender</i>	--	--	1.65 (0.63)	5.22 (1.52, 17.92)	--	1.41 (0.54, 11.91)
<i>Ethnicity</i>	--	--	0.25 (0.73)	1.29 (0.31, 5.41)	--	0.74 (0.27, 5.76)
<i>Grade</i>						
<i>10th</i>	--	--	-0.01 (0.94)	0.99 (0.16, 6.28)	--	0.49 (0.41, 6.59)
<i>11th</i>	--	--	1.55 (0.76)	4.69 (1.06, 20.78)	--	0.55 (0.47, 6.37)
<i>12th</i>	--	--	1.03 (0.80)	2.81 (0.58, 13.53)	--	0.72 (0.55, 7.77)
<i>Parent education</i>	--	--	0.13 (0.54)	1.14 (0.40, 3.26)	--	-1.27 (0.11, 0.69)

^aN = 250. Results significant at the 0.05 significance level are indicated in bold.^bN = 250. Adjusted for participants' gender, ethnicity, grade level, and parents' highest level of education. Results significant at the 0.05 significance level are indicated in bold. Reference groups are 'Male' for gender variable, 'White' for the ethnicity variable, '9th' for the grade variable, and '4 year college or less' for parent education variable.