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Do college students improve their grades by using prescription stimulants nonmedically?

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HIGHLIGHTS

- A prospective, within-subjects design studied 898 college students without ADHD.
- Nonmedical use of prescription stimulants (NPS) was not associated with GPA increase.
- Students who abstained from NPS had significant improvement in GPA.
- The research questions the academic benefit of NPS for students without ADHD.

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ABSTRACT

Introduction: Many college students engage in nonmedical use of prescription stimulants (NPS) because they believe it provides academic benefits, but studies are lacking to support or refute this belief.
Methods: Using a longitudinal design, 898 undergraduates who did not have an ADHD diagnosis were studied. Year 3 GPA (from college records) of four groups was compared: Abstainers (did not engage in NPS either year; 68.8%); Initiators (NPS in Year 3 but not Year 2; 8.7%); Desisters (NPS in Year 2 but not Year 3; 5.8%); and Persisters (NPS in both years; 16.7%). Generalized estimating equations regression was used to estimate the association between NPS and change in GPA, controlling for sex and Year 2 GPA.
Results: GPA increased significantly within Abstainers ($p < 0.05$), but did not change significantly within the other groups. Overall, the relationship between NPS pattern group and change in GPA was not statistically significant ($p = 0.081$). NPS was generally infrequent, but Persisters used more frequently than Desisters (11.7 versus 3.4 days in Year 2) and Initiators (13.6 versus 4.0 days in Year 3, both $ps < 0.001$), controlling for sex and Year 2 GPA.
Conclusions: We cannot rule out the possibility that NPS prevented declines in GPA, but we can conclude that students who engaged in NPS showed no increases in their GPAs and gained no detectable advantages over their peers. The results suggest that prevention and intervention strategies should emphasize that the promise of academic benefits from NPS is likely illusory.

1. Introduction

Prescription stimulants such as Adderall® or Ritalin® are beneficial for the treatment of Attention-deficit/hyperactivity disorder (ADHD; Chavez et al., 2009; Faraone, Biederman, Spencer, and Aleardi, 2006; Pliszka, 2005; Wilens, 2006). Clinical trials of such drugs utilizing samples of adolescents with ADHD have demonstrated improvements in attention and decreased hyperactivity symptoms (Bostic et al., 2000; Chan, Fogler, and Hammerness, 2016; Wilens et al., 2006). Even better

Abbreviations: NPS, nonmedical use of prescription stimulants; GPA, grade point average.

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results have been obtained from combining pharmacologic therapies with behavioral strategies to improve classroom behavior and schoolwork completion (Fabiano et al., 2007).

Nonmedical use of prescription stimulants (NPS) occurs when these medications are taken without having a prescription or in a way that is inconsistent with a physician's orders. NPS has been the topic of a wide variety of studies in recent years, although NPS by college students was documented as early as 1937 (Rasmussen, 2006). The prevalence of NPS varies by age, with the highest estimates of use reported for college students (Substance Abuse and Mental Health Services Administration, 2015; Wilens et al., 2008). National data from 2015 estimate that 10.7% of college students used Adderall® nonmedically during the past year (Miech, Johnston, O'Malley, Bachman, and Schulenberg, 2016). Prevalence estimates of lifetime NPS vary widely from 5.3% to 33.8% across studies of college students (DeSantis, Webb, and Noar, 2008; DuPont, Coleman, Bucher, and Wilford, 2008; Weyandt et al., 2013), owing in part to the characteristics of the schools studied, the demographic composition of the samples, and the methods used to assess nonmedical use.

One finding that is highly consistent across all studies of college students is that the primary motive for NPS is to improve academic performance. Students report that NPS is driven by study motives, such as increasing the ability to concentrate while studying or by increasing the amount of time they can sustain focus (DuPont et al., 2008; Garnier-Dykstra, Caldeira, Vincent, O'Grady, and Arria, 2012; Rabiner et al., 2009; Teter, McCabe, Cranford, Boyd, and Guthrie, 2005; Teter, McCabe, LaGrange, Cranford, and Boyd, 2006). Whether or not these purported changes in attention and focus while studying results in better performance on tests has not been examined in real-world settings.

The belief that these drugs can improve cognitive skills among individuals without ADHD is widespread among college students and has been in large part perpetuated by extensive attention in the popular media on neuroenhancement, calling the drugs “smart drugs,” “smart pills,” or “brain steroids” (Forlini and Racine, 2009; Partridge, Bell, Lucke, Yeates, and Hall, 2011). Several recent reviews of the literature have called into question cognitive performance benefits of these drugs for non-ADHD individuals (Advokat, 2010; Hall and Lucke, 2010; Repantis, Schlattmann, Laisney, and Heuser, 2010). Experimental studies have shown little benefit of these drugs over placebo among those without an ADHD diagnosis (Advokat, 2010; Chamberlain et al., 2011; Ilieva, Boland, and Farah, 2013; Volkow et al., 2008). For example, Volkow et al. (2008) tested the hypothesis that stimulant medication (methylphenidate) reduces cerebral activity by increasing efficiency utilizing a balanced placebo design. The results suggest that when neuronal resources are optimally distributed, stimulants might actually result in deterioration in performance.

In addition to experimental studies that have cast doubt on the benefits of NPS, several cross-sectional studies have observed that college students who engage in NPS have lower grade point averages (GPA), skip more classes, and have higher levels of other drug use and excessive drinking than non-users (Arria, O'Grady, Caldeira, Vincent, and Wish, 2008b; McCabe, Knight, Teter, and Wechsler, 2005; Rabiner et al., 2009; Teter, McCabe, Boyd, and Guthrie, 2003). Longitudinal research has demonstrated that marijuana and alcohol use are related to increases in skipping class and decreases in GPA (Arria et al., 2008b; Rabiner et al., 2009), and that NPS appears to be a compensatory “last ditch” attempt to improve grades among individuals who are experiencing such declines in academic performance (Arria et al., 2013b).

Although research has shown that students who engage in NPS have lower grades than non-users, the question that remains is whether or not they are, in fact, obtaining better grades than they would have if they did not engage in NPS. Farah, Smith, Ilieva, and Hamilton (2014) emphasize the lack of data from real-world investigations that examine the relationship between NPS and purported enhanced cognitive performance.

The purpose of this study was to examine prospectively the possible association between NPS and GPA. Our approach was to examine longitudinal changes in college GPA using a within-subjects design. Two consecutive years of data were used. We sought to test two hypotheses: (1) that students might increase their GPA after starting NPS (Initiators), relative to their counterparts who abstain from NPS (Abstainers), and (2) that students might experience a drop in GPA after stopping NPS (Desisters), relative to their counterparts who continue NPS (Persisters). Based on prior research, our prediction was that no improvements in GPA would be observed among Initiators and that no declines in GPA would be observed among Desisters. Because stimulant medications are thought to affect individuals differentially depending on whether or not they have ADHD (Chamberlain et al., 2011), we elected to focus our analyses on the subset of students who had never been diagnosed with ADHD.

2. Methods

2.1. Study design

The study uses data from the second and third annual assessments of the College Life Study, a longitudinal prospective study that began assessing a cohort of 1253 individuals in 2004 during their first year of college at one large public university (Arria et al., 2008a; Vincent et al., 2012). Individuals who had used an illicit drug or nonmedically used a prescription drug at least once during high school were oversampled based on their responses to a pre-college survey ($n = 3401$, 89% response rate), in order to ensure adequate statistical power for analyses of drug use during college. Eligibility was restricted to first-time, first-year students 17 to 19 years of age at college entry. Each annual assessment consisted of a two-hour interview and self-administered questionnaires measuring substance use and other health-related constructs. The response rate at baseline was 87% ($n = 1253$), and high follow-up rates were achieved in both Years 2 (91%; $n = 1142$) and 3 (88%; $n = 1101$). Participants were paid for each assessment. Informed consent was obtained for the study and specifically to collect GPA from school records rather than self-report. All study procedures were approved by the university's IRB, and participants received further protections under a federal Certificate of Confidentiality.

2.2. Participants

The analysis sample was first restricted to the 975 individuals who were still enrolled at the home university by Year 3 and had valid data on GPA from both years. The 77 individuals who had been diagnosed with ADHD by their Year 3 assessment were excluded, leaving a final sample size of 898. The inclusion sample was not significantly different from the rest of the overall sample ($n = 1253$) with respect to race or parental education, but was slightly under-representative of men (46% vs. 54%, $p = 0.01$).

2.3. Measures

2.3.1. GPA change

For each semester (i.e., fall, spring), the number of credit hours and GPA were obtained from the registrar's office, as allowed by participants' informed consent. For each individual, annual GPA was then computed by averaging the two semester GPA values, after weighting them for the number of credit hours. GPA values of zero were treated as missing because they were indistinguishable from placeholders that were automatically assigned to students whose grades were incomplete or were studying abroad. In cases where only one valid semester GPA (i.e., non-zero value) was available for a given year, the non-missing value was used as the annual GPA; this affected 22 individuals in Year 2 and 138 in Year 3, corresponding to the typical timing of study abroad experiences. Finally, GPA change scores were computed as the