

PLOS Science Wednesday: Hi Reddit, we're Shashwath and Godfrey and we assessed how the use of alcohol and marijuana impacted college student's academic performance over the long-term – Ask Us Anything!

PLOSScienceWednesday¹ and r/Science AMAs¹

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Hi Shashwath, thanks for doing this AMA it's a great topic.

So the elephant in the room for any of these sorts of longitudinal studies is 3rd variables. For instance, it's quite easy to make an argument that there could be personality or emotional or experiential differences that make someone more likely to consume alcohol and marijuana but also likely to decline in achievement. Do you think this is indeed a causal relationship whereby the combination of alcohol and weed is affecting cognitive ability?

[ImNotJesus](#)

Author SM: Hello - Thanks for the question. What you say is absolutely possible, however as we explicitly indicate in our paper, the analysis that we did just wasn't geared towards examining any causality. We tried to somewhat alleviate effects of intermediate variables by controlling for baseline measured personality and emotional traits. However to properly investigate what you allude to requires a causal modelling analysis such as SEM etc. We plan on doing this in the near future at least on the baseline variables to see what the data shows us. Again this is just the tip of the iceberg, much more to come in the future years!

While reading the paper I came across the longitudinally acquired data section. Why are there different data models for alcohol and MJ consumption Example - In alcohol consumption the researchers only asked the days and the quantity of alcohol consumed. Whereas while taking the MJ data they clearly specified the upper and lower bounds of the scales, moreover the quantity of MJ consumed was not asked.

Why take different data models (discrete for alcohol and scale for MJ) for this prediction ?

[Phosphobomb12](#)

Author GP: While it's easy to estimate quantity/frequency for alcohol because there are standard quantity units; with marijuana people buy different strengths of cannabis from different sources and inhale different hard-to-estimate amounts, in part because people share joints of different

sizes/bongs/vaporizer bags so that there is no "standard marijuana unit" that's equivalent to a standard alcoholic drink.

Why do you think the use of - weed high alcohol low/no - was basically none existent?

The legality of the substance? If you ran this test again in 6 years, would you expect a much higher use of - weed high alcohol low/no?

[TheIncompetenceOfMan](#)

Author GP: Connecticut is currently debating legalization of recreational cannabis, so we may have a chance to examine that as you say.

Why do you think the use of - weed high alcohol low/no - was basically none existent?

The legality of the substance? If you ran this test again in 6 years, would you expect a much higher use of - weed high alcohol low/no?

[TheIncompetenceOfMan](#)

Author SM: Possible given the recent changes with MJ regulations. However what i can say that our data was consistent with data that was captured and reported almost 15 years ago. Please see my above comment for the reference.

Does the study control for time spent studying?

Additionally, what do you predict the results would be if this study were performed with a population of solely minors; or even High School seniors?

[financiator](#)

Study author GP. It's hard to obtain accurate estimates of how much time students are actually spending studying outside of class. Even if you know the actual amount of time, it's hard to correct for the amount of "study time" actually spent on social media, spacing out or playing solitaire..

Does the study control for time spent studying?

Additionally, what do you predict the results would be if this study were performed with a population of solely minors; or even High School seniors?

[financiator](#)

Author SM: Unfortunately no, but i do 100% agree, this would have been a very interesting variable to capture and perhaps control for. In terms of this study being done in high school seniors, i wouldnt be very surprised if we saw a similar outcome as to what we see here.

There was a recent report that showed both alcohol and MJ were associated with greater academic delinquencies and unpreparedness in middle-high school students

<http://onlinelibrary.wiley.com/doi/10.1111/add.13442/abstract>

Do regular drinking and occasional heavy binge drinking have different effects on long term performance and cognitive ability?

Do you believe Marijuana users over estimate it's benefits?

Thank you very much.

[KING-UL](#)

Author SM: I dont think this has been directly examined in humans but there have been animal studies that point to heavy binging being more detrimental to cognitive function compared to consistent regular drinking.

Did you find any differences between the different courses of studies of the students and their academic performance? It's often supposed that especially Marijuana increases creativity which could lead to better performance in subjects such as art, philosophy, literature. Thank you for this AMA on a really important and interesting topic!

[Euriclea](#)

Author GP: useful question –we made an attempt to look at this, as well as the inherent difficulty of particular courses, and found it extremely difficult to come up with any standard measures for these.

Did you find any differences between the different courses of studies of the students and their academic performance? It's often supposed that especially Marijuana increases creativity which could lead to better performance in subjects such as art, philosophy, literature. Thank you for this AMA on a really important and interesting topic!

[Euriclea](#)

Author SM: No we did not but that would be an interesting thing to look at given that we already might have access that information.

Hi all, thanks for the AMA!

Is there's a casual relationship between substance use and GPA, what would you suggest is the mechanism?

[superhelical](#)

Author SM: there might be a variety of variables to consider that moderate causality, many of which have been discussed above. given that alcohol and marijuana have a direct impact on brain function and structure, we are working on methods to show direct moderating effects of brain physiology that mediates substance use and GPA.

Is there any plan to do a post university follow up? Academics aren't the only thing learned in college. I'd be far more interested in long term success then something as narrow and short term as gpa.

I was a nerdy, social anxious friendless 18 year old who went to what was basically a party school (Galway in Ireland). I joined sports clubs and socialised heavily, pretty much always with alcohol. My gpa was good but would certainly have been higher with less socialisation and more study.

On the other hand in the real world the intensive socialising developed my basic ability to make small talk, ask questions and hold a conversation. I use those skills every day with clients and colleagues. They make me a thousand times stronger in a job interview and have helped my career way more than the academics.

[disagreeabledinosaur](#)

Author GP: Good point. Most students "mature out" of heavy substance use by the time they leave college; those who don't tend to be more likely to have later substance use problems. We weren't funded to do a follow-up study, although we would love to do so, and it's remarkably hard to keep in touch with a large representative subsample of participants besides.

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[disagreeabledinosaur](#)

Author GP: if you can find us funding, we would be more than happy to try to do that..

Have you come across any connections to heavy marijuana use and psychosis/mental illness?

[SluttyMcCum dumpster](#)

Author GP: Not in our study sample. The base rate of schizophrenia is only 1%, so we're underpowered to detect that in our subjects.

Hello! It is always great to have these opportunities to ask scientists questions, thanks for doing this. My question is whether you think this data shows that the students who consumed either just alcohol or both alcohol and MJ did worse due to working while under the influence, or if they most likely did not do as well because they would postpone work until sober, i.e. procrastination. I myself am a college student but not a drinker or smoker so I don't know which is more common.

[TheInfinities](#)

Author GP: important question – I don't think students willfully take tests/exams when acutely intoxicated, but there will certainly be residual effects (hangovers, cognitive fuzziness) that last a variable amount of time depending on use patterns

Has your study looked at the differences within age of onset? For example, a student who begins smoking MJ or using alcohol at 18 may conceivably have more negatively averse effects on academic performance than someone who starts at 21 or 22 (or 25 for that matter given that white matter does

not fully develop until our mid 20's). I realize dealing with college students puts you at a disadvantage of assessing >22 year olds in general, but just curious if you saw differences within your own data set dependent on age of onset of consumption.

[knowledge1010](#)

author GP: this is an important question,, but virtually everybody in our study was age 18 when we began enrolling them, so no way to answer that in our sample

Can you go through your selection process of these Freshman for your study? Also do you have the survey that the students took? Finally how did you manage to make all the students respond accurately and promptly with your study?

[SgtTornak](#)

Author GP: we leafleted campus and made announcements and classes, and succeeded in getting over 95% participation. The survey was thousands of questions in multiple domains, so it's hard to summarize succinctly. We rewarded subjects for participation by paying them small amounts of money, and entered subjects who responded promptly into a monthly raffle for e.g. iPad. When subjects didn't respond they received multiple email reminders.. We also tried to boost subject retention by sending subjects birthday cards and later updates on study data that would not alter their responses.

Hi Shashwath, I'm a 25 year old student that just returned to school after a 4 year break. At 19 I went from having never smoked weed to smoking weed multiple times a day in response to events in my life at the time. Before that I had always been one of the smarter students in class and was an exceptionally good musician; however, six years of near-daily weed use have left me a shell of who I was. School is 1000x harder for me (It used to take zero effort to earn an A in every class) and I haven't been able to write a song I'm proud of in at least 2 years.

Is there anything in your research that suggests someone who used as heavily as I did has any chance of recovering their previous mental facilities or do your findings only apply to less frequent/younger users? I quit smoking a week ago, but I'm scared I might have fried myself already.

[Theroguewombat](#)

Author GP: students who moderated substance use on average saw their GPAs start to climb again, so hang in there

1. How do you control for a variable such as less serious students may be more likely to use and not do well.
2. How do you control for other correlation but not causation variables?
3. Currently reading "thinking fast and slow" and in it it goes over how many trials under estimate the sample. Size required for a test. What is considered significant in your testing?
4. The book also goes over poor psych screening. How dependent is your trial on psych evaluations.

[Morgsz](#)

Author GP: we administered all subjects extremely detailed neurocognitive measures (both paper and pencil and computer-based), as well as personality assessments and measures of impulsivity in multiple domains

How do you account for differences in the quality of weed? I see a lot of people in this trait claim they actually do better academically when smoking weed however, from my personal experience, I can't seem to get anything done when high. And I don't mean that because it gets you lazy but any task requiring a high amount of concentration seems near impossible and I will also make a lot of mistakes. Now I'm not from the U.S. but I'm pretty sure that the weed we have here is way "stronger" than the weed in the U.S. (tried it myself and a lot of friends say the same). So I guess what I'm actually trying to say is, aren't people sometimes severely overestimating the amount of weed they smoke (or rather how high they get) compared to other users?

[Zapsy](#)

Author GP: yes that's an inherent problem with these sorts of self-report studies.. Short of weighing the drug and assaying the amount of THC in each sample there's no way to have a truly valid answer to your question.

Thanks for doing this AMA. I'm curious as to how much of your findings you attribute more to teenagers adjusting to the freedom of college and exposure to these substances (and subsequent overindulgence that is often seen), vs the actual affects of the Alcohol/Cannabis?

[mrtiggles](#)

Author GP: we followed our students over multiple semesters for 24 months, and consumption patterns were generally pretty steady

Who exactly fit into each category? I see that you surveyed the students each month; if a student reported high levels of alcohol and MJ were they classified into that respective group solely for that month or for the entire study?

[jollyjellybeans](#)

Author GP: we summarized use patterns across each separate semester in order to characterize subjects

I was wondering what you were hoping to discover in this study? It would seem logical to assume that anyone who uses a large amount of alcohol and cannabis is going to have a hard time getting the work done. Just feels like you're trying to associate cannabis as a factor for lowering performance. In a collage setting, many of the students are just there to party and cannabis is not the only substance that they are adding to their alcohol consumption. I would love to see a more intelligent approach to these type of studies.

[charklar](#)

Author GP: Well, we might have predicted independent substance effects. But heavy drinking alone had almost no effect on grades

Was any consideration made to depression/anxiety? This seems to be a major cause of poor academic performance and goes hand in hand with drug and alcohol use in alot of people. A student that has

depression/anxiety will generally be affected more negatively by drugs and alcohol than one that doesn't.

[h20melon](#)

Author GP: yes we studied both of those things using anxiety and depression questionnaires and the MINI psychiatric diagnostic interview to address that

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[h20melon](#)

Author GP: yes we had explicit measures of anxiety, depression and overall psychiatric diagnosis

Blending alcohol and cannabis together to prove what we already know? That alcohol negatively impacts performance while high performers in real-life are often heavy cannabis users?

I know your choices were made to get attention and funding.

[mastertheillusion](#)

Author SM: id love to see your source for what you state above.

Your teams research is very interesting! A good read and enlightening to a sensitive subject. The group states, that you found almost no one that consumed no-low alcohol but high amounts of marijuana. Based off of your opinion would you say that high amounts of marijuana and no alcohol would show similar results of a general decline in GPA? Were there select people that exhibited that behavior that you followed up on? Or, was it scrapped due to such a small group? Thank you!

[Chanpete](#)

Author GP:there were too few of these subjects to do a meaningful follow-up on

As someone who soley uses Cannabis (20-25 times daily) I have to worry about how college party culture affects this. The call for the study went out and who answered? A large majority of students head into their freshmen year as their first experience governing themselves. They treat these substances accordingly because that have been denied then all there lives. I personally wouldn't participate in the study for all the aforementioned legal issues.

I'd also like to see some sort of citation tracking, how many school infractions and/or violations of the law occurred on each substance. This would obviously disregard possession of Cannabis laws due to the legality of the substance. I think there are broader social variables affecting who uses what and how they approach academics and participation in studies like these. A high GPA is great, but how likely are you to use that GPA if you wind up like Brock Turner. Which substance is more like to get you a high GPA and keep you out of a jail cell?

[musicpuke](#)

Author GP: we captured over 95% of incoming freshman so this is certainly a representative study. Infractions occur on and off campus and offenders are not routinely tested for alcohol or drugs, so it's hard to answer your second question

Thanks for the AMA! Really too bad you did not have a representation for the MJ and low or no alcohol use, I am a long term user of MJ and a University grad. My question is whether you had any intake questions regarding students mental health at this time? Just thinking that sometimes just the transition socially and academically can be tough on students - so is there a relationship of increased use/decreased academic performance related to their mental health? In personal experience I smoked a lot of weed my first two years for a number of reasons including poor mental health and my grades were baaad but when I got better or better at managing it (still smoking the same amounts) my grades were great. Thank you!

[laniakea11](#)

Author GP: yes, we screened specifically for ADHD, levels of depressive and anxiety symptoms and traits as well as using the MINI brief psychiatric screen

Thanks for the AMA!

I have one doubt about the validity of your study (in regards to the sampled population) and one question!

Firstly, at least where I am from, many more people only use marijuana and don't use alcohol at all. What do you think accounts for the lack of this group in your study?

Secondly, why do you think heavy users of both drugs didn't have a decrease in GPA over semesters? Could it be because they're more knowledgeable of the way their body works with the drug? Or could it be a physiological effect? for example, using marijuana occasionally will increase cortisol levels while you're on it. Using it regularly will decrease cortisol levels while you're on it.

[bicycle](#)

Author GP: we actually address that in the discussion section of the paper. It's possible that users develop tolerance, or that they tried to adapt to cognitive effects of substances by taking easier courses, or that they drop out of college. We think we eliminated the last possibility but not the other two.

Thanks for doing this AMA. I haven't had the chance to look at the full study, but it looks like a straightforward methodology. I was thinking about the use of the fMRI and was wondering if you thought that the different substance uses may trigger different activities in the brain, which could alter behavior?

[AppleGeniusBar](#)

Author GP : we did perform structural and functional MRI on a subsample of our students (450 at baseline) with two-year follow-up, so we are examining that and have a few publications out already

What's the value of a study like this when no causal claims can be made? Also, how do you deal with media outlets running rampant on studies like yours, but being very careless with how they refer to the

relationship between variables? (e.g., "New Yale Study Proves Weed Hurts Your Grades at School")

[metabyt-es](#)

Author GP: obviously it's unethical to choose a random group of subjects and dose some with variable amounts of alcohol and cannabis and others with placebo, but that doesn't mean a study that is not directly measuring cause is not useful. Think about epidemiologic studies showing correlational relationships between cigarette smoking and lung cancer as an example.

My question for you is how did you account for confounding variables (good/bad upbringing, motivation, how busy of a schedule/worker or non-worker) to be able to come to a statistically-significant conclusion?

[whitefox7895](#)

Author GP: the freshman and the different substance use groups started with non-different GPAs.

It seems like you left one major combination out, low alcohol, moderate or high use of cannabis. Can you talk about why that combination is not called out as a distinct subset of the population?

[Valisk](#)

Author GP: If they were there in our population, we would've found them. And yes, it was a surprise to us. I remember lots of people in the 60s and 70s who smoked marijuana and totally disdained alcohol use. As in "I would never use alcohol..... It's a drug".

Do you think consuming alcohol before an assignment or test has the effect of relaxing a student and helping them perform better?

[rocketbosszach](#)

Author GP: if you're anxious at baseline, consumption is related to performance in an inverted U-shaped curve