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Connection Between Cannabis Use and Psychosis and the Direct Vs. Indirect Form of Inquiry to Combat Self-Report Bias

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Connection Between Cannabis Use and Psychosis and the Direct Vs. Indirect Form of Inquiry to Combat Self-Report Bias

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The purpose of this paper is to investigate two problems: one clinical and one methodological. The first is whether there is a connection between drug use, and specifically cannabis use, and psychosis. Previous research on the subject has provided mixed results. Van Os et al. (2002) and Arseneault et al. (2002) both found that cannabis use predicted the onset of psychosis. Van Dam, Earleywine, & DiGiacomo (2008) found that the use of other drugs was a better predictor of psychosis than cannabis alone. The second problem involves how to maximize honesty when people answer questions regarding their own drug use. Self-report bias is a major issue for research investigating sensitive topics. Researchers have tried various methods for combating the problem. In this paper, the method used by John, Acquisti, & Loewenstein (2010) will be applied, for the first time, to a questionnaire asking about participants' drug habits. This kind of research is essential for understanding how drug use affects the brain. Further, it opens up a way for future researchers to obtain honest answers about drug use.

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There were several people who were instrumental in the completion of my thesis.

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Table of Contents

Introduction

The purpose of this paper is to answer two questions: "Is there a connection between cannabis use and psychosis?" and "How do you get people to honestly report on their own drug use?" Cannabis use is a controversial topic that has sparked enormous debate over the years. People have very different opinions on what the drug can do to the mind and body. For decades, researchers have argued about whether there is a link between marijuana use and psychosis, or even between marijuana use and schizophrenia. Results from previous studies on this subject are highly varied and have attempted to answer the question with many different methods. Part of the struggle for researchers is to find a way to obtain truthful answers from participants. People are not usually willing to disclose the extent or variety of their own drug use. The issue of self-report bias makes it difficult to accurately assess studies on sensitive topics because participants may be prone to play down their behavior or lie about it all together. Biased answering especially affects questions about drug use because of the way the "drug culture" has developed and is viewed in the United States. This paper will attempt to find ways to answer these two questions in a more credible, reliable way than what has been done in the past.

Connection Between Cannabis and Psychosis

There is much debate about whether cannabis use can trigger the onset of psychotic symptoms and, potentially, schizophrenia. Some researchers have found that cannabis use can predict the onset of psychosis even without the effects of other drugs (van Os, Bak, Hanssen, Bijl, de Graaf & Verdoux, 2002; Arseneault, Cannon, Poulton, Murray, Caspi, & Moffitt, 2002). Van Os et al., (2002) conducted a longitudinal study investigating self-reported drug use at assessment periods over three years. Participants did not have psychosis at baseline. However,

those who were using drugs at baseline were three times more likely to show psychotic symptoms at the later assessment periods. Lifetime use of cannabis was found to be the best predictor of psychosis even when controlling for the use of other drugs (van Os et al., 2002)

Arseneault et al. (2002) also used self-reported drug use of a sample of people based on use at age 15 and age 18. They found that by age 26, people who used three or more times by age 15 or by age 18, had more psychotic symptoms than the control group, who had used once or not at all at both ages. They, too, found that cannabis use was the best predictor of psychotic symptoms than any of the other drugs they asked about (Arseneault, 2002).

Others have found that, for people who already show a vulnerability to psychosis, cannabis use is a predictor of its onset. Henquet, Krabbendam, Spauwen, Kaplan, Lieb, Wittchen & van Os (2005) interviewed participants and assessed their vulnerability to psychosis and drug use habits based on the Munich version of the Composite International Diagnostic interview at baseline and four years later at follow-up. Those categorized as "exposed to cannabis" were people who had used cannabis five times or more before baseline. Those categorized as "cannabis users" were those who had used five times or more at follow-up. The investigators found that cannabis use increased the risk for developing psychosis in those who were already vulnerable (Henquet et al., 2005).

Another theory suggests a genetic component to the onset of psychosis after using cannabis. Caspi, Moffitt, Cannon, McClay, Murray, Harrington & Taylor (2005) found that a polymorphism on the catechol-O-methyltransferase gene could be involved in the development of psychosis in cannabis users (Caspi et al., 2005).

On the other side of the debate are those who have found that the use of many drugs is a better predictor of the onset of psychosis than cannabis alone. Van Dam, Earleywine &

DiGiacomo (2008) sent a survey to students asking about drug use. Based on their use of marijuana, participants were put into categories. Non-users were people who have never used. Former users were considered those who had used but not in the past year. Monthly users were those who had used at least once a month but less than four times in a month. Weekly users had used four times a month and at least once a week. They also asked questions about alcohol and illicit drugs. Van Dam et al. (2008), measured psychosis in the participants of their study using the Schizotypal Personality Questionnaire (SPQ-B; Raine & Benishay, 1995, as cited in Van Dam et al., 2008). This test assesses present symptoms of schizotypal personality disorder (SPD), which has been linked to schizophrenia. People who are diagnosed with SPD often have very distinct symptoms of psychosis. Furthermore, previous studies have shown that there is an association between responses on this questionnaire and cannabis use. The investigators found that polydrug use was a better predictor of psychosis than cannabis use alone (Van Dam et al., 2008).

Comparatively, the relationship between cannabis use and psychosis is an area of study that has not been well researched. There are only a handful of reliable studies that investigated the possible link and those studies that did came to a variety of different conclusions. Although these studies have gotten closer to understanding the effects of cannabis use on psychosis, they all lack an essential element: they have not yet found a reliable way to ask questions about drug use that maximize truthfulness in the responses they elicit. The studies described above, ask the participants directly about their past and present drug use. Although this is an obvious method, it is not necessarily reliable. People could easily lie and would even be expected to lie if they feared that a breach in confidentiality with their answers would get them into trouble. The closest any study has come to ensuring truthful answers was Fergusson, Horwood & Ridder (2005). In

this study, they asked the participants to nominate an informant who would also report on the participants' drug use. That way, the investigators would be getting answers to their questions from two separate people. Fergusson et al. (2005) found that the informants tended to corroborate the answers of the participants. Therefore, it appeared that the participants were giving truthful answers about their own drug use. After putting participants into groups based on daily, weekly, and monthly use, researchers found that daily cannabis users had psychosis rates that were 2.3 to 3.3 times higher than those who did not use cannabis. Using informants appeared to be a more accurate method of eliciting truthful responses. However, there was still no way to guarantee that the informants were not collaborating with the participants to answer the drug-related questions in the way that the participants wanted them to (Fergusson et al., 2005).

Although many of these studies suggest that cannabis use can trigger the onset of psychosis, these results are somewhat unreliable because of the potential for untruthful answers to the questions about drug use. It is possible that a participant would be more willing to admit to using cannabis in the past but less likely to admit to using psychomotor stimulants, so it would appear that their psychosis may have derived from their use of cannabis, when in reality it is from their use of stimulants. If participants are not willing to answer truthfully, researchers will not be able to get the whole story. Van Dam et al. (2008) found that psychomotor stimulants and ecstasy could, in fact, be better predictors of psychosis than cannabis alone. If people are less willing to report on the use of these drugs, researchers could be losing a vital piece of the puzzle and assume that cannabis alone is responsible for the onset of psychosis. Therefore, it is important to find a way to ask sensitive questions and elicit truthful responses.

Self-Report Bias

      Self-report bias is the tendency for people to portray themselves in a positive light. This does not mean that people necessarily think that they are going to lie in order to make themselves look good, but they may be more willing to leave out certain details or rationalize their behavior to avoid looking like an immoral person. This presents a problem because, for a lot of research, the only way for researchers to find out about specific behaviors is to ask participants directly. For example, to understand the effects of long-term heroin use on the brain, it would be unethical to give participants heroin regularly for 10 years. The only way to research these effects would be to ask participants about their past heroin use. This reliance on self-reports presents a problem, though, because people are rarely willing to divulge information as sensitive as that. White (2004; as cited in John, Acquisti, & Loewenstein, 2010) found that people tend to report sensitive information correctly only if they think they have something to gain from it. If students from a university are coming in to participate in a research experiment as part of their Psychology 101 class, as is the case in the current study, there is no benefit for them to tell the truth. In fact, if they have any fear of a breach in confidentiality, they may be more inclined to lie about sensitive topics. If they are not guaranteed anonymity, they may be less likely to divulge sensitive information (Ong & Weiss, 2000).

      What have researchers in the past done about self-report bias? They have devised several somewhat successful methods to combat this problem. The first is called the randomized-response technique (RRT). Wimbush and Dalton (1997) used this to capture a base estimate of employee theft, an act that no employee would willingly admit to. The idea behind the RRT is that the researcher designs some way to randomize responses to each question. So, for example, Wimbush and Dalton used a coin. They gave the participants a set of questions regarding their

behavior at work, including questions regarding theft from their employers. For each question, the participants were asked to flip the coin. No matter what the coin said, if they had done the act indicated in the question, they put an X in the box. If the coin landed on heads they were told to put an X in the box, regardless of the truth. If the coin landed on tails and they had not done the act, they do not mark the box at all. When flipping a coin, one could expect a rate of about 50 percent landing on heads by chance. So a rate higher than 50 percent would be the percentage of the participants who had stolen from the businesses they worked for. This method proved fairly effective for getting people to answer honestly because there would be no way for the researcher to know whether an individual committed the act or whether his coin had simply landed on heads. When the researchers averaged all the answers together, they were able to determine the general percentage of people who were stealing (Wimbush & Dalton, 1997).

Another method for attaining truthful answers from participants is called the unmatched-count technique (UCT). Wimbush and Dalton (1997) also used this technique in their research on employee theft rate. The UCT is similar to the RRT in that it strives to keep the participants' answers as anonymous as possible. With the UCT, participants are given a number of statements all presented at once. The people are asked to indicate how many of the actions described in the statements they have ever done, but are told NOT to specify which ones. So, if there were 10 statements, the individual might indicate that he had committed 2 of the acts listed but not specify which 2. This way, the researchers would never be able to know which statements were the ones applying to a particular participant and which were not. The technique requires two groups. The control group may, for example, have 10 statements. The experimental group would have 11 statements. The extra statement would be about whether they had ever stolen money from their employers. The researchers would be able to figure out the mean number of yes

statements from the control group and from the experimental group. It makes sense that the control group would have a lower mean than the experimental group because they have one fewer question. The difference between these means would be the percentage of employee theft (Wimbush & Dalton, 1997). The approach holds a lot of promise but requires large samples.

Both the RRT and UCT methods have been successful in obtaining a general percentage of people engaging in a particular behavior. However, they are imprecise. For the RRT, the researchers must assume that the coin did indeed land on heads only 50 percent of the time. Of course, it is possible that the coin landed on heads only 25 percent of the time, or maybe 75 percent of the time. These approaches can prove problematic unless samples are very large. Small groups would skew the results and give the wrong impression of the rate of the behavior. These methods are useful but very general. However, one research team discovered a third method to obtain truthful answers on sensitive topics that results in a much more exact number.

Indirect Inquiry Method

John, Acquisti, & Loewenstein (2010) used the direct versus indirect inquiry method. This measured the difference between questions asked in a straightforward way and questions asked more covertly. They gave students some questions that were relatively intrusive in subject matter and some that were only mildly intrusive. For example, a mildly intrusive question would be, "Have you ever littered?" A relatively intrusive question would be, "Have you ever cheated on your tax return?" The direct inquiry method asked the question bluntly (like the examples given above). The indirect inquiry method, on the other hand, asked in a seemingly off-handed way. In the indirect group, students were asked about the same behaviors asked about in the direct group, but instead of asking bluntly, they were asked to rate the ethicality of the behaviors based on whether they had ever engaged in the behaviors themselves. Thus, it seemed to students

that they were rating how ethical they judged each act to be, but in doing so, they were also indicating whether they had engaged in it. This ethical rating was based on a scale ranging from "not at all unethical" to "extremely unethical." They also provided choices for "it depends" and "nothing to do with ethics." The students read instructions that directed them to rate the ethicality of these behaviors based on whether they had ever engaged in the behavior themselves. So a behavior would be presented at the top. For example, it might have been, "cheating on your tax return." Two questions appeared beneath the behavior. The first said, "If you have EVER done this behavior, how unethical do you think it was?" and the second question read, "If you have NEVER done this behavior, how unethical do you think it would be, if you were to do it?" The students answered only one of the two questions for each behavior. If they had ever cheated on their tax return, they would use the ethicality rating scale beneath the first question. If they had never cheated on their tax return, they would use the rating scale beneath the second question. From the students' perspective, it looked as if the investigators were more concerned with how students rated the ethicality of the behaviors, when really they were concerned with which of the two questions students chose to answer. If they read the behavior and then chose to answer the first question, it would indicate that they had indeed committed the act indicated (John et al., 2010).

John et al. (2010) measured the number of truthful responses by the number of questions answered affirmatively; this was called the affirmative admission rate (AAR). Crucial to the logic of the method, if the student admitted to a behavior, the investigators assumed it was a truthful answer. The participants would have a reason to lie only if they had engaged in the behavior; they would not lie if they had never committed the act. The investigators found that the indirect inquiry method had a higher numbers of AARs than the direct method. So participants

were more willing to answer truthfully when asked indirectly. Furthermore, the category with the highest AARs was the indirect, intrusive questions. This means that the indirect method had more impact on the questions asking about more sensitive topics. This makes sense because the more intrusive questions would be the ones that the students would be less willing to answer honestly. By asking about the ethicality of these behaviors, students assumed that the researchers were not as interested in whether they had ever committed the acts but rather interested in how ethical the students thought the acts were. Asking the questions in an indirect way resulted in eliciting more truthful responses from the students, even though the subject matter was sensitive in nature. Perhaps the reason for these findings is because, since it appeared to the students that the researchers did not care as much about whether they had done the behaviors, they felt like they would be less likely to get in trouble (John et al., 2010).

Of the three methods to combat self-report bias, the present study used the indirect versus direct inquiry method because it was the most effective way of determining the difference between those who are answering questions truthfully and those who are not; simply compare the number of affirmative responses in the direct group versus the indirect group. Students were either asked about drug use in a direct, point-blank way, or they were asked to rate the ethicality of using various drugs based on whether they had done it themselves.

Participants were randomly assigned to either the direct or indirect method. In the direct method, they were asked bluntly about drug use. For example, "Have you ever had caffeine (e.g. coffee, tea, caffeinated energy drinks, etc.)?" The options were either "yes", "no", or "no answer". In the indirect method, participants were given questions in the form that John et al. (2010) created. A question at the top of the page would ask, for example, "How ethical do you think it is to have ever consumed caffeine (e.g. coffee, tea, caffeinated energy drinks, etc.)?"

Two related questions appeared beneath. The participants were asked to answer only one of the two. The first was, "If you have EVER done this behavior, how unethical do you think it was?" The second question was "If you have NEVER done this behavior, how unethical do you think it would be, if you were to do it?" and a rating scale appeared beneath each of the two questions. So, if they had ever consumed caffeine, they would use the rating scale beneath the first question. If they had never consumed caffeine, they would use the rating scale beneath the second question. The answers on the scale beneath each question were, "0 not at all unethical", "1 somewhat unethical", "2 quite unethical", "3 extremely unethical", "4 it depends", or "5 nothing to do with ethics". How ethical the participants actually rated each behavior is unimportant to the study. The crucial part is which question they chose to answer. To explain, for each drug, if they answered question 1, they had used it, and if they answered question 2, they had not used it. This way, it appeared to the participants that the study was more concerned with how they rated the ethicality of certain behaviors, when in fact it was the act of answering either question 1 or question 2 that is most important.

Methods

Participants

Participants in this study were students at a university in upstate New York. In various psychology classes (most but not all were psychology 101 classes), students are required to participate in a number of studies at the university as a course requirement or to get extra credit. In most cases, the students received .5 credits for participating in the study. They registered through the Sonasystems website, toward their total number needed to pass their class. The students who participated in the study were mainly freshman and sophomores at the university; the average age was 19.3 (SD= 3.10). The population was 52% male and 48% female. 54%

indicated that they were Caucasian, 16% African descent, 14% Asian, 12% Latino, and 4% chose "other".

Procedure

When students arrived in the lab for the survey, they were directed to a link on the board that led them to the survey website, surveymonkey.com. This study, titled, "On Your Honor", was an online questionnaire that took approximately thirty minutes to complete . The first page of the survey was a consent form approved by the Institutional Review Board at the university. This informed the participant that the survey would measure the relation between attitudes and likes and dislikes. It also mentioned that some questions would be of a sensitive nature and that they did not have to answer them if they did not want to. The consent form assured them that the information in the survey would be kept confidential but that, as with all online sites, some breach of confidentiality is possible, though highly unlikely. Only those participants who agreed to the conditions set forth in the consent form continued on with the survey. Next, the survey led all participants to a page of demographic questions. These included questions about age, sex, ethnicity, and education level.

After being asked the general demographic questions, all the participants completed the brief form of the Schizotypal Personality Questionnaire (SPQ-B; Raine & Benishay, 1995, as cited in Van Dam et al., 2008). Twenty-four questions on the SPQ-B ask about traits associated with paranoia, feelings of disconnection from others, and magic ideation. So, for example, one question was, "Are you sometimes sure other people can tell what you are thinking?" Two of the questions were designed to make sure participants were paying attention and taking their time answering. One was, "I breathe air every day" and the other was, "Have you ever been inside a store?" The answer to these questions should always be "yes", so if people answered anything

other than that, it was an indication that they were not actually reading the questions and their data were not used. Participants had to answer all the questions in the SPQ-B to proceed with the rest of the survey. However, their answer choices were, "yes", "no" and "no answer." Therefore, they were able to avoid answering a question if they did not feel comfortable.

When participants had completed the SPQ-B section, they were asked if their birthdays were at the beginning of the month (days 1-15) or the second half of the month (days 16-31). This was a way of randomly assigning participants to the indirect method of questions or the direct method. If the participants answered that their birthdays were in the first half of the month, they were directed to the indirect method of inquiry. If they answered that their birthdays were in the second half, they were assigned to the direct method. The direct and indirect method of inquiry asked about the same drugs: caffeine, cigarettes, alcohol, prescription stimulants, marijuana, "shrooms" (psilocybin), ecstasy, LSD, inhalants, powdered cocaine, crack-cocaine, amphetamine, methamphetamine, and heroin. For each drug, participants were asked about lifetime use and use in the last year, which was similar to how Van Dam et al. (2008) conducted their survey (they asked about use in the last month and last year). So, in the direct method section, questions regarding drug use asked bluntly: "Have you ever had alcohol?" and "Have you had alcohol in the last year?" The choices were, "yes", "no", and "no answer". In the indirect method, the questions would be, "How ethical do you think it is to have ever had alcohol?" and the participants would answer based on whether they had ever consumed alcohol or had never consumed alcohol. Then the next question would be, "How ethical do you think it is to have had alcohol in the past year?" and they answered based on whether they had consumed alcohol in the last year.

More in-depth questions were asked about cannabis use. In previous research on this topic, researchers have asked more specific questions about cannabis use, such as daily, weekly, and monthly use (Fergusson et al., 2005;Van Dam et al., 2008) or number of times used by certain ages (Arseneault et al., 2002). This is done to get a clear picture of the type of user each participant is. In the current study, along with asking about lifetime use and use in the last year, both the indirect and direct sections asked if the participants had used cannabis 3 times or more before age 15, 3 times or more before age 18, 6 times or more in the last year, and every day for two or more weeks in a row.

At the end of the survey, both groups of participants (the group given the indirect questions and the group given direct questions) were directed to a page asking if their data should be included in the results of this study. If they answered "No" to this question, then it was assumed that they did not answer the questions honestly and the data from those participants were not used. This was an experiment check designed to further ensure the truthfulness of the given answers. After this page, the participants were shown a list of referrals for mental health facilities and drug and alcohol rehabilitation centers, in case they were disturbed in any way after taking the survey and wanted to get help. A paper copy of this list of referrals and the consent form they saw in the beginning were offered to them as they were leaving the study.

Results

Cannabis use and Psychosis Results

The results from the survey produced an unexpected outcome. There was no significant link between cannabis use and psychosis. Table 1 and Figure 1 show the results from the SPQ-B questionnaire. Under the "Mean" column in Table 1 is the average score for people in each condition who showed signs of psychosis based on the SPQ-B. The "Direct Yes" row are those

who admitted to using cannabis at least once in their life, in the direct condition. The "Direct No" row shows those who have never used cannabis. The "Indirect Yes" row are those who admitted to using cannabis at least once in their life, in the indirect condition. "Indirect No" shows the people who have never used cannabis, in the indirect group. In Figure 1, blue bars represent the direct group, while red bars represent the indirect group. The mean score in each of the four groups did not differ significantly from each other. In other words, the group that had used cannabis before did not differ significantly in their rates of psychosis from those who had never used cannabis before. This same effect was present with all the other drugs in the questionnaire as well. Based on these results, it appears that using drugs did not significantly correlate with psychosis. There could be a number of reasons for the ambiguous outcome, which will be discussed later in the paper.

Correlation Between Psychosis and Cannabis Use

|	Mean	Std. Deviation	DF
Direct Yes	7.757	4.742	213
Direct No	8.9841	3.912	213
Indirect Yes	8.116	4.541	278
Indirect No	8.277	4.446	278

*Table 1

Key for Table 1:
Rows:
-Direct Yes= People in the direct condition (questions asked bluntly) who admitted to using cannabis in their life
-Direct No= People in the direct condition (questions asked bluntly) who have never used cannabis in their life
-Indirect Yes= People in the indirect condition (questions asked about ethics of each behavior) who admitted to using cannabis in their life
-Indirect No= People in the indirect condition (questions asked about ethics of each behavior) who have never used cannabis in their life
Columns:
-Mean= The average number of people in each condition who were found to exhibit signs of psychosis based on the SPQ-B
-Std. Deviation= Variation from the mean score
-DF= Degrees of freedom, equal variances assumed

Mean score on the SPQ-B for users and non-users of cannabis
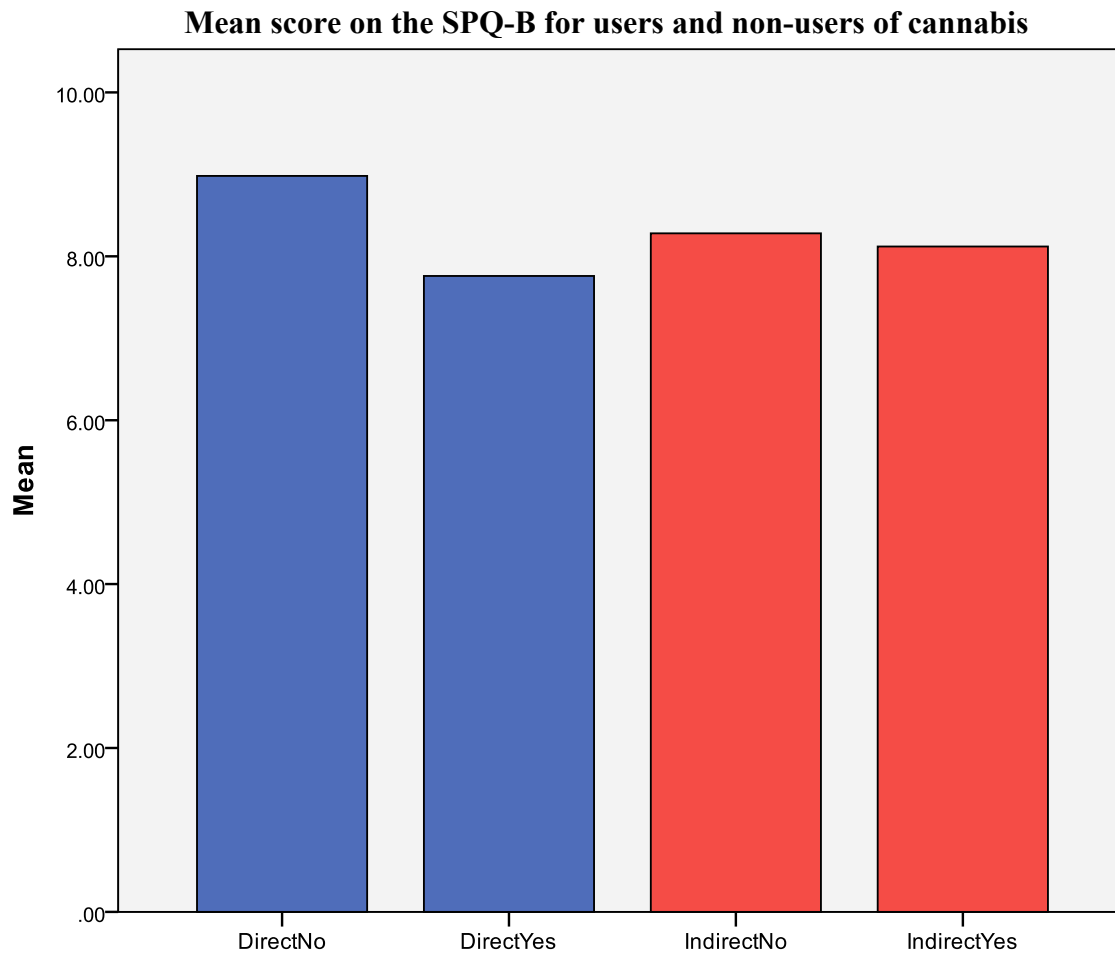
*Figure 1

*Key for Figure 1:
-DirectNo = People in the direct condition who have never used cannabis in their life
-DirectYes= People in the direct condition who admitted to using cannabis in their life
-IndirectNo= People in the indirect condition who have never used cannabis in their life
-IndirectYes= People in the indirect condition who admitted to using cannabis in their life

Self-Report Bias

While the drug use and psychosis question is still left unanswered, the direct and indirect

questions showed a persuasive result. Participants were more likely to answer yes when they

were asked in an indirect way. Table 2 shows the affirmative answers for the cannabis and

alcohol questions. T-tests were conducted to assess whether the indirect and direct form of

questions differed significantly from each other in rates of affirmative responses. Questions asking about cannabis use 6 times or more in the last year (C6), use 3 times or more before age 15 (C15), 3 times or more before age 18 (C18), every day for 2 or more weeks in a row (Daily), use in the last year (Last Year), and lifetime use (Ever), all had significant p values (less than 0.05). This means that the difference between the direct questions (Direct-column 1) and the indirect questions (Indirect- column 2) for cannabis was significant. Thus, people were more likely to answer affirmatively if the questions were asked in the indirect way. The column in Table 2 labeled "Factor" comes from dividing the indirect percentages by the direct percentages. The resulting number indicates the number of times more often that people answered affirmatively in the indirect condition than the direct condition. So, for example, for "C15", the largest result, people were about 4 times more willing to answer affirmatively in the indirect group opposed to the direct group. Affirmative answers are considered truthful answers, so it can be inferred that people were more likely to answer truthfully if asked in an indirect way.

The last item in Table 2 shows the results from the questions asking about lifetime use of alcohol (Alcohol Ever). For this question, the p value is not significant because it is greater than 0.05. Therefore, the way that the question was asked had no significant effect. People were just as likely to answer affirmatively when asked in the direct way as in the indirect way. Figure 2 shows the percentages of those who answered affirmatively in the direct versus indirect condition for cannabis and alcohol-related questions. The direct group is represented by blue bars, while the indirect group is represented by red bars. The percentages are far higher in the indirect condition for all the cannabis questions. However, it is clear that the percentages of people willing to admit that they have used alcohol at some point in their lifetime are close to equal in the indirect and direct conditions. So, for the alcohol question, the method of asking had

no effect on how the participants answered, but for cannabis-related questions, the method of

asking was essential in obtaining truthful responses.

Comparison of the indirect vs. direct method in cannabis and alcohol-related questions

|	Direct	Indirect	Factor	Z score	P value
C6	42.2%	62.9%	1.491	-4.729	<.001
C15	13.5%	54.2%	4.015	-10.321	<.001
C18	44.6%	62.9%	1.410	-4.401	<.001
Daily	21.1%	58.7%	2.782	-9.217	<.001
Last year	58.5%	72.4%	1.238	-3.503	<.001
Ever	34.6%	75.2%	2.173	-9.774	<.001
Alcohol Ever	93.8%	92.9%	0.990	1.291	.902

*Table 2

Key for Table 2:
Rows:
-C6= People who used cannabis 6 time or more in the last year
-C15= People who used cannabis 3 times or more before age 15
-C18= People who used cannabis 3 times or more before age 18
-Daily= People who used cannabis every day for 2 or more weeks in a row
-Last Year= People who used cannabis at least once in the last year
-Ever= People who have used cannabis at least once in their life
-Alcohol Ever= People who have used alcohol at least once in their life
Columns:
-Direct= Percentage who answered affirmatively in the direct condition (questions asked in a straightforward way)
-Indirect= Percentage of those who answered affirmatively in the indirect condition (questions asked about the ethics of each behavior)
Factor= The indirect percentage divided by the direct percentage

Percentages of affirmative answers for cannabis and alcohol-related questions in the direct vs. indirect groups
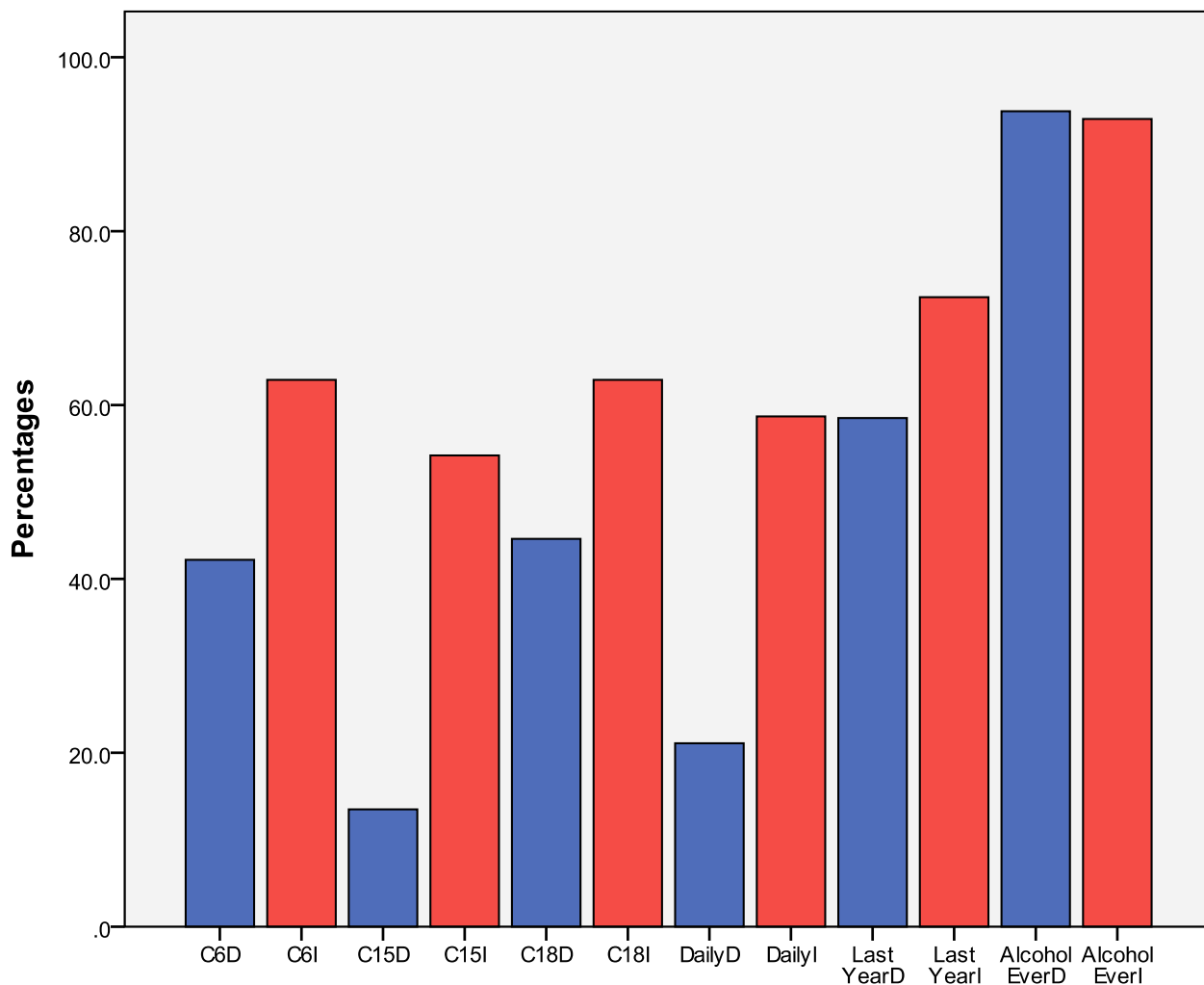
*Figure 2

*Key for Figure 2:
-C6D= People who used cannabis 6 times or more in the last year in the direct group.
-C6I= People who used cannabis 6 times or more in the last year in the indirect group.
-C15D= People who used cannabis 3 times or more before age 15 in the direct group.
-C15I= People who used cannabis 3 times or more before age 15 in the indirect group.
-C18D= People who used cannabis 3 times or more before age 18 in the direct group.
-C18I= People who used cannabis 3 times or more before age 18 in the indirect group.
-DailyD= People who used cannabis every day for 2 or more weeks in a row in the direct group.
-DailyI= People who used cannabis every day for 2 or more weeks in a row in the indirect group.
-Last YearD= People who used cannabis at least once in the last year in the direct group.
-Last YearI= People who used cannabis at least once in the last year in the indirect group.
-EverD= People who have used cannabis at least once in their life in the direct group.

-EverI= People who have used cannabis at least once in their life in the indirect group.
-Alcohol EverD= People who have used alcohol at least once in their life in the direct group.
-Alcohol EverI= People who have used alcohol at least once in their life in the indirect group.

Discussion

The purpose of this paper was to answer two questions: "Does cannabis co-vary with psychosis?" and "How do you answer the former question using self-report questionnaires?" The results did not supply any conclusive answers about the first question. Previous studies have provided widely varied results about the effect of cannabis on the development of psychosis. This is a question that needs more investigation. In this study, participants were not only asked about their use of cannabis but also their use of other drugs, ranging from cigarettes to heroin. This is the key to any further investigations of this research question; researchers must ask enough questions to get a picture of overall drug habits. It could be that hallucinogens, like LSD, set off long-term psychoses rather than marijuana because of their short-term psychosis-like effects. The hard part is separating the distinct effects of various drugs. It is also possible that drugs interact with a genetic vulnerability to develop psychosis in certain people (Caspi et al., 2005). Or perhaps drugs have no effect on the development of psychosis at all but rather people who are living a life where they are using a variety of drugs are more likely to have unstable mental health to begin with. These are all controversial questions that need answers in order to better understand and treat the mind.

The results from the present study have shown that the technique created by John et al., (2010) is useful in getting honest answers regarding use of illicit drugs. It is clear that the direct method of inquiry yielded far fewer affirmative answers to questions of drug use than did the indirect method. Looking at the questions asking about cannabis use, participants were far more likely to admit to using when the question was indirect. This is probably because, in the indirect

method, the purpose of each question appears to be to gauge participants' opinions of the ethicality of using various drugs. Of course, the real purpose is to see which drugs they have used and get an idea of how often. Participants are probably more willing to answer indirect questions because they feel they are not going to get into trouble. To them, it appears that the main goal is not about their own drug use and, therefore, they are less likely to get reported if they answer honestly. With the direct method, the purpose of the questions is obvious.

Another interesting result that came out of the indirect method of inquiry in the present study is the difference between the alcohol questions and the cannabis questions. The indirect method of inquiry had no effect on alcohol questions. Participants were equally likely to admit to using alcohol when asked directly or indirectly. This provides an interesting insight into how drugs are viewed in this country. It appears that alcohol, a legal and widely used drug, has less of a stigma against it because people were more willing to admit to using it. However, it is interesting to note that the population used in this study had an average age of around 19 years old. Since the legal drinking age is 21, the participants admitting to using alcohol are admitting to an illegal behavior. Yet they are perfectly willing to answer affirmatively when asked outright. When asked directly about cannabis use, these same people felt the need to be less truthful as is evident from the differences in the means between the indirect and direct condition for alcohol and cannabis. If participants are not being truthful due to the fear of getting in trouble, then underage drinking and cannabis use should both be affected equally by the indirect method of inquiry. Because this is not the case, self-report bias must be partially caused by the stigma against certain kinds of drugs and not just the fear of getting in trouble. Even though cannabis is widely used, especially among college students, the stigma against it must still be great enough to deter students from admitting to using it. Under this line of reasoning, people would be least

willing to admit to using a drug like heroin because it has such a stigma and danger associated with it.

Applications

One limitation is that the population used in this study consisted of college students with an average age of about 19 years old. It is possible that the indirect method of questioning affected this age group differently from how it would affect people older or younger. Perhaps college students are more willing than other age groups to divulge information about their own drug use. In this case, the indirect questioning may have an even greater effect on other populations of people. It is also possible that the opposite is true; college students may be less willing to divulge than other groups. Therefore, indirect questions would have a greater effect on college students than anyone else. Future research should focus on applying this technique to a wider variety of age groups than was available for use in this study.

More research is needed on the connection between drug use and psychosis. Not enough is known about the effects of drug use, and especially cannabis use, to determine how the mind will react. It is important to understand more about this connection in order to better treat those who suffer from long-term psychoses or drug addition problems. It is important for future research to determine participants' vulnerability to developing psychosis as a separate entity from their drug use, in order to understand how they interact. Further, researchers must make the distinction between the effects of each drug used to get a clear picture of how they may be affecting the mind.

The results of this study have provided evidence that using an indirect form of questioning can elicit more truthful responses to drug-related questions. This has expanded on the idea proposed by John, Acquisti, & Loewenstein (2010) that people will answer sensitive

questions more honestly if not asked directly. The form of indirect questioning used in this paper should be used in future drug research to attain more truthful answers and provide more reliable results.

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