

COMPETING THEORIES OF MARIJUANA USE: A LONGITUDINAL STUDY*

IRVING J. GINSBERG

JAMES R. GREENLEY

University of Wisconsin —Madison

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Constructive debate over public policy concerning the use and possession of marijuana is hampered by a lack of adequate empirical tests which assess the relative independent predictive power of theories designed to account for marijuana use. This paper presents a longitudinal study of college student marijuana use which allows assessment of the relative utility of certain of these theories. Consistent with prior studies, orientation toward a marijuana-using reference group is the most substantial predictor of marijuana use in this study. Contrary to earlier conclusions based solely on cross-sectional data, marijuana use at follow-up is not related to initial lack of commitment to conventional institutions, directly or indirectly, when statistical controls for other theoretical variables are applied. In addition, psychological distress at follow-up is associated with lower levels of initial marijuana use, when other spurious effects are removed. Finally, degree of involvement in conventional activities is not related to marijuana use. The implications for reinterpretation of previous data are discussed.

The use of marijuana has increased markedly in the United States in the past decade, especially among college students (cf. National Commission of Marihuana and Drug Abuse, 1972; Gallup Opinion Index, 1969, 1972; Abelson et al., 1972, 1973; Groves, 1974). Along with increased use has come heightened concern over public policy regarding the possession and use of marijuana. However, constructive debate of these issues continues, to be hampered by a lack of adequate empirical tests of theories designed to account for marijuana use.

Most past studies of why people come to use marijuana have employed cross-sectional survey research designs and have reported correlates of marijuana use which are subject to various theoretical interpretations (cf. Dembo et al., 1976). However, one cannot conclude from cross-sectional data whether correlates of marijuana use represent causes or consequences of its use. Longitudinal studies which temporally order variables allow more confident conclusions regarding

what may be a cause versus an effect. In this paper we present longitudinal data on students' marijuana use that enables us to critically examine the relative predictive adequacy of several theories.

Several prior longitudinal studies have investigated the extent to which a variety of demographic, personality, social-environmental, and behavioral factors are useful predictors of subsequent marijuana use (Kandel and Faust, 1975; Kaplan, 1975; Lucas, 1973; Smith and Fogg, 1975; Sadava, 1973a, 1973b; Mellinger et al., 1975; Jessor et al., 1973; Jessor, 1976). However, few longitudinal studies address the relative utility of various theories or variables in predicting marijuana use. Jessor et al. (1973), in a longitudinal study of high school and college students, report step-wise multiple regression analyses predicting initial use of marijuana from sets of personality and perceived environment variables. For example, among high school-aged males, significant multiple correlation coefficients were reported for the relationships between onset of marijuana use and perceived environment and personality variables ($R = .35$ and $.36$, respectively). The multiple correlation coefficients predicting onset of marijuana use among high-school-aged males from both personality and perceived environment variables

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combined was not much larger ($R = .39$), suggesting that these sets of variables may not be independent predictors of marijuana use. No competitive tests using statistical controls were reported to evaluate the relative independent predictive power of these two theoretically important sets of variables or to assess the relative predictive utility of specific variables within these groups.

Sadava (1973b) reports a six-month longitudinal study of college students using various measures to predict future levels of marijuana use. Frequency of marijuana use was regressed on the predictor variables simultaneously; social support for marijuana use, belief in Internal vs. External control, and the experience of negative functions of marijuana use remained significantly related to marijuana use independent of other factors. These three variables predicted marijuana use with multiple $R = .47$, while social support alone predicted marijuana use with $R = .42$. Clearly, social support for marijuana use was the strongest predictor of frequency of marijuana use in this study. In addition, Sadava's data demonstrate that variables predicting the use of marijuana over time may themselves be predicted from prior levels of marijuana use, and several other studies report changes in these variables concomitant with changes in levels of marijuana use (Jessor et al., 1973; Jessor, 1976; Sadava, 1973a). However, Sadava's (1973b) data are difficult to interpret because in predicting marijuana use from other variables, the possible effect of the initial level of marijuana use is not considered. Thus, relationships between predictors and subsequent frequency of marijuana use may be due solely to associations of these predictors with initial levels of use and stability of use over time (cf. Heise, 1970). Studies such as Jessor et al. (1973), Jessor (1976), Lucas et al. (1973), and Sadava (1973a), which predict the onset of marijuana use beginning with a non-user group, escape this problem; however, these studies fail to differentiate adequately the relative independent predictive power of prominent competing theories.

These longitudinal, and other cross-sectional, studies suggest a wide variety of

theories of marijuana use (Gorsuch and Butler, 1976; Lettieri, 1975; Braucht et al., 1973). Certain of these theories cannot be examined using data reported in the present study, including those involving certain specific personality characteristics (Jessor et al., 1973; Sadava, 1971, 1973a, 1973b; Kaplan, 1975), self-reported reasons for using marijuana (Dvorak, 1972), parental legal and illegal drug use (Smart and Fejer, 1972; Kandel, 1974), and the quality of family relationships (Blum, 1969; Tec, 1970; Jessor, 1976). In addition, some longitudinal studies have addressed issues other than factors predicting the use of marijuana; these include studies of the changing rates of marijuana use over time (Kandel et al., 1976; Johnson, 1974), sequences and stages in the progression from legal to illegal drugs and from marijuana to other illegal drugs (Kandel and Faust, 1975), the reliability and validity of longitudinal drug surveys (Single et al., 1975), methodological problems in drug-use surveys (Haberman et al., 1972), adaptation to marijuana use (Brill and Christie, 1974), and the use of drugs by returning Vietnam veterans (Robins et al., 1974, 1975). Although these issues are important in **their own right**, they will not constitute the focus for the present study.

THEORIES OF MARIJUANA USE

Four theories of marijuana use will be contrasted in this report. The **first** is reference group theory, which suggests that a person may use marijuana in an attempt to emulate others who use it. A reference group is a group a person takes as a frame of reference for self-evaluation (Merton, 1957; Shibutani, 1967). A positive reference group is a source of standards of conduct and belief for an individual. Usually, groups to which a person belongs are reference groups for that person, such as peer groups on college campuses (cf. Secord and Backman, 1964:210). Many researchers have suggested that marijuana use occurs, at least in part, as a result of the influence of peers, whether in the guise of conformity to peer group pressure; learning to smoke properly, perceive

the effects, and define them as pleasurable; or as simply due to social modeling and imitation (Johnson, 1973; Becker, 1953; Suchman, 1968; Goode, 1970; Tec, 1972; Sadava, 1973a; Jessor et al., 1973; Jessor, 1976; Kandel, 1974; Thomas et al., 1975; Linn, 1971; Lavenhar et al., 1972; Gorsuch and Butler, 1976; Lettieri, 1975).

These arguments are central to what has been called "peer group theory," although different elaborations of peer group theory contain various additional arguments (cf. NCMDA, 1972). One's peer group is always a group one is a member of, although one's reference group may or may not be a group to-which one belongs. For example, a person may have a positive reference group whose standards he emulates and yet not be a member of it. Thus, the reference group concept is a more general concept than is peer group, and similarly, reference group theory is the more general theory.

Reference group processes are related in complex ways to differential association theory (Sutherland and Cressey, 1966; Tec, 1972) and the notion of a drug subculture (Lindesmith, 1968). For example, greater exposure to a marijuana-using subculture may lead to increased identification with marijuana users as a reference group. Thus, identification with marijuana users as a reference group may constitute a crucial link between exposure to a marijuana-using subculture and the use of marijuana. In addition, having marijuana users as a positive reference group may lead to increased association with marijuana users as well as to marijuana use. Our focus will be on reference group processes because these processes are often thought to provide the causal mechanism linking differential association, e.g., exposure to a marijuana using subculture, with specific behaviors such as marijuana use.

Commitment theory or control theory is the second explanation for marijuana use examined here. Commitment theory suggests that deviant behavior (as marijuana use is here conceptualized), will be more likely the weaker are a person's attachment and adherence to the norms and values of the society in general

(Johnson 1973; Hirschi, 1971). Commitment is defined as support of major societal institutions, institutionalized goals, and institutionalized forms of behavior *as they now exist*. This support of conventional activity may be generated in several ways, as Hirschi (1971: 16-26) argues, including beliefs, attachment to others, and commitment to conventional activities because deviant ones appear less beneficial than conventional ones. In this paper we make no distinctions among these types of bonds to non-deviant behavior patterns. Adherence to traditional religious, economic, and political values is often used as a measure of commitment. Johnson (1973), Suchman (1968), Keniston (1968), Knight et al. (1974), and Gergen et al. (1972) all incorporate variations of commitment theory into their explanations of marijuana use.

The third theory, which we will call *stress theory*, attributes marijuana use to a person's desire to escape from personal or psychological problems. Proponents of this view cite studies showing that frequent drug users score higher on problem indices or measures of psychological distress than nonusers (cf. Steffenhagen et al., 1972; Mellinger et al., 1975; Beaubrun and Knight, 1973; Cross and Davis, 1972; Ausubel, 1970). However, stress theory does not necessarily suggest that the marijuana user is mentally ill; psychiatric disorder may be seen as its own type of escape. Rather, marijuana use is more often viewed as a coping response in which a person seeks a physiological or recreational refuge from mild to serious fears, anxieties, boredom, or depression.

A fourth theory attributes non-deviant behavior to the fact that a "person may be simply too busy doing conventional things to find time to engage in deviant behavior" (Hirschi, 1971:22). This argument, which we will call *involvement theory* following Hirschi, was common in juvenile delinquency prevention, where for instance playgrounds and other recreational possibilities were provided to keep adolescents busy and thus out of trouble. With regard to college life, involvement theory suggests that certain students may spend so much time at their studies, em-

ployment, or conventional student organizational activities that they have neither the time nor energy to use marijuana.

The relationships between reference group processes, commitment, involvement, and psychological stress have been incorporated into more complex arguments. For instance, Johnson (1973) argues that encouragement from one's peer group, as a reference group, is a major motivating factor in marijuana use and that lack of commitment to major societal values and institutions predisposes one to associate with peer groups likely to be using drugs. However, data are largely lacking allowing assessment of these more complex explanations.

Some of the factors and processes leading to marijuana use are probably further related through complex feedback mechanisms and reciprocal causation (Goode, 1969). For example, one question concerns the extent to which having a marijuana-using reference group leads to marijuana use versus the extent to which using marijuana leads one to adopt a marijuana-using reference group. Using the longitudinal data in this study we will attempt to assess the extent of occurrence of these processes, and which has the greater influence over time.

A number of studies have reported that persons with the following socio-demographic characteristics are more common among marijuana users: males, persons aged 18 to 21, unmarried, middle or upper class, urban, Jewish, and atheists (NCMDA, 1972; Steffenhagen et al., 1971; Gergen et al., 1972; Dvorak, 1972). However, other studies have found no relationship between some of these characteristics and marijuana use, and several suggest that different factors may be related to marijuana use among high school, college, and post-collegiate age groups (cf. Jessor et al., 1973; Henley and Adams, 1973). Socio-demographic factors may be variously related to or predisposing toward lack of commitment to traditional societal values, adoption of a drug-using reference group, less involvement in conventional activities, or psychological distress. However, available research is inadequate to allow precise specification of

the manner in which these factors are related to marijuana use.

This paper uses longitudinal data to contrast commitment, reference group, involvement, and stress theory as explanations for marijuana use. Other theories exist but these four are among the most widely known and best supported by available data (cf. Cohen, 1969:54-5).

METHODS

A self-administered questionnaire was mailed to a random sample of all students registered at the University of Wisconsin-Madison in November, 1971. With repeated follow-ups an 82 percent response rate was obtained, represented by 1502 respondents. The 319 respondents who were freshmen or sophomores at the time of the original survey and who were still registered students in January of 1974 were mailed a follow-up questionnaire and 86 percent responded, yielding a sample with $N = 274$. A comparison of those students who remained enrolled with those who left the University during the interim indicated that those 160 freshmen and sophomores who left the University during the two-year follow-up period were significantly heavier marijuana users than their 319 classmates who remained enrolled.

In addition, respondents to the follow-up survey ($N = 274$) were compared with enrolled nonrespondents ($N = 45$), using information from the original survey. Significantly more respondents (81 percent) than nonrespondents (58 percent) were 19 years of age or younger at the time of the original survey. Respondents were also significantly less oriented to the student counter-culture, according to an index of attitudes reported more extensively elsewhere (Greenley and Mechanic, 1976). No other significant differences between these two groups were observed on any other variables, including measures of psychological distress and marijuana use.

Each respondent was asked how often in the past twelve months he or she used marijuana. Response categories were "never," "once or twice," "from 3 to 12

times," and "more than 12 times." Thus, our measure of marijuana use enables us crudely to examine frequency of reported use as well as use versus non-use. A particular twelve-month period was asked about to avoid the **difficulties** inherent in interpreting lifetime use data (Josephson, 1974:179-83), and because a period shorter than the time between our original and follow-up survey was needed to allow investigation of "causal" relationships over time. Studies of response bias in self-reported drug use suggest that our self-administered questionnaire method probably does not lead to substantial distortions of the data (Luetgert and Armstrong, 1973; **Haberman** et al., 1972; Whitehead and Smart, 1972; Single et al., 1975).

To establish whether marijuana use was a characteristic of a student's reference group, respondents were asked to what extent "uses marijuana" described students they "admire and identify with." Five response categories were supplied ranging from "very characteristic" to "very uncharacteristic." Obviously, **stu-** dents who are admired and identified with need not be close friends or even casual associates of the admirer. However, one's peers usually constitute one's reference group (**Secord** and **Backman**, 1964:210), suggesting that this measure may also be highly related to certain peer group **processes**.

Our measure of commitment is an assessment of support by the student for major societal institutions. Following conceptual and empirical work by **Suchman** (1968), **Johnson** (1973), and **Hirschi** (1971), we focused on political, religious, and economic institutions. From a large number of available items in our questionnaire relevant to these institutions, with the aid of factor-analytic techniques a particular item was chosen to represent commitment to each of these institutions. This procedure resulted in the choice of items which we feel best represent commitment to institutions as measured in this study. The question regarding religion was, "how frequently do you ... currently participate in religious services?"; with six response categories supplied ranging from "more than once a

week" to "never." The politically relevant question was, "how would you classify your political beliefs?" Seven response categories were supplied, ranging from "very conservative" to "very radical." The third question asked respondents to indicate on a five-point scale from "strongly agree" to "strongly disagree" how they felt about the statement, "Becoming a success is a matter of hard work." Standardized scores on each of these variables were added into an index of commitment to conventional institutions, where greater commitment was indicated by agreement with the statement on hard work, frequent participation in religious services, and conservative political beliefs. Because the statement concerning hard work was not included in the follow-up survey, our measure of commitment to conventional institutions at follow-up consists of an index of the other two items constructed in the same manner. As a further check on this variable, we constructed several other measures of commitment, largely drawing on a series of other relevant but less preferable items, and found that use of none of these other measures led us to any different conclusions.

In order to examine stress theory, a number of measures of psychological distress and personal problems were examined. Some incorporated serious psychiatric symptoms, some took into account the seriousness of symptoms, and some dealt with problems in various areas of life (e.g., school, family, and work). All of our measures of psychological stress eventually led us to the same conclusions. The index reported here is a summed score of 27 reported symptoms, each weighted by the respondent's assessment on a **four-** point scale of how serious this symptom was. Such commonly used symptom checklists contain psychophysiological and psychological symptoms and have been appropriately criticized by the **Dohrenwends** (1969), **Phillips** and **Clancey** (1970), and **Seiler** (1973). Items for the index were drawn from the **Langner 22-** Item Screening Score and scales being developed by **Dohrenwend** and his colleagues (**Langner**, 1962; **Dohrenwend** et al., 1970). Items focus on common **prob-**

lems such as general anxiety, depression, and loneliness, as well as on more severe problems such as hearing voices and seeing things others do not.

A measure of involvement was constructed to reflect the number of hours per week a student was participating in college courses, employment, and campus organizations engaged in publications, dramatics, sports, and so forth. A student was considered to spend three hours per week on course work for every credit for which he was registered. To these course hours was added the number of hours the student reported he or she was gainfully employed per week and the number of hours the student indicated were spent in organized campus activities per week.

A multiple regression path analysis will be used to examine our longitudinal data. The effect of Time 1 factors on follow-up marijuana use will be estimated, controlling for the effect of marijuana use at Time 1. Controls for marijuana use at Time 1 are necessary because initial marijuana use may be associated with another variable (X) measured at Time 1, resulting in a spurious relationship between variable X and follow-up marijuana use (cf. Heise, 1970).

RESULTS

In this sample of college students, marijuana use is common and increases over the two-year study period. As freshmen and sophomores in the 1971–1972 academic year, 25 percent of these students reported using marijuana more than 12 times, 20 percent reported use from 3 to 12 times, 9 percent said they used marijuana once or twice, and 46 percent said they never used marijuana. As juniors and seniors in the spring of 1974, comparable percentages were: 12 or more times, 36 percent; 3 to 12 times, 17 percent; once or twice, 14 percent; and never, 32 percent. The proportion of the original sample of students who were heavier users at the follow-up is probably slightly underestimated because a small but statistically significantly greater proportion of heavy marijuana users 'ceased being registered students on this campus

during this period. For **example, 29 percent of the 479 freshmen and sophomores originally responding used marijuana 12 or more times during the previous year, while only 25 percent of the 274 follow-up study respondents said they used marijuana 12 or more times in the year prior to the initial survey.**

Use of marijuana was significantly higher among students whose fathers had higher-status occupations as indicated by the Duncan occupational status index (Reiss, 1961), and lower among those whose mothers were Protestant in religious orientation (see Table 1). No significant relationships were found between marijuana use and sex, age, college year, size of community of origin, or father's education. Marital status and race could not be adequately examined because 97 percent of the sample were white and 95 percent were single.

As Table 1 shows, involvement in conventional activities such as university course work, campus organizations, and employment is not significantly related to drug use as reported either at the initial or follow-up interviews. None of the individual items used to construct the measure of involvement in conventional activities is significantly related to marijuana use at follow-up, and further analyses revealed no suppressor effects due to relationships with other variables. The degree of involvement in conventional activities, as measured here, does not contribute to our understanding of student marijuana use.

'**Marijuana use is significantly and substantially higher among students who admire and identify with marijuana users (see Table 1). Also, students who have less commitment to conventional institutions (religious, political, and economic) are significantly more likely to report higher frequencies of marijuana use than are more committed students. Finally, marijuana use is significantly higher among students reporting higher levels of psychological distress. Thus the zero-order correlations shown in Table 1 provide evidence in support of reference group theory, commitment theory, and stress theory.**

Our longitudinal data allow an assess-

TABLE 1. CORRELATION MATRIX OF STUDY VARIABLES .

Variables	1	2	3	4	5	6	7	8	9	10	11
Socio-Demographic Variables											
1. Father's Occupational Status (High)											
2. Mother's Religion (Protestant)	-.07										
Time 1, Initial Survey											
3. Involvement in Activities	-.02	.01									
4. Marijuana-Using Reference Group (High)	.12	-.17	-.03								
5. Commitment to Conventional Institutions (High)	-.13	.15	.07	-.43							
6. Psychological Distress (High)	.04	-.20	-.15	.23	-.12						
7. Respondent's Marijuana Use (High)	.17	-.25	-.07	.67	-.46	.30					
Time 2, Follow-up Survey											
8. Marijuana-Using Reference Group (High)	.10	-.09	.01	.57	-.31	.18	.52				
9. Commitment to Conventional Institutions (High)	-.18	.13	.07	-.40	.67	-.13	-.40	-.39			
10. Psychological Distress (High)	-.05	-.11	-.12	.22	-.12	.60	.16	.22	-.17		
11. Respondent's Marijuana Use (High)	.14	-.21	-.05	.58	-.31	.21	.64	.68	-.39	.22	

*N=274; correlations of $r \geq .118$ are significant with $p \leq .05$

ment of the relative importance of these various factors with regard to marijuana use; this analysis is presented in the path analysis represented in Figure 1.

As might be expected, Figure 1 shows that the best predictor of marijuana use at the follow-up survey is marijuana use at the initial survey. Having a **marijuana**-using reference group is the only other variable in the model that remains significantly related to respondent's marijuana use at follow-up. With the other variables in the **model** controlled, neither commitment to conventional institutions nor psychological distress is significantly related to marijuana use at follow-up.

Father's occupational status has no significant direct effect in the path model and only one indirect effect, due to marijuana users at Time 1 having fathers with significantly higher occupational statuses than nonusers. Religious background has a small indirect effect on students' marijuana use through its relationship with marijuana use at Time 1, i.e., students with Protestant mothers report less

marijuana use at Time 1 than students with non-Protestant mothers. In addition, fewer students with Protestant mothers claim a marijuana-using reference group at Time 1 than do students with mothers of other religious backgrounds. Thus, mother's Protestant background is also linked to respondent's follow-up marijuana use through the reference-group orientation variable.

Further analyses were done to delineate more carefully the factors leading to choice of a marijuana-using reference group and to determine if reference group also, predicts the other theoretical variables. As shown in Table 2, reports by a student that he or she has a **marijuana**-using reference group at follow-up were regressed on those Time 1 variables in Figure 1. Reporting a marijuana-using reference group at time-one is the best predictor of reporting a marijuana-using reference group at follow-up. When statistical controls for the other independent variables are applied, respondent's marijuana use at Time 1 is the only other

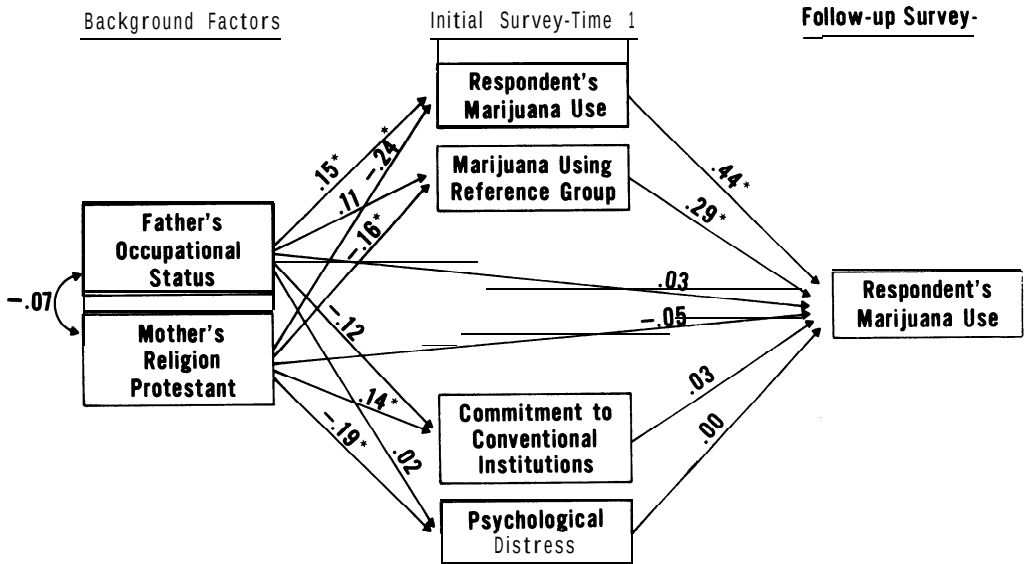


FIGURE 1. PATH ANALYSIS OF VARIABLES RELATED TO MARIJUANA USE

Note: Variance unexplained by variables in this model is for the endogenous variables: respondent's marijuana use at follow-up, .56; respondent's marijuana use at Time 1, .91; marijuana-using reference group, .97; commitment to conventional activities, .97; psychological distress, .97. Coefficients with * are significant at $p < .05$. $N = 274$.

variable significantly related to having a marijuana-using reference group at follow-up. Neither psychological distress at Time 1 nor commitment to conventional institutions at Time 1 is significantly related to having a marijuana-using reference group at follow-up, controlling for reference-group orientation and marijuana use at Time 1.

As shown in the regression analysis in Table 2, commitment to conventional in-

stitutions at Time 1 is the only significant independent predictor of commitment to conventional institutions at follow-up. However, there is a tendency for students reporting a marijuana-using reference group at Time 1 to be less committed to conventional institutions at follow-up, although the relationship is small and significant at only the $p < .08$ level. Consequently, commitment to conventional institutions may be spuriously related to

TABLE 2. REGRESSION OF CERTAIN FOLLOW-UP VARIABLES ON TIME 1 VARIABLES^a

Time 1 Variables	Follow-Up Variables			
	Marijuana-Using Reference Group	Commitment to Conventional Institutions ^b	Psychological Distress	Marijuana Use
Respondent's Marijuana Use (High)	.24*	.05	-.16 ⁿ	.46*
Marijuana-Using Reference Group (High)	.39*	-.11	.17 ⁿ	.29*
Commitment to Conventional Institutions (High)	.03	.59	.04	.02
Psychological Distress (High)	.02	.02	.61*	.00
R ²	.35	.45	.37	.44

^a Standardized regression coefficients; $N=274$.

^b Commitment to conventional institutions as measured at follow-up is a two-item index consisting of those items on political orientations and religious practices which were included in this variable measured at time-one.

* Coefficient is significant at $p < .05$.

marijuana use at follow-up due to the effect of reference group identification on both commitment and marijuana use.

Psychological distress measured at time-one is substantially and significantly related to psychological distress at the follow-up, providing further evidence for the general consistency over time of these symptom-based measures (cf. Srole, 1975). The data further indicate that having a marijuana-using reference group at Time 1 significantly predicts psychological distress at follow-up, i.e., controlling for other factors, individuals with a marijuana-using reference group are more likely to report distress at follow-up. However, despite being positively correlated with distress at follow-up, frequency of marijuana use at Time 1 predicts negatively to distress at follow-up, frequency of marijuana use at Time 1 predicts negatively to distress at follow-up. This result is contrary to the argument that the use of marijuana leads to increased distress. According to our data, this surprising result occurs because using marijuana at Time 1 is significantly and positively correlated with both distress at Time 1 and identification with a marijuana-using reference group at Time 1, both of which predict positively to distress at follow-up, thereby producing a spurious positive correlation between initial frequency of marijuana use and psychological distress at follow-up. Thus our data indicate that, consistent with the claims of many users, using marijuana may actually alleviate distress.

Regression of marijuana use at follow-up on the Time 1 variables (Table 2) shows the coefficients to differ little from those of the path model (Figure 1) which in addition incorporates two background factors. As Table 2 indicates, identification with a marijuana-using reference group at Time 1 predicts marijuana use at follow-up only marginally better than marijuana use at Time 1 predicts reporting a marijuana-using reference group at follow-up. Thus, our multiple regression analyses suggest that these factors are engaged in a reciprocal causal relationship of approximately equal strength.

The relatively equal importance of marijuana use and reference-group identification in their reciprocal relationship is

further confirmed through **16-fold** table analyses. Depending upon how our variables are dichotomized for this analysis, Lazarsfeld's (1973) Index of Mutual Effect varies, although it remains relatively low, ranging from $+.086$ to $-.194$ (a negative coefficient indicates marijuana use is the more important variable). However, the Index of Mutual Effect has several weaknesses which may lead to inaccurate causal inferences (Kessler, 1977). Therefore, Kessler's indices for generating and preserving effects were also calculated for our **16-fold** tables. These results indicate that initial levels of each dichotomized variable are more highly predictive of an increase in the other variable ("generating effect") than of a decrease ("preserving effect") by a ratio of roughly two to one. In addition, the results do not consistently show either variable to be causally dominant, thereby supporting the findings using the Index of Mutual Effects as well as our multiple regression analyses.

To explore further whether these models might largely be capturing processes leading to increased or decreased marijuana use, rather than to beginning use, we regressed marijuana use at follow-up on the Time 1 variables for those 127 students reporting *no* marijuana use at Time 1. Among this subsample, the standardized regression coefficients (predicting marijuana use at follow-up) from the following Time 1 variables are: marijuana-using reference group, **.30**; commitment to conventional institutions, **-.04**; and psychological distress, **.05**. Thus, having a marijuana-using reference group is a significant factor in beginning as well as increasing marijuana use. None of the other variables, including background factors also examined, was significantly and independently related to marijuana use at follow-up in this reduced sample.

Various tests for non-linear effects revealed none. The data were also examined for interaction effects and none were found.

DISCUSSION.

This analysis clearly demonstrates the importance of marijuana users whom a

student admires and with whom the student identifies in the adoption of marijuana use. In addition, marijuana use itself is shown to affect identification with a marijuana-using reference group, as Goode (1969) suggests. These findings are consistent with the results of an increasing number of longitudinal and cross-sectional studies which indicate that these factors may be engaged in a reciprocal causal relationship in which each affects the other (cf. Becker, 1953; Goode, 1970; NCMDA, 1972; Sadava, 1973b; Tec, 1972; Lavenhar et al., 1972; Kandel, 1974).

The arguments made by Keniston (1968), Gergen et al. (1972), and implicitly by Suchman (1968), which suggest that lack of commitment to conventional social values and institutions is the primary determinant of drug use and also of involvement in the drug subculture, are not supported by our data. Neither is there any evidence for Johnson's (1973) argument that lack of commitment may have an indirect effect on drug use by predisposing persons to identify with or become involved with marijuana-using groups. The results suggest that lack of commitment may be spuriously related to marijuana use because identification with a marijuana-using reference group may lead directly or indirectly to more negative views of conventional institutions.

While commitment is defined and operationalized in this study following the leads of Johnson (1973) and Suchman (1968), it lacks the tested validity and reliability of many of the other variables and thus may not appear as a more important variable in our analysis. However, commitment as measured here is substantially correlated with marijuana-using reference group identification¹ and the use of marijuana. Our study thus replicates past cross-sectional survey findings. Yet, the multivariate analysis of our longitudinal data suggests that commitment does not significantly **affect** either choice of a marijuana-using reference group or frequency of marijuana use over time. Marijuana use does not appear to be an anti-social act engaged in to reflect negative feelings towards the larger society. Rather, as the importance of **reference-group** identification suggests, marijuana

use appears to be a positive act designed to emulate others and probably to help integrate the marijuana user into his peer group (cf. Thomas et al., 1975).

The data provide no support for involvement theory. Marijuana use may not only be deterred by an active life but may serve as a recreational respite from conventional activities. Furthermore, marijuana use, unlike some forms of deviant behavior, takes relatively little time and may even be incorporated in the course of these conventional activities.

Psychological distress as measured in this study was not found to predict marijuana use over time independent of other factors. Proponents of stress theory, such as Ausubel (1970) and Louria (1970), may have prematurely concluded from cross-sectional data that distress brought about marijuana use or vice-versa. Our longitudinal data suggest that, controlling for other factors, the **greater** the frequency of marijuana use at Time 1, the less distress reported at follow-up. That psychological distress is correlated positively on a zero-order level with marijuana use is to some degree explained by the strong positive correlation between reference-group identification and the use of marijuana, and the positive effect of reference-group identification on psychological distress. Involvement in a marijuana-using subculture may bring about changes in living arrangements, relationships with parents, life goals, and views of self, all of which may be associated with greater reported psychological distress.

Some of the modest but statistically significant relationships between marijuana use and socio-demographic factors that have been previously reported were not found in this study. We suspect that some of these relationships, such as the relationship with sex, have in fact diminished as marijuana use has spread more pervasively through student communities.

The conclusions drawn from this analysis should be interpreted cautiously. Although moderate violations of the assumptions underlying our analytical model are not likely to invalidate the results, this is true for the relative magnitude of effects, not for their absolute

values (Heise, 1970). One critical assumption is that the measurement interval is approximately equal to the causal lag period, i.e., the time between the initial survey and the follow-up is about equal to the amount of time it takes the independent variable to cause a measurable change in the dependent variable. This assumption is probably violated to some degree, since the measurement interval of approximately two years may be somewhat greater than the average causal lag period for the key theoretical variables. Violation of this assumption is likely to attenuate the relationships, but the relative strength of the relationships in comparison to each other should not be affected. The model also assumes that the causal lag period for each of the relationships in the system is about the same, and violation of this assumption could change the relative magnitude of the results. For example, if it takes significantly longer for commitment to affect reference-group identification than *vice versa*, the results could be misleading. However, we have no reason to suspect that this is the case.

Caution should be exercised in generalizing these results to other situations, especially non-college student cohorts. Some of the sociodemographic or theoretical variables may have affected frequency of marijuana use prior to the time of the first survey but not subsequently, e.g., among high school but not college student groups. This could account for associations with marijuana use at Time 1 and the finding of no independent direct effect between Times 1 and 2. However, we cannot test this hypothesis because the effects of the theoretical variables prior to the initial survey are not analyzed in this study. Other studies of different cohorts (e.g., high school students or post-collegiate groups) might examine these effects and provide data on other time periods.

In conclusion, the results of this study strongly support the hypothesis that identification with a marijuana-using reference group is a prime determinant of the use of marijuana by college students. Institutional commitment, involvement with conventional activities, and psychological

distress appear to have little or no impact on subsequent marijuana use among students.

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