

Marijuana Use, Introspectiveness, and Mental Health*

BENJAMIN ZABLOCKI

Rutgers University

ANGELA AIDALA

Columbia University

STEPHEN HANSELL

HELENE RASKIN WHITE

Rutgers University

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Conflicting evidence suggests that marijuana use may be associated with either positive or negative mental health. This study explores the possibility that the association of marijuana use with mental health differs among various subgroups of users. Specifically, we investigate the hypothesis that marijuana use and the personality disposition of introspectiveness interact in their effects on psychological well-being. Results support this hypothesis and show that marijuana use is associated significantly with psychological distress for highly introspective individuals. In contrast, marijuana use has no such association for those low on introspectiveness. Additional evidence shows that marijuana use involves primarily self-oriented cognitive and emotional experiences for highly introspective individuals, whereas for those low on introspectiveness it is characterized more often by perceptual distortions and sensorimotor sensations.

Although the initiation of marijuana use often is associated with stressful life events and psychological distress (Kaplan 1985; Paton and Kandel 1978; Timmer, Veroff, and Colten 1985), the nature of the association between marijuana use and mental health has remained elusive. Major studies have produced inconsistent findings. In reviewing the literature, Newcomb and Bentler (1988, p. 171) concluded that "It is not clear ... what impact drug use has on changes in long-term psychological status."

Several studies, for example, show that marijuana use is associated with greater psychological distress. Kandel (1984a) and Kandel et al. (1986) found a significant

association, over time, between the use of marijuana and the frequency of self-reported symptoms of psychological distress. They also found that marijuana use was associated with a lack of stability in adult role performance. Yet they acknowledged that the strong association between smoking marijuana and the use of other illicit drugs poses a severe problem in isolating the separate effects of cannabis. Robins, Darvish, and Murphy (1970) found that adult black men with a history of marijuana use during adolescence scored worse on indicators of psychosocial functioning than adult black men who had never used the drug.

On the other hand, in a prospective study that controlled for initial levels of several potential confounding variables, Brunswick (1988) found no direct effects of marijuana use on later measures of emotional distress. Huba and Bentler (1982) reported a short-term increase in positive self-concept associated with the use of marijuana. This result suggested that marijuana use may have some

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positive psychological benefits in a manner similar to the moderate use of alcohol (Newcomb and Bentler 1988). A follow-up study of the respondents in adulthood, however, showed no change in self-acceptance associated with cannabis use (Bentler 1987).

One possible reason for these ambiguous findings is that marijuana use may not be associated with mental health in the same way for all users. The ethnographic literature suggests that marijuana use fulfills a variety of functions which are likely to be associated differentially with psychological well-being. Some people use marijuana as self-medication to mask the discomfort of pre-existing psychological difficulties (Haas and Hendin 1987; Hendin and Haas 1985). Others use it to cope with environmentally induced stress (Labouvie 1986). Still others smoke marijuana as recreation, to enhance sensory pleasure (Becker 1963; Musty 1988). Thus, dissimilar individuals may experience the drug quite differently. They may use it for differing purposes, and may feel widely varying positive or negative emotions (Musty 1988).

Some evidence suggests that psychological outcomes may be a function of interactions between personality dispositions and marijuana use. Musty (1988) argued that because individual personality characteristics are associated with variations in feelings and emotions, in self-perceptions of cognitive functions, and in physical sensations, they also may contribute to variations in the phenomenological experience of marijuana intoxication. Wilson and Maguire (1985) demonstrated that individuals with different personality characteristics have varying expectations and perceptions regarding the effects of marijuana; as a result, they have different subjective experiences associated with marijuana use.

Introspectiveness is one personality disposition that may help to specify the relationship between marijuana use and psychological distress. Introspectiveness involves the degree to which diffuse attention is focused inward on oneself as opposed to outward on the external environment (Hansell and Mechanic 1985, 1986, forthcoming; Hansell, Mechanic, and Brondolo 1986; Mechanic 1983). It is similar to concepts such as objective self-awareness (Duval and Wicklund 1972) and private self-consciousness (Buss 1980; Carver

and Scheier 1981; Fenigstein, Scheier, and Buss 1975). The highly introspective person monitors a wide variety of thoughts and feelings about the self with no specific goal or task in mind (Mechanic 1983). Transient, situationally induced changes in the focus of attention occur frequently. Relatively stable individual differences in self-attention, however, develop over time (Buss 1980; Carver and Scheier 1981; Fenigstein et al. 1975; Hansell and Mechanic 1985; Mechanic 1983). Hansell and Mechanic (forthcoming), for example, report a test-retest correlation of $r = .60$ for introspectiveness over a one-year period.

Highly introspective individuals report higher levels of psychological distress than those low on introspectiveness, as measured in terms of depressed and anxious moods (Hansell and Mechanic forthcoming). One explanation of the process underlying this finding posits the cumulative effects of self-attention on negative affect. Theoretically, self-attention can amplify both positive and negative affect, but experimental research suggests that self-attention increases negative affect most often (Gibbons 1990).

Duval and Wicklund (1972) and Wicklund (1975) increased self-attention by seating subjects in front of mirrors. These self-aware subjects subsequently reported increased negative feelings and poorer self-evaluations. The researchers concluded that self-attention stimulated a critical examination of the self, which often aroused negative feelings when the observed self failed to meet idealized standards. Most people have a finite number of positive characteristics on which they can focus, but the number of ways in which individuals can fall short of their standards is potentially unlimited. Thus self-attention results most often in self-criticism, which in turn contributes to negative affective states. We expect that this process occurs more often among highly introspective individuals, who spend relatively more time engaging in self-attention.

Introspectiveness may play an important role in the process through which marijuana-induced changes in the self are experienced and translated into temporary psychological distress and, if experienced repeatedly, into chronic psychological symptoms. Marijuana use can create several kinds of experiential discontinuities. Its effects on sensorimotor perceptions are almost always disorienting. Even when marijuana use has become a habit,

the effects of the drug still produce marked discontinuities from normal day-to-day experiences.

Such drug-induced discontinuities can stimulate self-attention. For example, some users report that marijuana use encourages contemplation and global self-evaluation, increases their understanding of self and others, and makes them feel more philosophical and more insightful about their surroundings (Hendin et al. 1987). Also, marijuana use over long periods of time can modify directly the subcultural reference group against which the self is evaluated. It does so by breaking down social relationships with nonusers and encouraging the development of relationships with other marijuana users (Becker 1963). Finally, at high doses, marijuana can induce hallucinations, delusions, paranoid feelings, and the panic associated with a bad marijuana experience (Julien 1988). Thus marijuana use typically brings about numerous changes in self-perceptions (Newcomb and Bentler 1988; Zinberg 1984), which can stimulate self-attention.

Such discontinuities are likely to be experienced differently by persons high and low on introspectiveness. We assume that introspectiveness is an enduring personality trait and therefore is unaffected by marijuana use.¹ We expect, however, that discontinuities associated with marijuana use are especially likely to trigger self-attention for individuals who are high on the disposition of introspectiveness, which may in turn contribute to psychological distress. Consequently we anticipate an interaction effect involving introspectiveness and marijuana use on psychological distress. We expect that heavier marijuana use will be associated with significantly greater psychological distress, and with depressed and anxious moods, for highly introspective individuals. In contrast, we do not anticipate a significant association between marijuana use and distress for those low on introspectiveness. For such individuals, marijuana use is less likely to precipitate self-attention and self-criticism; therefore it is not expected to be associated significantly with distress.

Current theories of self-regulation also lead us to expect an interaction effect involving introspectiveness and marijuana use. Research suggests that there is a hierarchy of responses to the self, involving progressively more complex physical, behavioral, and

global cognitive self-appraisals (Gibbons 1990). At lower levels, individuals focus on physical sensations and behaviors. At higher levels, global individual traits and personality characteristics, which are central components of the self-system, are compared with idealized standards. We expect that for individuals high on introspectiveness, marijuana use is more likely to trigger relatively high-level global self-appraisals, which in turn stimulate self-criticism and negative affect. Those low on introspectiveness are more likely to focus on relatively low-level appraisals of physical states or behaviors resulting from their use of the drug.

In summary, the ambiguous findings of prior work suggested our first hypothesis, namely that marijuana use is not associated directly with psychological distress. Consistent with earlier studies, our second hypothesis is that higher levels of introspectiveness are associated with greater psychological distress. Then we developed the argument that introspectiveness and marijuana use interact in their effects on distress. Specifically, our third hypothesis is that marijuana use is associated with greater distress for highly introspective individuals, whereas no association between marijuana use and distress exists for those low on introspectiveness. Finally, our fourth hypothesis is that individuals varying in introspectiveness differ in how they experience marijuana, as reflected in their descriptions of marijuana intoxication. Highly introspective individuals are expected to emphasize cognitive and emotional responses to marijuana, whereas we expect that those low on introspectiveness will tend to report mainly perceptual distortions and sensorimotor sensations. We hypothesize a negative association between marijuana use and mental health among individuals reporting primarily cognitive and emotional responses to marijuana use, whereas we expect no association among those reporting mainly sensorimotor responses.

METHODS

Sample

We examined these hypotheses with data from an ongoing longitudinal study of individuals who, at the time of the first interview, were members of communal living groups

(Zablocki 1980). These individuals originally were studied in their early to mid-twenties in 1974-1976; follow-up interviews were conducted in 1968-1988, when most respondents were in their thirties. Most of the follow-up interviews were conducted in person and averaged approximately three hours. These interviews consisted of an open-ended, semi-structured interview schedule and a series of closed-ended paper-and-pencil questionnaires. A small proportion of the follow-up sample was interviewed by telephone because these individuals lived out of range of field interviewers, and personal interviews were not feasible. The telephone interviews lasted one to two hours; these respondents were asked to return by mail the same paper-and-pencil questionnaires that the other subjects had completed.²

Of the 804 persons constituting the adult membership rosters of the 60 communes in Wave 1, 96 percent ($N = 772$) participated in the first wave of the study in 1974-1975. Of these, 743 were still alive in the United States or Canada by 1986. These 743 were taken as the base population for Wave 2 of the study. Of these 743 people, 11 percent ($N = 79$) could not be contacted or refused to participate in the follow-up. An additional 22 percent ($N = 164$) of the follow-up cases could not be analyzed because of incomplete data. Thus our working follow-up sample consisted of 500 cases. In this report we analyzed the 92 percent ($N = 460$) of the follow-up cases who had ever tried marijuana.

A comparison of the analytic subsample with the original commune sample in Wave 1 showed that the analytic subsample comes from somewhat more highly educated households (57% of the former, as compared to 53% of the latter, have parents who graduated from college), but otherwise is very similar to the original commune sample in demographic characteristics. The 460 respondents in the analytic subsample have a mean age of 38 years; 54 percent were male; 65 percent graduated from college; 54 percent are currently married; the mean number of children is 1.0. Virtually all the subjects are white (less than 1% nonwhite); more than three-fourths (77%) define themselves as coming from middle- or upper-class homes.

Long-term use of marijuana was not typical of the age cohorts now in mid-adulthood. Therefore the rates of marijuana use in

representative samples of these cohorts often have been too low for multivariate analysis. One advantage of our analytic subsample is that a large proportion of respondents have used marijuana intensively during the last 20 years. Approximately one-half of the analytic subsample, at some point, has used marijuana daily for at least one year. About three-fourths have used it at least weekly for one year or more. Further, approximately one-half of the subjects have smoked marijuana for at least 10 of the last 20 years. Almost half of our subjects have smoked marijuana in the last year; the rest are no longer current users. Thus the analytic subsample displayed substantial variance in the frequency and intensity of marijuana use over the study period. The results of the study, however, may not be generalizable to broader populations.

In addition, our study design does not address issues of causation. Measures of introspectiveness and psychological distress were included only in the follow-up wave of data collection. Furthermore, the use of marijuana was monitored retrospectively over a 20-year period. Therefore the results reported here are cross-sectional, and causal inferences cannot be made.

Measures

The dependent measure of psychological distress measured in the follow-up wave was the 90-item Symptom Check List (SCL-90) (Derogatis 1977). The SCL-90 has high reliability and high convergence with the MMPI and other self-report measures of mental health status. This measure yields a global severity index (GSI) of mental health and nine specific subscales. All of these scales are coded so that higher scores indicate higher levels of distress. We used as the dependent variables the GSI ($\alpha = .96$) and the subscales of depressed and anxious moods ($\alpha = .88$ and $.83$ respectively). We chose these specific subscales because epidemiological studies show that depression and anxiety are among the most common types of psychological distress experienced in the general population (Robins et al. 1984). In addition, depression and anxiety reflect most clearly the dimension of negative affect that is relevant to our specific hypotheses. To reduce skewness, we used the logs of GSI and

of depressed and anxious moods (plus 1) in the analyses.³

We measured the independent variable of introspectiveness in the follow-up wave using a 12-item scale developed by Hansell et al. (1986). Typical questions included "How much do you think about yourself?", "How much do you pay attention to your feelings?", and "How much do you try to figure yourself out?" An analytic advantage of this scale is that none of the items refer to positive or negative affect or distress. Therefore it is not confounded directly with measures of psychological distress in any simple way. The internal consistency of this measure is $\alpha = .94$.

Three specific marijuana use measures based on self-reports were included in this analysis: AMOUNT, RECENCY, and BADEXP. Within certain limits, self-reports have come to be accepted as reliable and valid indicators of substance use (Radosevich et al. 1980; Single, Kandel, and Johnson 1975). In addition, other researchers have succeeded in collecting reliable retrospective data on drug use (e.g., Fillmore, Bacon, and Hyman 1979; Kandel 1984b; Robins 1977). These measures, however, are subject to the limitations inherent in retrospective accounts.

AMOUNT is an estimate of the number of times marijuana was used during a 20-year period before the follow-up interview. It is taken from retrospective accounts of frequency of use per year for each of the 20 years. Data from our Wave 1 study of the same respondents 12 to 14 years earlier suggested that the recall of overall patterns of marijuana use was generally accurate. There was a small amount of underreporting, as indicated by discrepancies between fieldworkers' observations in 1971-1976 and retrospective self-reports. This systematic underreporting was quite rare, however: estimated major discrepancies occurred in fewer than 2 percent of all cases. The pinpointing of specific drug-related events was more often subject to a nonsystematic vagueness shift of plus or minus two years.⁴ Such randomly distributed shifts would not be expected to affect appreciably the results of this analysis. RECENCY is a measure of the number of days since the last use of marijuana, which was assessed in the follow-up wave. We used the log of RECENCY (plus 1) to reduce skewness. BADEXP is a dichotomous measure of whether the respon-

dent ever had one or more bad psychological experiences while using marijuana, which also was reported in the follow-up wave. In addition, we computed three interaction terms by multiplying each of the marijuana use measures by introspectiveness.

Let us speak here about the reason for including the variable BADEXP in our set of marijuana use measures despite the likelihood of its confounding with the dependent variables of psychological distress. Because of this possible confounding, any association discovered between BADEXP and psychological distress may turn out, of course, to be a spurious effect of the association between current psychological distress and prior distress. Therefore our goals for the analyses involving BADEXP must be somewhat different from our goals for the analyses involving AMOUNT and RECENCY. In examining the relationship between the independent variables AMOUNT and RECENCY and the dependent variables measuring psychological distress, we will aim both to predict the conditions under which adult distress will be elevated and to explain this elevation. When we examine the association between BADEXP and distress, however, our more modest aim will be simply to find an indicator that will predict (in the limited statistical sense of the word) adult distress without the implication that this indicator offers an explanation of the distress. Such a predictor would be useful, for example, in instances requiring screening for mental health risk on the basis of an adolescent report of a single bad experience with marijuana where no adolescent mental health measures are available. Even if BADEXP turns out to be associated with prior distress as well as with later distress, BADEXP still would be useful in this capacity.

Personal background and status attainment variables assessed in the follow-up wave included sex, age, marital status, number of children, education of parents, and education of respondent. Religious background, class background, income, and occupational attainment were excluded because preliminary analyses showed that they were not correlated with mental health. Race and instability of the family of origin, although theoretically relevant to the issues we are exploring, were not included in the analysis because the sample is more than 99 percent white, and more than 90 percent come from intact families of origin.

The qualitative assessment of the drug experience was based on open-ended questions in the interview. Respondents were asked to describe the experience of being high on marijuana. We explored perceptual differences by counting words or phrases in the interviews that reflected our categories of interest: self-oriented cognitive imagery and emotional affect versus sensory and physical imagery. We discounted words or phrases with negative qualifiers (not, never, rarely). We also discounted words or phrases that were associated with the first marijuana experience or the first few such experiences, if they were inconsistent with descriptions of later episodes of marijuana use. These category assignments were coded blind with respect to the introspectiveness scores of individuals.

Descriptions of the marijuana experience that were assigned to the self-oriented, cognitive/emotional category included the following words: mind, mental, ego, brain, head, thought, thinking, contemplation, meditation, deceptive, delusional, misleading, creative, mentally stimulating, light-headed, dull, stupid, hypnotic, fantasy, imagination, insight, happy, sad, fearful, brave, paranoid, depressing, elated, joyful, euphoric, doubt, certainty, questioning, critical. Descriptions of the marijuana experience that were assigned to the sensorimotor category included the following terms: senses, sights, sounds, smells, tastes, music, movies, food, eating, physical comfort, muscle relaxation, discomfort, headache, pain, nausea, dry mouth, sleepiness, sexual, horny, floating, time-distorting, laughing, goofy, giddy, silly, crying, weeping. The response that marijuana use was "just like getting drunk on alcohol" was common, but it was somewhat ambiguous and was not coded.

On the basis of these descriptions of the subjective experience of marijuana intoxication, respondents were assigned to a perceptual category. If words or phrases associated with both categories (in about equal numbers) were used to describe the experience, the response was coded as mixed. If two-thirds or more of the terms fell into one of the categories, however, the response was assigned to that category. The great majority (84%) of the responses could be assigned to either category or to a mixture of the two. The remaining 16 percent were treated as missing values.⁵

RESULTS

Associations among Marijuana Use, Introspectiveness, and Distress

The three dependent measures of psychological distress (global severity index, depressed mood, and anxious mood) were highly intercorrelated. Therefore, to avoid problems of multicollinearity, we analyzed the association between the independent variables and each distress measure in separate regression models. In addition, for each dependent measure of psychological distress, we assessed the main effects of marijuana in one regression model, the main effects of introspectiveness in a second model, and the interaction effects in a third. Specifically, for each of the three dependent variables, the first model included all of the background variables plus the three measures of marijuana use. The second model included all of the background variables plus the measure of introspectiveness. The third included all of the above variables as predictors, plus the three multiplicative interaction terms involving marijuana use and introspectiveness. These regressions are summarized in Table 1.

The results provided mixed support for the first hypothesis, namely that marijuana use is not associated directly with psychological distress. The AMOUNT and RECENCY of marijuana use were not associated significantly with any measure of psychological distress (Models 1, 4, and 7) when background factors were controlled.⁶ In contrast, having a bad marijuana experience was associated significantly with all three measures of distress. Individuals who had had a bad marijuana experience reported higher levels of GSI (Model 1), depressed mood (Model 4), and anxiety (Model 7). These results suggest that the nature or quality of the marijuana experience may be associated with psychological distress, but that the intensity or frequency of use may not be associated with distress. Taken together, however, these results provide an ambiguous representation of the association between marijuana use and psychological distress, which often has been found in prior research.

The results in Table 1 clearly support the second hypothesis, namely that introspectiveness is associated with psychological distress. Individuals with higher levels of introspectiveness had significantly higher GSI scores (Model 2), depressed mood (Model 5), and

TABLE 1. Regressions of Psychological Distress on Predictors for the Whole Sample (N = 460)

Predictors	Global Severity Index			Depressed Mood			Anxious Mood		
	1	2	3	4	5	6	7	8	9
Sex	.18*	.10	.12*	.24*	.16*	.18*	.16*	.09	.11
Age	-.03	-.02	-.02	-.03	-.02	-.01	-.01	-.01	.00
Parent Education	-.08	-.03	-.07	-.07	-.02	-.06	-.07	-.03	-.07
Marital Status	-.15*	-.12	-.10	-.15*	-.13*	-.10	-.14*	-.13	-.11
Number of Children	-.05	-.07	-.05	-.06	-.07	-.06	-.05	-.06	-.05
Own Education	-.06	-.09	-.10	-.02	-.06	-.07	.01	-.02	-.02
Amount of Marijuana	.05	—	-.10	.02	—	-.12	.06	—	-.11
Recency of Marijuana	-.06	—	.18	-.13	—	.12	-.05	—	.13
Bad Experience with Marijuana	.24*	—	.02	.21*	—	.03	.24*	—	-.02
Introspectiveness	—	.25*	.48*	—	.27*	.52*	—	.17*	.32
Intro x AMOUNT	—	—	.15	—	—	.13	—	—	.17
Intro x RECENCY	—	—	-.41*	—	—	-.43*	—	—	-.31
Intro x BADEXP	—	—	.23*	—	—	.18	—	—	.28*
Adjusted R ²	.11	.11	.19	.13	.15	.22	.09	.06	.14

Note: Standardized betas are shown. Sex is coded 0 for males and 1 for females; marital status is coded 1 for married, 0 for divorced, separated, widowed, or never married.

* Beta is significant, $p < .01$.

anxious mood (Model 8) when background variables were controlled. These results are consistent with those of earlier research on introspectiveness.

The results in Table 1 also provide substantial support for the third hypothesis—that psychological distress is associated with marijuana use for high introspectives but not for low introspectives. The interaction terms involving both recency of use and having had a bad marijuana experience were significant predictors of the global severity index (Model 3). Also, the interaction term involving RECENCY was associated significantly with depressed mood (Model 6), and the interaction term involving BADEXP was associated significantly with anxious mood (Model 9).⁷

The interaction term involving RECENCY was associated almost significantly with anxious mood ($p < .03$), and the interaction term involving BADEXP was associated almost significantly with depressed mood ($p < .02$). Thus all six interactions involving either RECENCY or BADEXP were significant or nearly significant at the .01 level. Contrary to our hypothesis, however, the interaction term involving the amount of marijuana use was not associated significantly with distress in any of the models (Models 3, 6, and 9).

Possible Confounding Effects of Other Drugs

The possible confounding effects of drugs

other than marijuana on mental health have plagued most studies of marijuana use (Kandel et al. 1986; Newcomb and Bentler 1988). Researchers have found that the use of marijuana is correlated positively with the use of every other major drug. Therefore we considered the possibility that the observed associations between marijuana use and psychological distress may be spurious effects due to the use of other drugs.

We attempted to examine the effects of marijuana use and introspectiveness for the subsample of respondents who had used marijuana but no other illicit drugs.* Unfortunately, however, this sample contained too few individuals who had used only marijuana to permit statistical analysis. Because marijuana smokers tend to be risk takers, most have experimented with at least one other drug, and many are regular polydrug users. Therefore we examined a slightly more inclusive subsample of individuals who had not used any illicit drugs other than marijuana more than five times during their lives, and who had not used any illicit drugs other than marijuana at all during the past 12 months. The drugs in this category included cocaine, heroin, and all hallucinogens, as well as analgesics, stimulants, sedatives, and tranquilizers used nonmedically. This definition yielded a subsample of 139 relatively “pure” marijuana users.

The results for this subsample are summarized in Table 2; they are generally similar to

TABLE 2. Regressions of Psychological Distress on Predictors for the Pure Marijuana User Subgroup (N = 139)

Predictors	Global Severity Index			Depressed Mood			Anxious Mood		
	1	2	3	4	5	6	7	8	9
Sex	.16	.13	.16	.20	.16	.19	.07	.04	.07
Age	.10	.09	.10	.05	.03	.06	.12	.10	.12
Parent Education	.00	.06	.03	.06	.12	.10	-.03	.04	.01
Marital Status	-.15	-.13	-.11	-.20	-.18	-.17	-.04	-.04	-.01
Number of Children	-.14	-.14	-.16	-.08	-.07	-.09	-.15	-.14	-.17
Own Education	-.20	-.22*	-.19	-.18	-.19	-.17	-.11	-.14	-.10
Amount of Marijuana	-.05	—	.29	-.04	—	.18	-.09	—	.33
Recency of Marijuana	-.12	—	.45	-.14	—	.22	-.15	—	.34
Bad Experience with Marijuana	.25*	—	-.23	.21*	—	-.28	.26*	—	-.19
Introspectiveness	—	.18	.99*	—	.26*	.75*	—	.13	.81*
Intro x AMOUNT	—	—	-.27	—	—	-.16	—	—	-.36
Intro x RECENCY	—	—	-.86*	—	—	-.50	—	—	-.70
Intro x BADEXP	—	—	.48*	—	—	.51*	—	—	.45*
Adjusted R ²	.14	.11	.24	.15	.17	.26	.06	.01	.13

Note: Standardized betas are shown. Sex is coded 0 for males and 1 for females; marital status is coded 1 for married, 0 for divorced, separated, widowed, or never married.

* Beta is significant, $p < .01$.

those obtained for the full sample, with only a few differences. For the pure marijuana users, introspectiveness was not associated significantly with the GSI or with anxiety (Models 2 and 8), although it was associated significantly with depressed mood (Model 5). In addition, the interaction term involving RECENCY was not associated significantly with depressed mood, but the interaction term involving BADEXP showed a significant correlation with depressed mood (Model 6). These slight differences could be due to the smaller subsample size; the overall pattern of results is consistent with those obtained for the whole sample.

Thus our confidence in linking the observed associations to marijuana use alone is strengthened. This confidence, however, is subject to two qualifications. First, in the case of the hallucinogens, we cannot rule out the possibility that a bad experience resulting from even a single dose may produce long-lasting distress. Second, we controlled only for the effects of illegal drugs. Because the use of tobacco and alcohol and the prescription use of analgesics, stimulants, sedatives, and tranquilizers are very common, it was not possible to control for these substances.

Differences among Individuals Varying in Introspectiveness

The significant interactions in Tables 1 and

2 suggested that marijuana use is associated differently with psychological distress for individuals who vary in introspectiveness. The presence of interaction terms, however, limits out ability to interpret main effects in these regressions. As Allison (1977) showed, main effects are interpretable in the presence of interaction terms only if the variables being multiplied have true zero points. Although each of our marijuana measures has a true zero, introspectiveness is measured on an interval scale. Therefore, to explore our third hypothesis further, we trichotomized respondents in terms of their introspectiveness scores. In Table 3 we show the results of regressions run separately for subgroups who are low, medium, and high on introspectiveness. Each regression included the marijuana use and background variables; separate regressions were run for each dependent variable.

The results provided clear support for our third hypothesis—that marijuana use is associated with psychological distress only for highly introspective individuals. Specifically, no measure of drug use was associated significantly with psychological distress for individuals low on introspectiveness (Models 1, 2, and 3), or medium on introspectiveness (Models 4, 5, and 6). For both subgroups, neither the amount nor the recency of marijuana use was associated significantly with distress; having had a bad marijuana

TABLE 3. Regressions of Psychological Distress on Predictors for Introspectiveness Subgroups

Predictors	Low Introspectiveness (N = 154)			Medium Introspectiveness (N = 163)			High Introspectiveness (N = 143)		
	GSI 1	Dep 2	Anx 3	GSI 4	Dep 5	Anx 6	GSI 7	Dep 8	Anx 9
Sex	.04	.12	-.04	.19	.27*	.12	.11	.17	.17
Age	.16	.23	.14	-.03	-.02	.02	-.12	-.15	-.06
Parent Education	-.10	.04	-.15	.02	-.05	.07	-.16	-.14	-.16
Marital Status	-.12	-.05	-.09	-.19	-.17	-.14	-.02	-.10	-.08
Number of Children	-.11	-.11	-.03	-.09	-.13	-.09	-.02	.01	-.05
Own Education	-.22	-.20	-.02	-.08	-.05	-.09	.01	.02	.10
Amount of Marijuana	-.17	-.20	-.16	.20	.13	.17	-.02	-.05	.02
Recency of Marijuana	.08	-.02	.04	.03	-.08	.06	-.25*	-.31*	-.20
Bad Experience with Marijuana	.14	.05	.07	.16	.16	.19	.33*	.29*	.35*
Adjusted R ²	.10	.07	.03	.10	.13	.07	.16	.18	.17

Note: GSI refers to the Global Severity Index, Dep refers to depressed mood, and Anx refers to anxiety. Standardized betas are shown. Sex is coded 0 for males and 1 for females; marital status is coded 1 for married, 0 for divorced, separated, widowed, or never married.
* Beta is significant, $p < .01$.

experience also was not associated significantly with distress.

A very different pattern emerged for individuals high on introspectiveness (Models 7, 8, and 9). For this subgroup, individuals who had used marijuana more recently or who had had a bad marijuana experience reported significantly higher general distress, as measured by the GSI (Model 7), and significantly higher depressed mood (Model 8). In addition, highly introspective individuals who had had a bad marijuana experience reported significantly higher levels of anxiety (Model 9).

The variance explained by all three models for the highly introspective subgroup (16% for GSI, 18% for depressed mood, and 17% for anxious mood) is substantially greater than the variance explained in the models for the subgroups with low and medium introspectiveness. Contrary to our hypothesis, however, the amount of marijuana use was not associated significantly with psychological distress for any subgroup.

It is intriguing that the amount of marijuana use was associated negatively with distress for those low on introspectiveness. Therefore those who used greater amounts of marijuana tended slightly to report less distress. This negative relationship is weak but almost significant ($p < .05, .02$, and $.08$ respectively in Models 1, 2, and 3 in Table 3) for all three measures of distress among those low on introspectiveness. This unexpected, albeit statistically nonsignificant, finding suggests

the possibility that extensive marijuana use may have a cumulative effect of anesthetizing psychological discomfort for the low introspectives.

Cognitive/Emotional versus Sensorimotor Descriptions of Marijuana Use

Our fourth hypothesis, that introspectiveness is associated differentially with the subjective experience of marijuana use, was supported by the qualitative, open-ended interview data. As expected, highly introspective marijuana users were significantly more likely to describe their experience in self-oriented cognitive/emotional terms ($r = .27$), whereas those low on introspectiveness were more likely to describe their experience in sensorimotor terms. Moreover, this association is stronger if one examines only the tails of the distribution of introspectiveness, defined as more than one standard deviation from the mean in each direction. Among these extreme cases, 84 percent were in the category consistent with our hypothesis. (These data are not presented here but are available from the authors upon request.)

We examined the association between marijuana use and psychological distress for the two subgroups who described the marijuana experience primarily in terms of cognitive/emotional or sensorimotor terms. These results, which are shown in Table 4, supported our hypothesis. Specifically, most

TABLE 4. Regressions of Psychological Distress on Predictors for Cognitive/Emotional and Sensorimotor Subgroups

Predictors	Sensorimotor (N = 85)			Cognitive/Emotional (N = 61)		
	GSI 1	Dep 2	Anx 3	GSI 4	Dep 5	Anx 6
Sex	.16	.33*	.12	.17	.23	.16
Age	-.02	.10	-.04	-.02	.01	-.12
Parent Education	.16	.14	.10	-.18	-.05	-.15
Marital Status	-.07	-.05	-.02	-.15	-.19	-.18
Number of Children	-.21	-.30	-.21	-.02	.01	.00
Own Education	-.09	-.12	.09	-.15	-.08	-.05
Amount of Marijuana	.15	.11	.13	.05	-.05	.01
Recency of Marijuana	-.01	.02	.00	-.37*	-.39*	-.39*
Bad Experience with Marijuana	.25	.18	.36*	.34*	.28	.33*
Adjusted R ²	.08	.11	.09	.24	.27	.28

Note: GSI refers to the Global Severity Index, Dep refers to depressed mood, and Anx refers to anxiety. Standardized betas are shown. Sex is coded 0 for males and 1 for females; marital status is coded 1 for married, 0 for divorced, separated, widowed, or never married.

* Beta is significant, $p < .01$.

measures of drug use were not associated significantly with psychological distress for individuals who described their experience primarily in sensorimotor terms (Models 1, 2, and 3). Neither the amount nor the recency of marijuana use was associated significantly with distress. Contrary to our hypothesis, however, having a bad marijuana experience was associated significantly with anxious mood for the sensorimotor subgroup.

The results for individuals who described the marijuana experience in primarily cognitive/emotional terms were strikingly different. Those who had used marijuana more recently or had had a bad marijuana experience reported significantly higher general distress, as measured by the GSI (Model 4), and significantly higher anxious mood (Model 6). In addition, individuals who described the marijuana experience in cognitive/emotional terms and who had used marijuana more recently reported significantly higher levels of depressed mood (Model 5). Although these results must be interpreted cautiously because of the small number of cases involved, the overall pattern of results is very similar to the results shown in Table 3. The results for the sensorimotor subgroup were similar to those for individuals low on introspectiveness, whereas the results for the cognitive/emotional subgroup resembled those for highly introspective individuals.

DISCUSSION

We examined four hypotheses about the

associations among marijuana use, the disposition of introspectiveness, and psychological distress. The first hypothesis—that marijuana use is not associated with mental health—received mixed support. AMOUNT and RECENCY of use, the measures typically used in studies of marijuana use and psychological distress (e.g., Newcomb and Bentler 1988), were not associated significantly with distress in this sample. Yet we found a significant association for BADEXP, which suggested that having at least one negative experience with marijuana is associated with negative affect.

This result must be interpreted cautiously because it is possible that people who are more distressed may experience marijuana more negatively than people who are less distressed. We could not test the direction of this effect with our cross-sectional data, but the findings suggest that future research needs to examine this relationship more closely. As mentioned earlier, our goals in including BADEXP in the model were limited to prediction and did not aspire to explanation. From the viewpoint of prevention and treatment it is useful to know that a bad marijuana experience predicts adult psychological distress, but we cannot say that this predictive indicator tells us anything about the process by which this distress is produced.

The second hypothesis was supported clearly. In keeping with earlier research, introspectiveness was associated with distress. Higher levels of introspectiveness were

associated with self-reports of greater psychological distress.

The results also supported substantially our third hypothesis—that marijuana use interacts with introspectiveness in its association with psychological distress in such a way that an association between marijuana use and mental health was observed for high introspectives but not for low introspectives. Specifically, analysis confirmed that for highly introspective individuals, marijuana use was associated significantly with self-reports of poorer adult mental health. Recency of use and having had a bad marijuana experience were associated in particular with higher levels of distress. In marked contrast, those low on introspectiveness evidenced much less association between psychological distress and marijuana use.

Our fourth hypothesis also was supported clearly by the data. Highly introspective users described marijuana use in self-oriented cognitive and emotional terms. In contrast, those scoring low in introspectiveness described marijuana intoxication in terms of distortions of normal sensorimotor functioning and disruptions or modifications of normal everyday activities. Thus the data suggested that marijuana focuses the attention of highly introspective individuals inward on the self, whereas the attention of those low on introspectiveness is directed more toward the outside world or toward physical sensations that are less likely to have implications for self-evaluation. In addition, as predicted, we found a significant association between marijuana use and mental health only for the cognitive/emotional subgroup. Those who described marijuana intoxication primarily in sensorimotor terms evidenced no significant association between marijuana use and distress.

The cross-sectional design of this investigation necessarily limits our confidence that these correlational patterns reflect the specific causal relationships which we have posited. It may be true that introspectiveness and marijuana use interact to affect subsequent psychological distress, but we cannot eliminate various reasonable alternative hypotheses. One alternative possibility, for example, is that distress causes higher levels of both drug use and introspectiveness; such a possibility would require a very different theoretical interpretation than the one developed here. Therefore these results must be

replicated in longitudinal studies before our hypotheses can be accepted with confidence.

The uniqueness of this sample of marijuana users, which consists of a select group of predominantly white, middle-class, middle-aged adults who lived in communal households during their adolescence and young adulthood, also limits our confidence in the generalizability of the results. It is possible that sample selection influenced the results. Clearly, our hypotheses need to be explored in broader, more representative samples.

Nevertheless, even after we acknowledge these limitations, the findings suggest strongly that individuals who use marijuana are not a homogeneous population with regard to outcomes. Considerable research has demonstrated that various components of the self-concept affect the motivations for marijuana use, the circumstances of use, and the likelihood of addiction. In this paper we suggest further that certain aspects of the self-concept are crucial for understanding the psychological outcomes of marijuana use. Specifically we suggest that the degree of introspectiveness may condition the association between marijuana use and distress.

The possibility of an interaction effect involving marijuana use and introspectiveness is particularly important because we (and others) have found no clear evidence of a global association between marijuana use and mental health in mid-adulthood. In this sample of white adults, the traditional measures of marijuana use (e.g., AMOUNT and RECENCY) were not associated significantly with psychological distress. Interpretable results, however, were revealed by separate analyses for subgroups of users who varied in degree of introspectiveness.

With the cross-sectional data analyzed here, we cannot determine the specific mechanisms through which introspectiveness may exacerbate the distressfulness of the marijuana experience. We speculate, however, that highly introspective individuals experience marijuana intoxication in ways that stimulate global self-evaluations and sharpen the contrast between the ideal and the perceived self. Rather than being distracted from personal problems of unusual sights, sounds, or tastes, such persons may experience marijuana as a confrontational drug, which focuses attention on the very aspects of the self that are currently most troublesome.

In contrast, those low on introspectiveness

may be more likely to have experiences that draw attention away from real or imagined deficiencies in the self, toward less crucial physical and behavioral aspects of the self, and toward perceptual distortions in the sensorimotor realm of experience. Although sensorimotor discontinuities in perception can be stressful in themselves, they are less likely to stimulate the self-evaluation and self-criticism that contribute in turn to feelings of depression and anxiety.

We speculate further that introspective and nonintrospective modalities of marijuana experience may present different kinds of dangers of maladaptive response, which, in the aggregate, may partially cancel each other out. The nonintrospective user may be more prone to habituation, overindulgence, and risk taking, and may be more likely to be influenced by external peer and environmental pressures. We even found a weak but intriguing indication that for those low in introspectiveness, the total amount of marijuana consumed may serve to reduce distress, possibly by inducing a sense of generalized well-being.

The conditions under which marijuana consumption may reduce psychological distress over the long run for low introspectives is an important area for future investigation. Huba and Bentler's (1982) finding that adolescent marijuana use can lead to increased self-esteem suggests a strategy for such investigation. Newcomb and Bentler (1988), however, provided evidence that the pathway between general drug use (including marijuana use) in adolescence and adult psychological distress leads through adolescent distress and adult psychoticism. Their data do not differentiate by introspectiveness. We may hypothesize, however, that low-introspective adolescents, highly vulnerable to feelings of worthlessness but relatively invulnerable (because of their nonintrospective dispositions) to the dangers of drug-induced psychoticism, may be precisely those in whom long-term marijuana use produces a paradoxical effect of decreasing rather than increasing psychological distress. Thus although Bentler's (1987) follow-up to the Huba and Bentler study seemed to conclude this line of investigation by showing that the positive effects of marijuana use on self-esteem did not continue over the long run, it may be useful to examine these data again,

differentiating the sample by indicators associated with introspectiveness.

In contrast, the highly introspective, self-attentive user may be more likely to become paranoid, depressed, or temporarily psychotic during or after episodes of marijuana use. Although our present analysis does not address this possibility, we would expect to find less habitual use among highly introspective individuals than among those who are low on introspectiveness. We would expect this outcome because our findings suggest that the experience of marijuana intoxication may be perceived as less unambiguously pleasurable to those high in introspectiveness.

Because introspectiveness is correlated with other psychosocial variables (e.g., self-esteem, stressful life events, extroversion, and emotional sensitivity; see Hansell and Mechanic 1985, forthcoming; Hansell et al. 1986), it is possible that the associations among introspectiveness, marijuana use, and psychological distress observed here are mediated to some degree by such variables. In exploratory analyses that are not shown here, however, we added measures of self-esteem and stressful life events to our models, but these variables did not significantly increase the variance explained in mental health outcomes. Other potential mediating variables, particularly those associated with personality dispositions, were not explored here, but they may have important theoretical implications that need to be examined in future research. Nonetheless the possibility remains that the moderating effects which we have observed for introspectiveness may reflect in fact the moderating effects of some unmeasured variable correlated strongly with introspectiveness.

We also must consider an alternative explanation for the low levels of psychological distress found among marijuana users who are low in introspectiveness. Such individuals may tend not to admit psychological problems or to report negative affect. Thus it is possible that for low introspectives, the SCL-90 indicators do not tap actual emotional states because of a systematic reporting bias. Although we cannot entirely rule out this kind of response bias as an explanation of the results, other analyses of these data are inconsistent with such an explanation. If response bias produced our findings, we would expect to find, among the low introspectives, evidence of marijuana use

associated with behavioral correlates of distress, such as family or economic dysfunction. The fact that we found no such association (White, Aidala, and Zablocki 1989) makes it less likely that the interaction effects presented here are due to any simple response bias.

If our interaction hypothesis is corroborated by future research, it will have important implications for understanding when and how marijuana use becomes problematic, as well as for the design of prevention and treatment programs. The existence of predisposing differences among users suggests that rather than attempting to prevent all marijuana use, it may be more efficient to screen and then counsel only youths at high risk for adverse consequences. On the basis of our findings, highly introspective individuals, particularly those who already have had at least one bad experience with the drug, are expected to have relatively greater chances of negative psychological consequences. In contrast, these results suggest that individuals low on introspectiveness may not incur any negative effects of marijuana use on mental health.

NOTES

1. In this paper we do not test the assumption that introspectiveness is an enduring personality trait. If subsequent research proves this assumption to be incorrect, our findings will be subject to several alternative interpretations. There is some evidence, however, that marijuana use in itself does not produce elevated levels of introspectiveness. Reich and Gutierrez (1987) examined internal attributional style, a cognitive disposition that some investigators believe to be related closely to introspectiveness, in a sample of drug-abusing subjects living in therapeutic communities and in a matched control sample. Drug abusers were assessed upon first entrance into treatment, again three or four months into treatment, and four to six months after treatment ended. Controls were tested at the first two periods. The authors found little change among either drug abusers or controls, and concluded that internal attributional disposition was stable across time and was unaffected by current drug use patterns. We must acknowledge, however, that the relationship between internal attributional style and introspectiveness is still largely speculative.
2. Some of the respondents who completed interviews over the phone did not return the supplementary questionnaires that were sent to them, or returned them only partially completed. For this reason, valid *Ns* for items on the questionnaires are somewhat lower than for items in the main interview schedule. A comparison of responses to background, behavioral, and attitudinal indicators revealed no significant differences in methods between in-person respondents and phone respondents.
3. Logging the dependent variables reduced skewness for all three dependent variables. The skewness of GSI and depressed mood were reduced to 1.65 and 1.53 respectively. Therefore we were confident in these measures because regression is robust with deviations from normality in this range. The skewness of the logged anxiety measure, however, remained greater than 3.0. Upon closer examination, this skewness resulted from seven extreme cases of anxiety measuring more than three standard deviations above the mean of the logged anxiety scores. When these seven cases were dropped from the sample, however, the skewness was reduced to 1.5; the regression analyses showed exactly the same pattern of significant betas and a very similar pattern of variances explained. For ease of comparability, we report our findings for all three dependent variables on the same sample, which includes these seven outliers on anxiety.
4. We checked the reliability of the follow-up retrospective data on marijuana use by comparing responses to the recent drug use grid with responses obtained in 1964-1975. Out of 118 randomly chosen cases we found only one inconsistent response. This response was from an individual who claimed that he did not use marijuana in 1975, just one week after his commune had been raided by the police for drugs. When reinterviewed in 1986, he reported that he had used marijuana in 1975. We also compared **nondrug** data collected retrospectively with the original interview data from 1974-1975, which suggest a clear pattern. Our respondents recall accurately whether prior events occurred and the order in which they occurred. In addition, we compared the reliability of recall of marijuana use events for high and for low introspectives to see whether a recall bias was associated with introspectiveness. We found virtually no difference in the reliability of recall between these subgroups.
5. We made transcriptions of taped interviews with a random selection of 200 respondents who described their perceptions of the marijuana "high." This was a pilot project to determine the feasibility of transcribing the recordings of the entire sample. Of the 200 respondents, 61 classified the experience unambiguously in cognitive/emotional terms, 85 in sensory/physical terms, 22 in a mixture of the

- two, and 32 in terms that could not be categorized in this way.
6. We used the .01 level of statistical significance throughout the paper unless noted otherwise.
 7. We assessed the potential effects of multicollinearity among the three interaction terms by running three separate regressions for each dependent variable, each with a different interaction term. Although the betas in these regressions varied somewhat among these three models, the statistical significance of the four interaction terms as shown in Table 1 did not change.
 8. Our strategy here is dictated by the fact that we are not interested in the mental health effects of marijuana, net of other illicit drugs, among polydrug users. Such an interest would have led us to enter measures of other drug use as additional independent variables in our model. Rather we are interested in quite a different question: whether marijuana alone, if no other drugs are abused, can lead to the elevation of symptoms of psychological distress. Therefore we chose to modify the sample for this analysis rather than modifying the model.
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Benjamin Zablocki is a professor of sociology and the director of the Social Science Research Center at Rutgers University. His current research focuses on cults and communal living and on the use of drugs and alcohol over the life course.

Angela Aidala is an associate research scientist at the Department of Sociomedical Sciences at Columbia University. She is interested in the links between broader cultural patterns and health and illness behaviors. Her current research focuses on African-Americans.

Stephen Hansell is an associate professor in the Department of Sociology and the Institute for Health, Health Care Policy, and Aging Research at Rutgers University. His research focuses on the social psychology of health and illness behavior among adolescents and the elderly.

Helene Raskin White is an associate professor of sociology at the Center of Alcohol Studies at Rutgers University. Her research focuses primarily on the development and consequences of drug use behaviors from adolescence into adulthood.