

MARIJUANA USE AND DELINQUENCY: A TEST OF THE "INDEPENDENT CAUSE" HYPOTHESIS

Helene Raskin White

This paper tests an "independent cause" hypothesis, that there is a degree of etiological independence between marijuana use and delinquency. Adolescent subjects are clustered into groups based upon their levels of marijuana use and delinquency over time. The independent cause hypothesis is supported. Specific mode of friends' deviance clearly differentiates between deviants who become more involved in marijuana use and those who become more involved in delinquency. On the other hand, while several personality variables reliably distinguish deviants from nondeviants, they do not differentiate between marijuana users and delinquents.

Introduction

Several studies using adult populations support the notion that drug use and crime are causally linked (for reviews see Gandossy et al. 1980; Watters, Reinerman and Fagan 1985; White 1990). However, studies examining the drug-crime nexus in normal adolescent populations suggest a different view of the relationships involved than have been observed for adults and raise important questions regarding both the nature of the phenomena and potential interventions (White 1990). In general, causal models have not been supported among adolescents. Rather, the spurious model is the perspective that is generating increasing research and theoretical support (Elliott and Ageton 1976; Huizinga and Elliott 1981; White 1990). This model assumes that drug use and delinquency are both elements in a concurrent cluster of other adolescent problem behaviors (Jessor and Jessor 1977; Kandel 1978), and possibly different behavioral manifestations of a general deviance orientation

Helene Raskin White is an associate professor of Sociology at the Center of Alcohol Studies, Rutgers University. The author would like to thank Drs. Marsha E. Bates, Randy LaGrange, and Valerie Johnson for their comments on this paper. Preparation of this paper was supported, in part, by grants from the National Institute on Drug Abuse (#DA-03395; #DA-03790) and the National Institute on Alcohol Abuse and Alcoholism (#AA-05823). This article is a revised version of a paper presented at the American Society of Criminology Conference in Montreal, Canada in November 1987.

which may be explained by a "common cause" or common set of factors (Elliott, Huizinga and Ageton 1985; White 1990).

This article addresses the question as to whether the drug-crime relationship is a result of common factors or whether there are independent influences for both drug use and crime. Based on research suggesting that marijuana use is part of a general deviance syndrome (Elliott and Ageton 1976; Elliott et al. 1985; Jessor and Jessor 1977), this article will test an "independent cause" hypothesis, that marijuana use and general delinquency (ranging from minor delinquent acts, such as petty theft and evading payment, to more serious acts, such as breaking and entering and grand theft) are distinct phenomena with separate influences.¹

Theoretical Issues

Evidence supporting the spurious model frequently has been derived from adolescent samples where relatively nonserious forms of substance use (cigarette smoking, occasional alcohol use, or experimentation with marijuana) appeared to occur simultaneously with relatively minor and infrequent forms of delinquent behavior. This type of association led Jessor and Jessor (1977) to identify a problem behavior syndrome in which cigarette use, precocious sexual behavior, problem drinking, use of marijuana and other drugs, stealing, and aggression clustered together. This cluster of behaviors was explained by the same set of environmental and personality variables and was negatively related to conventional behavior. In a later analysis, Donovan and Jessor (1985) found that a single latent variable was sufficient to account for the covariance among these same deviant behaviors and the findings confirmed that this variety of deviant behaviors formed a general syndrome of deviance. The concept of a problem behavior syndrome has been supported by other research as well (e.g., Johnson and White 1989; White and Johnson 1988).

While researchers agree about the co-occurrence of drug use and delinquency, the generality of deviance hypothesis is still open to debate. Fagan, Weis, Cheng and Watters (1987) suggest that drug use and delinquency may simply be two different manifestations of deviance and parallel but independent results of similar processes. They argue that a common cause hypothesis is only partially applicable to both behaviors. Similar processes may occur in parallel groups specific to each behavior, but the processes or groups are not identical and do not influence the joint occurrence of both drug use and delinquency. In other words, drug use and delinquency may be independent and separate dimensions of qualitatively different types of deviance.

Osgood, Johnston, O'Malley and Bachman (1988) also suggest that it is possible that there are common causes which partially determine a range of deviant behaviors, but independent causes which contribute to the specific form of deviance. Osgood et al. (1988) argue that if one accepts the totality of generality of deviance, then it precludes any influence of one type of deviance

on another, precludes any influences specific to particular forms of deviance, assumes a perfect correlation between the behaviors, and assumes that the type of deviant behavior engaged in would be random. It is more likely that delinquency and drug use have some influences in common and some that are specific, including one behavior serving as a partial cause of the other.

To test the issue of generality versus specificity of deviancy, Osgood et al. (1988) used a structural equation model which separated general and specific components of several types of deviance (illicit drug use, marijuana use, heavy alcohol use, criminal behavior, and dangerous driving). Their results were mixed. They identified a single latent variable that could account for virtually all the cross-sectional and longitudinal correlations among the deviant behaviors, however, this latent variable fell short of explaining all of the reliable and stable variance of the separate behaviors. Osgood et al. (1988) concluded that each behavior is, in part, a manifestation of a more general tendency toward deviance and also, in part, a unique phenomenon. Overall, however, they concluded that the influence of each behavior on another is age related but relatively negligible and that people who engage in one form of deviance are also likely to engage in others.

As stated earlier, the data are contradictory as to whether a common cause hypothesis can account for the drug-crime relationship. There have been a few noteworthy applications of theoretical common cause models. In studies of etiology, researchers have applied traditional deviance theories to explain both drug use and delinquency. The most often tested theories are control theory (Hirschi 1969), differential association theory (Sutherland and Cressey 1978) and integrations of the two (e.g., Elliott et al. 1985). For example, as predicted by control theory, adolescents who are not well bonded to their parents, to their teachers or to school are more likely to engage in delinquency (LaGrange and White 1985; Matsueda 1982) and in substance use (Elliott et al. 1985; Massey and Krohn 1986). At the same time, the deviance-inducing effect of deviant peers as postulated by differential association theory (Sutherland and Cressey 1978) has been at least equally successful in explaining adolescent substance use (Akers et al. 1979; White, Johnson and Horwitz 1986) and delinquency (LaGrange and White 1985; Matsueda 1982).

In addition, several researchers (e.g., Elliott et al. 1985; Marcos, Bahr and Johnson 1986) have applied integrated theories combining differential association and control perspectives to both delinquency and drug use. They argue that attenuated bonds to parents and school in conjunction with bonding to deviant peers predisposes one to both drug use and delinquency. Elliott et al. (1985) tested an integrated model and concluded that alcohol and marijuana use belong to a general deviance syndrome involving a wide range of minor criminal acts and predicted by a common set of causes. Their results, as well as other tests of theory cited above, strongly support a common cause hypothesis.

On the other hand, there has been evidence which suggests that there may be independent causes for involvement in delinquency and involvement in drug use (Loeber 1988) and that delinquency and drug use may represent distinctively different types of behavior (White, Pandina and LaGrange 1987). For example, research by Kandel, Simcha-Fagan and Davies (1986) failed to support a common cause hypothesis. The researchers tested a risk model combining variables from socialization, social learning, and social control theories, as well as sociodemographic variables and measures of commitment to adult roles. They compared the ability of this model to predict theft, interpersonal aggression, marijuana use, and illicit drug use among male and female young adults. Their model was better able to predict drug use than delinquency. However, this difference may have resulted from the choice of variables included in the model (a qualifier which can be applied to all of the research in this field). These researchers concluded that their results were equivocal in regard to the ability of a common cause model to predict adult participation in delinquency and use of illicit drugs; they found rather that prediction depended upon the type of delinquency, the type of drug used, and sex of the individual. For males they found a common etiology between illicit drug use and theft, but not aggressive behavior. They also found that the same factors that predicted illicit drug use among female adults predicted delinquency among males.

Fagan et al. (1987) used cluster analysis to develop a typology of substance use and delinquency. In terms of prevalence, they identified five distinct groups having varying combinations of high and low delinquency and substance use rates. In terms of incidence clusters (taking into account the frequency of each behavior), five groups also emerged with varying levels of delinquency and substance use. The results of these cluster analyses indicated that there are several heterogeneous groups of adolescents; for some groups drug use and delinquency are closely related and for others they are independent of each other (see also White et al. 1987). The incidence groups differed reliably in the expected direction on a majority of variables drawn predominantly from control theory and differential association theory. As found in most other studies, peer influences were the strongest predictors of both joint and separate occurrences of drug use and delinquency. The discriminant analyses were able to distinguish noninvolvement (no drug use, no delinquency group) from any level of involvement (the other four groups), but could not differentiate among levels of involvement (Fagan et al. 1987).

In a subsequent paper, Fagan, Weis and Cheng (1990) examined the same theoretical model using separate typologies for drug use and delinquency. Overall, they found that the model significantly predicted seriousness and intensity of substance use and delinquency, although the amount of variance explained was relatively low. When they controlled for delinquency type, they found that the model was only powerful in predicting substance use for low-level

delinquency, but not for more serious delinquency. The authors concluded that the results of their study reinforce the fact that substance use and delinquency are explained by parallel but different processes.

Elliott, Huizinga and Menard (1989) tested an integrated social-psychological model, combining elements of strain theory, social control (bonding) theory, and social learning theory, separately for drug use and delinquency. Their results did not support a common cause model. They found that delinquency was influenced by delinquent peer group bonding, sex, and the interaction between conventional and delinquent bonding. On the other hand, the only independent variable shared by both drug use (alcohol use, marijuana use, and polydrug use) and delinquency was delinquent peer bonding. They found that beliefs, age (for alcohol), and family involvement (for marijuana) had direct influences on drug use, although not on delinquency and that neither sex nor the interaction between conventional and delinquent bonding were significant influences on drug use. Rather than a common etiology, their findings suggested that drug use and delinquency have separate but related etiological paths with only one direct influence (bonding to delinquent peers) and several indirect influences (e.g., sex, school strain, belief in conventional norms) in common.

A study of adjudicated delinquents identified two groups in terms of their drug use: one group who used drugs extensively and a smaller group who never used drugs or used them only a few times (Wells et al. 1987). The former group was primarily distinguished from the latter in terms of social network variables (i.e., peer, parent and sibling definitions of drug use and use patterns). The authors concluded that the reliable variance in a specific deviant behavior, such as drug use, which is not shared with other forms of deviance may be due to the specific definitions of that behavior held by those in the social environment of the individual (Wells et al. 1987:14). On the other hand, the analysis was unable to distinguish between the two groups of delinquents in terms of control theory variables (e.g., attachment/commitment to parents and school), suggesting that those factors may be associated with a general tendency toward deviance rather than with a tendency to use or not use drugs if one is already deviant.

In another study of serious delinquency and drug use, my colleagues and I (White et al. 1987) demonstrated that drug use and delinquency represent qualitatively different types of behaviors and that there are factors that distinguish those adolescents who turn to drug use from those who turn to delinquency. The data indicated that serious drug use and delinquency are not necessarily concentrated in a homogeneous grouping of adolescents, but that several groups exist that represent somewhat unique sets of individuals whose dynamic processes are qualitatively distinct. Further, results indicated that while a combination of differential association theory and control theory is useful in explaining deviance proneness among adolescents, there may be an additional set of intrapsychic predictors (such as autonomy, impulsivity, need

for achievement and harm avoidance) that differentiate "deviants" who will become serious delinquents from those who will become serious substance abusers.

Present Study

Our purpose is to address the question of why some "deviants" become more involved in delinquent activities and others become more involved in drug use. An "independent cause" hypothesis is tested in contrast to the commonly accepted common cause hypothesis. This hypothesis predicts that there are different factors that account for specific *mode* of deviant behavior. Rather than focusing on the similarities between delinquent and drug-using adolescents, we attempt to elucidate the peer group and personality differences between them so that we may better understand the unique underlying processes involved in the development of each.

The analysis employed in the present study differs from our earlier analysis (White et al. 1987) in several ways. First, although the earlier analysis was longitudinal, the independent variables were measured at Time 1 and the dependent variables at Time 2. In this paper, groups are developed based upon both Time 1 and Time 2 measures of the dependent variables and "predictor" variables are examined at both points in time. Second, the earlier paper examined serious drug users separately from serious delinquents and noted the lack of overlap between groups. In this paper, the focus is not on serious deviance and groups are developed empirically, combining levels of both marijuana use and delinquency.

Two sets of predictor variables are hypothesized to distinguish between marijuana users and delinquents. The first set of predictors is derived from differential association/social learning theory (Akers 1985; Sutherland and Cressey 1978). It has been demonstrated that delinquency and drug use are more likely to be adopted by adolescents who are exposed to peers modeling and/or reinforcing such behavior (e.g., Akers et al. 1979; Marcos et al. 1986; White et al. 1986). Yet, some researchers do not distinguish between peer drug use and other types of delinquency such as theft and vandalism (e.g. Elliott et al. 1985). It is hypothesized that type of peer group, that is, where peers are predominantly delinquents versus marijuana users, will differentiate delinquents from marijuana users.

The second set of predictors includes variables from the personality domain to test the hypothesis that there are distinct personality characteristics that differentiate marijuana users from delinquents. Given that there is a paucity of research comparing delinquents with drug users in terms of personality characteristics, it was not viable to generate a specific set of hypotheses with regard to relative levels of selected personality traits between delinquents and drug users. Several personality traits demonstrated to be related to delinquency and/or drug use were included instead in the analyses. For example, research

MARIJUANA USE AND DELINQUENCY

has demonstrated that delinquents as compared to nondelinquents are more likely to have low self-esteem (Kaplan 1975), to be hostile (Glueck and Glueck 1950), to be aggressive and uncontrolled (measured here by emotional outbursts) (Hindelang 1972), to be high sensation seekers (White, Labouvie and Bates 1985), and to have a tendency to "psychoticism" (Eysenck 1977). Similarly, it has been demonstrated that drug users as compared to nonusers are more likely to be impulsive (Braucht, Follingstad and Berry 1973; Labouvie and McGee 1986), to be high sensation seekers (Zuckerman 1979; Bates, Labouvie and White 1986), and to be depressed (Braucht et al. 1973). Hence, this set of variables is used to test for factors that distinguish marijuana users from delinquents and to answer the question of whether delinquents can be distinguished from marijuana users in terms of specific intrapersonal characteristics.

Method

Design and Sample

Data were collected as part of the Rutgers Health and Human Development project, a prospective longitudinal study of adolescent development. Adolescents were originally identified by a random telephone survey. Following the telephone survey, field staff interviewed interested participants and their parents in their homes. Subsequently, subjects came to the test site for a full day of testing. Because the design of the project called for the testing of 450 subjects each year, evenly divided by age and gender (i.e., 75 per cell), a quota sampling procedure guided the second phase of obtaining subjects. Once the target number of 75 for a specific age-gender group was nearly reached, field interviewers were no longer assigned call-backs to eligibles in that group. About 46% of the eligible adolescents interviewed after the initial telephone call participated in the study. (For greater detail on the initial subject recruitment see Horwitz and White [1987].)

The subjects were tested initially between 1979 and 1981 (Time 1, T1) at the ages of 12, 15, and 18 ($N = 1380$). These subjects returned three years later in 1982-1984 (Time 2, T2) and were retested using essentially the same battery of instruments. The retest yielded a three-year follow-up rate of 95% ($N = 1308$). A comparison between those subjects who were retested and those who dropped out indicates minimal differences in the extent of substance use and delinquent behavior at T1 (White et al. 1987). (For more extensive details of methodological and theoretical considerations of this study see Pandina, Labouvie and White [1984].)

The total sample for the present analyses consists of 892 New Jersey adolescents grouped into two age groups. These subjects were age 12 ($N = 437$) and 15 ($N = 455$) at T1 and 15 and 18 at T2. The oldest age group (18 at T1 and 21 at T2) were eliminated from the present analysis because our earlier

research indicated that the behaviors of interest decline or level off during that age period (White, Pandina and Labouvie 1985; Pandina and White in press).

The overall sample is predominantly white (90%) compared to 83% of the New Jersey population (U.S. Bureau of Census 1981). Half of the subjects are Catholic, 30% are Protestant, 9% are Jewish, and the final 11% are another or no religion, analogous to the religious breakdown of New Jersey. The median family income of respondents' parents at T1, between \$20,000 and \$29,000, is also comparable to that of the entire state at that time (U.S. Bureau of Census 1981). Participants are comparable to refusers in demographic characteristics and selected behaviors sampled during the original telephone survey, except that participants display slightly higher parental occupation and education. Yet, neither variable is restricted in terms of dispersion. Overall, these data suggest that the sample of participants is most representative of non-minority adolescents living in a metropolitan area, working and middle-class environment. Results of analyses on validity and reliability of the data indicate that the sample has a satisfactory degree of representativeness and that empirical findings derived from it have an acceptable degree of generalizability. It is likely that the relationships observed among variables are not seriously attenuated in this sample and it is appropriate for testing theoretical and developmental issues (Donovan and Jessor 1985).

Measures

The data stem from self-report questionnaires. Self-reports are generally accepted as a reliable indicator of delinquent behavior (Hindelang, Hirschi and Weis 1981; Huizinga and Elliott 1981) and alcohol and drug use (Single, Kandel, and Johnson 1975; Rouse, Kozel and Richards 1985) if conducted in appropriate settings under nonthreatening circumstances (Dembo et al. 1990). In addition, self reports provide a more direct, sensitive and complete measure of various forms of deviant behavior than do measures based upon official law enforcement and institutional records and avoid the problem of false negatives (i.e., "hidden" cases) (Elliott et al. 1989). (For greater detail on the advantages and disadvantages of self-report data see Elliott et al. [1989] and Hindelang et al. [1981]).

To maximize reliability and validity of the self-report data, questionnaires were administered individually by a trained interviewer assigned to a participant for the length of the testing day. Participants were instructed not to put their names on any questionnaire and were repeatedly assured of the complete confidentiality of all data especially with regard to parents, teachers, and public authorities.

The level of delinquency reported by our respondents is similar to the amount of involvement found in other surveys of predominantly middle-class adolescents (e.g., Linden 1978).² The data on the prevalence of alcohol and drug use in our sample are comparable to, and replicate, rates for adolescents

MARIJUANA USE AND DELINQUENCY

living in the Northeast region of the country (Johnston, O'Malley and Bachman 1984). (Data on prevalence of substance use and delinquency for this sample are presented in detail in Pandina and White [in press].)

Dependent Variables

Scores of *delinquent behavior* (DEL) reflect the summary score of nine items that measure the self-reported frequency of property crime (grand theft, motor vehicle theft, and breaking and entering), violent crime (assault, atrocious assault, and armed robbery), and minor delinquent activity (evading payment, vandalism, and stealing things worth less than \$50). (Because the delinquency scale is made of several behaviors that we would not necessarily expect to occur together in the same individual, a reliability coefficient has not been computed for this scale.)

Marijuana use (MU) is a summary measure of frequency of use in the past year (10-point scale ranging from no use to using more than once a day), quantity on a typical occasion (10-point scale ranging from none to more than one ounce) and frequency of getting high when smoking marijuana (6-point scale ranging from never to always). The internal consistency estimate (alpha) is .90.

Peer Variables

Three measures of peer influence are used. *Friend marijuana use* (FMU) is the proportion of close friends (5-point scale ranging from none to all) who have tried marijuana and *friend delinquency* (FDEL) is the maximum proportion of close friends who have engaged in minor delinquent activities, property crimes or violent behaviors. A *ratio* (RAT) of *friends' marijuana use to friends' delinquency* (FMU/FDEL) is also employed.

Personality Variables

A total of seven measures are used to tap the intrapsychic domain:

- three scales from the Johns Hopkins Symptoms Checklist (SCL-90-R) (Derogatis 1977) which tap psychiatric symptomatology—*depression* (DEP), *hostility* (HOS) and *psychoticism* (PSY) (the psychometric properties of the SCL-90-R have been documented elsewhere [Derogatis 1977] and the internal consistency of the overall scale is greater than .85 in our sample);
- three items of engaging in *emotional outbursts* (EMO) as a means of coping with personal problems (e.g., breaking and throwing things, alpha = .57) (Labouvie 1987);
- the *Disinhibition* scale (DIS) of the Zuckerman (1979) Sensation Seeking Scale (alpha = .65);

- *self-esteem* (EST) using four items measuring positive self-evaluation (e.g., being a good person, $\alpha = .71$); and
- a second order factor derived from the Jackson Personality Research Form E (PRF) (Jackson 1968) which measures an *impulsive orientation* (IMP) by combining the subscales of play, harm avoidance (reversed), cognitive structure (reversed) and impulsivity ($\alpha = .63$).³

All variables were measured at both T1 and T2 except for the Disinhibition Scale which was not administered at T1 to 12-year-olds because Zuckerman (1979) has indicated that 14 is the minimum age for which the scale should be used.

Results

Marijuana Use Delinquency Association

First the correlations between marijuana use and delinquency across time are examined in order to simply depict the degree of association between the dependent variables. The stability coefficients for marijuana use and delinquency over a three-year period are presented in Table 1. Marijuana use is more stable than delinquency at each age level and the stability of both

Table 1
Zero-Order Correlations Between Marijuana Use (MU) and
Delinquency (DEL) Over Time by Age and Sex

Young - 12 (T1) 15 (T2) Year Olds

	Females (N=214)		Males (N=223)	
	MU T1	MU T2	DEL T1	DEL T2
MU T1		.33**	.14	.20*
MU T2	.23**		.18*	.41**
DEL T1	.10	.15		.25**
DEL T2	< .01	.46**	.15	

Old - 15 (T1) 18 (T2) Year Olds

	Females (N=227)		Males (N=228)	
	MU T1	MU T2	DEL T1	DEL T2
MU T1		.60**	.41**	.24**
MU T2	.58**		.40**	.34**
DEL T1	.25**	.26**		.43**
DEL T2	.08	.27**	.37**	

* $p < .01$
** $p < .001$

MARIJUANA USE AND DELINQUENCY

behaviors increases with age. The data suggest that the greatest fluctuations in both behaviors occur between 12 and 15 years of age.

At T1 the cross-sectional correlations between marijuana use and delinquent behavior are relatively weak for the 12 year olds (age at T1) and modest for the 15 year olds. As reported elsewhere (White, Pandina and Labouvie 1985), the T1 cross-sectional relationships are strongest for the 15-year-old males ($r = .41, p < .001$). Yet at T2, the cross-sectional relationships are comparable for 15- and 18-year-old males and the largest coefficient is obtained for the 15-year-old females. Whether these gender differences between T1 and T2 cross-sectional findings reflect cohort effects is a question beyond the scope of the present analysis. Nevertheless, it appears that, in adolescence, drug use and delinquency are at best moderately related.

The cross-lagged correlations between marijuana use at T1 and delinquency at T2 are relatively weak especially for females. On the other hand, among older males, the correlation coefficients for delinquency at T1 and marijuana use at T2 are of the same magnitude as the T2 delinquency-T2 marijuana use correlations. Thus, among males, delinquency patterns at age 15 and at age 18 are comparable predictors of marijuana use at 18.

Marijuana Use and Delinquency Clusters

A disjoint cluster analytic solution was used to identify groups of adolescents with differing levels of marijuana use and delinquency involvement over time. The purpose of cluster analysis is to place subjects into groups suggested by the data rather than defined a priori such that the subjects in a given group tend to be similar to each other in some sense and subjects in different groups tend to be dissimilar (Everitt 1980). Using the SAS FASTCLUS procedure (SAS 1985)⁴ individuals' T1 and T2 scores (standardized to a mean of 0 and standard deviation of 3 separately by age and sex) on the delinquency and marijuana use measures were clustered to obtain distinct types of deviant and nondeviant adolescents separately for each age/sex group. After initial identification of eight clusters in each group, members of smaller clusters ($N < 13$) were reassigned to the next nearest cluster in order to obtain groups of sufficient size for analysis. For the younger subjects (age 12 at T1), T1 marijuana use scores were excluded from the cluster analyses because too few subjects (3%) had tried marijuana at T1.

Among both male and female younger subjects, four clusters were retained: low on both measures at both times (LM-LD), high on marijuana but low on delinquency (HM-LD), low on marijuana, high on delinquency at T1, but low on delinquency at T2 (LM-HD1), and low on marijuana, low on delinquency at T1, but high on delinquency at T2 (LM-HD2). Note that the majority of 12 year olds fall into the low cluster group. The number of subjects falling into each cluster can be found in Table 2.

Table 2
Cluster Group Means and Standard Deviations (S.D.) on
Marijuana Use and Delinquency by Age and Sex

Age/sex	Cluster Group				
Young Males (N = 223)	LM-LD (N = 114)	HM-LD (N = 38)	LM-HD1 (N = 37)	LM-HD2 (N = 34)	
MU T1 Mean	-0.40	1.15	-0.40	0.47	
S.D.	0	5.37	0	5.05	
MU T2 Mean	-1.49	5.44	-1.54	0.59	
S.D.	0.80	1.86	0.77	3.02	
DEL T1 Mean	-1.66	0.99	3.92	0.19	
S.D.	0.86	3.74	2.89	2.33	
DEL T2 Mean	-1.54	0.81	-0.61	4.91	
S.D.	0.89	2.38	1.80	3.72	
Young Females (N = 214)	LM-LD (N = 158)	HM-LD (N = 28)	LM-HD1 (N = 15)	LM-HD2 (N = 13)	
MU T1 Mean	-0.29	1.82	-0.41	0.07	
S.D.	0.86	7.83	0	1.73	
MU T2 Mean	-1.16	6.03	1.54	-0.73	
S.D.	0.83	2.39	5.09	1.22	
DEL T1 Mean	-0.72	-0.59	9.23	-0.63	
S.D.	1.45	1.83	2.57	1.60	
DEL T2 Mean	-1.01	2.94	1.26	4.55	
S.D.	0.93	5.77	3.08	2.06	
Old Males (N = 228)	LM-LD (N = 146)	HM-LD (N = 27)	LM-HD1 (N = 24)	LM-HD2 (N = 14)	HM-HD (N = 17)
MU T1 Mean	-1.37	5.08	-0.74	-0.92	5.47
S.D.	1.31	1.68	1.90	1.79	2.41
MU T2 Mean	-1.30	3.27	1.10	0.34	4.14
S.D.	2.26	2.19	2.72	2.93	1.58
DEL T1 Mean	-1.48	0.25	3.83	1.70	5.52
S.D.	1.15	1.58	1.96	2.85	4.74
DEL T2 Mean	-1.22	-0.14	0.35	7.81	3.75
S.D.	1.47	1.67	1.59	3.94	2.32
Old Females (N = 227)	LM-LD (N = 93)	HM-LD (N = 75)	LM-HD1 (N = 26)	LM-HD12 (N = 15)	HM-HD (N = 18)
MU T1 Mean	-1.73	1.87	-1.68	-1.28	4.65
S.D.	0.85	3.24	0.81	2.06	2.22
MU T2 Mean	-2.46	2.24	-1.11	0.82	4.32
S.D.	0.96	2.07	2.53	2.75	1.66
DEL T1 Mean	-1.17	-0.21	-1.40	6.55	3.46
S.D.	1.43	2.10	1.15	4.61	2.96
DEL T2 Mean	-1.72	-1.27	3.93	4.99	4.33
S.D.	0.94	1.39	2.50	2.41	1.95

The same four groups in addition to a fifth group, high on both marijuana and delinquency at both times (HM-HD), emerged for the older males.⁵ For the older females five groups were also retained. They were identical to those for the older males except that group 4 (see above) is (low on marijuana and) high on delinquency at both T1 and T2 (LM-HD12). Hence, it appears that females who are high in delinquency by age 18 are already heavily involved by age 15.⁶

The results of the cluster analyses indicate that delinquency and marijuana use do not necessarily cluster together in one group of adolescents, but rather that there are some adolescents who are more involved in marijuana use than delinquency, some who are more involved in delinquency than marijuana use, some who are jointly involved in both behaviors, and the largest number of adolescents who are not heavily involved in either (Fagan et al. 1987; White et al. 1987). The means and standard deviations on the marijuana and delinquency measures for the cluster groups are presented in Table 2. An examination of the means supports the validity of the cluster groups that were retained and indicates that each represents a distinct group in terms of marijuana use and delinquency patterns.

Cluster Effects on Peer and Personality Variables

Repeated measures (measurement time) analyses of variance (with unequal cell sizes) were used to examine cluster group (between subjects), time (within subjects), and cluster by time interaction (within subjects) effects on the selected peer and personality variables. Main effects of cluster group would indicate between group differences in peer and personality measures across the three-year test interval and significant interaction effects would reflect differences in longitudinal trends as a function of cluster group membership. An advantage of repeated measures designs is that variability in the dependent variable that is accounted for by stable individual differences can be directly tested (Dwyer 1983). *F*-test results were considered reliable if they obtained at least a .01 level of significance. All tests were conducted separately by age and sex.

Peer Variables

The results of the repeated measures analyses for the peer group variables are presented in Table 3. Significant cluster effects are obtained for all of the peer variables across age and sex groups (except the ratio variable for older males). The means comparisons across cluster groups are provided to clarify the significant cluster group effects. Tukey tests for unequal cell sizes (SAS 1985) were performed (only on those means for which a significant main effect was found) to determine reliable differences between individual means.

Table 3
**Repeated Measures Analysis of Variance Results for
 Cluster Group Effects on Friend Variables by Age and Sex**

Variable		Cluster Group Means					F-test		
		LM-LD	HM-LD	LM-HD1	LM-HD2		Cluster Effect	Time Effect	Cluster By Time
Young Males									
RAT	T1	1.04a +	1.04ab@	0.71b	0.91ab		5.40*	40.46**	.NS
	T2	1.44ab	1.78a	1.18b	1.16b				
FMU	T1	1.29a	1.61a	1.39a	1.44a	29.67**	230.18**	25.44**	
	T2	1.96a	3.84b	1.89a	3.03c				
FDEL	T1	1.44a	1.92ab	2.47c	2.06bc	19.16**	12.02**	11.34**	
	T2	1.55a	2.57b	1.92a	3.03b				
Young Females									
RAT	T1	1.11ab	1.42a	0.83b	1.04ab	4.35*	32.00**	.NS	
	T2	1.78ab	2.22a	1.94ab	1.17b				
FMU	T1	1.27a	1.71b	1.20ab	1.15a	25.99**	159.76**	15.93**	
	T2	2.17a	4.14b	3.00c	2.23ac				
FDEL	T1	1.27a	1.38a	1.53a	1.46a	9.00**	29.89**	8.76**	
	T2	1.35a	2.36b	1.87ab	2.23b				
Old Males									
RAT	T1	1.64	1.70	1.04	1.08	1.36	.NS	21.75**	.NS
	T2	2.09	2.07	2.28	1.29	1.76			
FMU	T1	2.55a	4.26b	3.26c	3.00ac	4.47b	23.53**	15.63**	4.06*
	T2	3.14a	4.11b	3.96b	3.93ab	4.47b			
FDEL	T1	1.94a	2.85b	3.29b	3.07b	3.47b	20.90**	9.62*	4.38*
	T2	1.85a	2.37ab	2.26ab	3.36c	3.12bc			
Old Females									
RAT	T1	1.87a	2.41b	1.94ab	1.20a	1.59ab	7.86**	51.56**	.NS
	T2	2.62a	3.38b	2.47a	2.30a	2.85ab			
FMU	T1	2.54a	3.79b	2.38a	2.87a	4.06b	27.50**	50.04**	.NS
	T2	3.16a	4.32b	3.23ac	4.07bc	4.39b			
FDEL	T1	1.59a	2.05bc	1.46ab@	2.64cd	2.83d	15.17**	17.39**	.NS
	T2	1.33a	1.49ab	1.52ab	2.27c	1.83bc			

* $p < .01$; ** $p < .001$; NS = Not Significant

+ Means followed by different letters differ significantly ($p < .05$) from each other based upon Tukey tests.

@ Note that whether or not two means are significantly different from each other depends on the group sizes and the standard errors accounting for apparent inconsistencies.

As hypothesized, "marijuana-using deviants" are clearly different from "delinquent deviants" in terms of peer associations. Among the younger subjects, those in the high marijuana (HM-LD) group have the highest proportion of marijuana-using friends at T2. Also, for the younger subjects,

members of high delinquent groups (LM-HD1 or LM-HD2) as opposed to members of the high marijuana group (HM-LD) have a lower relative proportion of marijuana-using friends to delinquent friends (RAT); although, in general, the actual proportion of delinquent friends (FDEL) does not vary among high marijuana and high delinquent group members except among the younger males at T1. For older males the relative proportion of friends engaging in both behaviors (RAT) is not reliably different among cluster groups; while for older females, high marijuana users (groups HM-LD and HM-HD) have significantly more marijuana using than delinquent friends at T2 than do other subjects. Friends' marijuana use clearly distinguishes high marijuana users (groups HM-LD and HM-HD) from pure delinquents at T1 for older subjects, whereas friends' delinquency reliably distinguishes heavily involved delinquents (groups LM-HD2, LM-HD12 and HM-HD) from other groups at T2.

Significant time effects are found for all peer variables across age and sex groups. (The means comparisons are not shown here but are available from the author upon request.) There is an increase in the proportion of friends smoking marijuana and in the relative proportion of marijuana-using friends to delinquent friends from T1 to T2 for all age/sex groups. Younger subjects increase in the proportion of delinquent friends from T1 to T2 (i.e., from age 12 to 15), while older subjects decrease in the proportion of their friends engaging in delinquent activities from T1 to T2 (i.e., from age 15 to 18). These age trends for peers are consistent with those found for the subjects themselves (White, Pandina and Labouvie 1985).

The only reliable time by cluster interaction effects are for two of the friend variables. Over time, cluster differences change with respect to friends' marijuana use and friends' delinquency (except among the older females) (see Table 3). In general, the data indicate fewer differences among clusters at T1 than T2 for the younger subjects and fewer differences at T2 than T1 for the older subjects. Also, some of the differences in cluster effects over time on friends' delinquency are due to differences between T1 and T2 high delinquency groups. That is, in general, the LM-HD1 group as compared to the LM-HD2 group has the higher proportion of delinquent peers at T1 and the lower proportion of delinquent peers at T2.

Personality Variables

The repeated measures analyses of variance results for the personality variables are presented in Table 4. There are relatively fewer significant main effects for cluster group than were found for the peer variables, and when there are main effects, there are no consistent differences between groups heavily involved in marijuana use and those heavily involved in delinquency.

Intensity of emotional outbursts, disinhibition and impulsivity are significantly related to group membership across all age/sex groups (except

Table 4
**Repeated Measures Analysis of Variance Results for Cluster Group
 Effects on Personality Variables by Age and Sex**

Variable		Cluster Group Means					F-test		
		LM-LD	HM-LD	LM-HD1	LM-HD2		Cluster Effect	Time Effect	Cluster By Time
Young Males									
DEP	T1	0.74	0.82	0.99	0.84		.NS	12.12**	.NS
	T2	0.59	0.67	0.71	0.69				
HOS	T1	0.85	0.89	1.17	1.04		.NS	8.05*	.NS
	T2	0.70	0.84	0.79	0.96				
PSY	T1	0.79	0.86	1.05	0.96		.NS	16.59**	.NS
	T2	0.61	0.68	0.68	0.75				
EMO	T1	6.37a +	6.50a	7.95b	7.29ab		8.13*	.NS	.NS
	T2	6.35a	7.16ab	7.30ab	8.00b				
DIS	T1	.NA	.NA	.NA	.NA		15.99**	.NA	.NA
	T2	3.53a	5.78b	4.24ac	5.24bc				
EST	T1	14.45	14.24	14.30	15.09		.NS	.NS	.NS
	T2	15.11	14.05	15.30	14.50				
IMP	T1	22.18a	24.94b	22.38ab	24.16ab		5.29*	32.49**	.NS
	T2	24.56a	28.38b	25.09ab	27.06ab				
Young Females									
DEP	T1	0.79	0.72	0.89	0.51		.NS	.NS	.NS
	T2	0.74	1.04	0.72	0.80				
HOS	T1	0.75a	0.99a	0.94a	0.44a		5.84**	.NS	.NS
	T2	0.68a	1.37b	0.83ab	0.77a				
PSY	T1	0.79	0.77	0.74	0.45		.NS	.NS	.NS
	T2	0.65	0.84	0.63	0.69				
EMO	T1	6.16a	6.85a	7.67a	5.77a		4.61*	.NS	.NS
	T2	6.52a	7.93b	7.27ab	7.08ab				
DIS	T1	.NA	.NA	.NA	.NA		6.79**	.NA	.NA
	T2	2.70a	4.50b	3.43ab	3.23ab				
EST	T1	13.80	13.71	14.73	14.77		.NS	.NS	.NS
	T2	14.14	13.39	13.80	14.62				
IMP	T1	20.33	23.04	22.77	20.38		.NS	25.18**	.NS
	T2	23.73	28.79	23.43	24.77				
Old Males									
		LM-LD	HM-LD	LM-HD1	LM-HD2	HM-HD			
DEP	T1	0.68	0.63	0.83	0.68	0.70	.NS	.NS	.NS
	T2	0.68	0.72	0.72	0.74	0.60			
HOS	T1	0.84	0.69	1.22	0.80	1.12	.NS	.NS	.NS
	T2	0.71	0.67	0.98	1.20	0.99			
PSY	T1	0.76	0.63	0.94	0.57	0.67	.NS	.NS	.NS
	T2	0.67	0.61	0.63	0.76	0.61			
EMO	T1	6.27a	6.96ab	7.62b	7.29ab	7.76b	5.86**	.NS	.NS
	T2	6.29a	7.37ab	6.75ab	8.29b	7.53ab			
DIS	T1	3.58a	5.78b	5.29b	5.43b	5.86b	16.08**	.NS	.NS
	T2	3.88a	4.93ab	5.00ab	6.50b	6.06b			
EST	T1	15.00	14.11	14.79	14.36	14.24	.NS	.NS	.NS
	T2	15.16	15.30	14.58	14.71	14.94			

MARIJUANA USE AND DELINQUENCY

Table 4 (continued)

IMP	T1	23.80a	28.31b	27.68ab	27.71ab	30.50b	10.86**	.NS	.NS
	T2	23.78a	28.96bc	26.87ab	33.50bc	29.76bc			
Old Females		LM-LD	HM-LD	LM-HD1	LM-HD2	HM-HD			
DEP	T1	0.79	1.03	1.01	1.06	1.15	.NS	.NS	.NS
	T2	0.79	0.75	0.83	1.09	1.20			
HOS	T1	0.76a	1.08ab	0.86ab	1.25ab	1.39b	3.64*	16.43**	.NS
	T2	0.71a	0.64a	0.62a	0.79ab	1.25b			
PSY	T1	0.79	0.99	0.97	1.31	0.95	.NS	19.75**	.NS
	T2	0.58	0.46	0.64	0.87	0.98			
EMO	T1	6.54a	7.53b	7.38ab	8.47b	8.22b	6.20**	.NS	.NS
	T2	6.47a	6.84ab	7.12ab	8.13b	7.94b			
DIS	T1	2.58a	4.04bc	3.24ac	4.47bc	5.22b	13.68**	.NS	.NS
	T2	2.80a	3.91b	3.96bc	4.47bc	5.28c			
EST	T1	14.65	14.32	14.73	13.53	14.28	.NS	.NS	.NS
	T2	15.18	15.31	15.12	13.87	14.44			
IMP	T1	22.47a	24.05ab	22.96ab	28.40b	27.82b	5.62**	.NS	.NS
	T2	22.12a	24.41a	24.50a	31.00b	26.61ab			

* $p < .01$; ** $p < .001$; NS = Not Significant; NA = Not Assessed

+ Means followed by different letters differ significantly ($p < .05$) from each other based upon Tukey tests.

impulsivity for younger females). While these variables are significantly related to cluster group membership, the means comparisons indicate that there are no consistent marijuana user versus delinquent differences. The level of emotional outbursts tends to be reliably higher among delinquents (LM-HD1, LM-HD2, and/or HM-HD) as compared to the low group members (LM-LD) in most comparisons (except younger females), yet there are no significant differences between high marijuana (HM-LD) and high delinquency (LM-HD1, LM-HD2 and HM-HD) groups (except younger males at T1). Similarly, among males, impulsivity tends to be reliably higher among members of the high marijuana group (HM-LD) versus members of the low group (LM-LD), yet it does not distinguish high marijuana users (HM-LD) from delinquents (LM-HD1 and LM-HD2). Further, among older subjects, level of disinhibition is clearly higher in the high marijuana and high delinquency group (HM-HD) than in the low group (LM-LD), although it does not differ between the two types of deviants.

While a significant cluster group effect is found for hostility among females, the means comparisons do not indicate any consistent pattern of differentiation except that members of the high group (HM-HD) score significantly higher than members of the low group (LM-LD) in hostility among the older females. Finally, subjects grouped by level of marijuana use and delinquency are not reliably different in level of self-esteem, depression or psychoticism.

Reliable time effects are also obtained for some of the personality variables. (The means are not presented here, but are available from the author upon request.) For example, younger males increase in depression, hostility, and psychoticism from age 12 to 15. Older females decrease on the hostility and

psychoticism subscales from T1 to T2. Impulsivity increases from age 12 to age 15 for both sexes. There are no significant time by cluster group interaction effects on the personality variables.

Discussion

The findings of this study do not support the assumption that marijuana use and delinquency are part of a general deviance syndrome and are caused by the same set of factors. First, the correlational analyses indicate that the relationship between delinquency and marijuana use is moderate at best and that over 75% of the variance is not shared. These findings are consistent with other correlational analyses (e.g., Elliott et al. 1989; White, Pandina and Labouvie 1985), however, alternative methods of establishing an association have demonstrated stronger relationships (Elliott et al. 1989; Fagan et al. 1987; White, Johnson and Garrison 1985a).

Second, the differences in stability rates and in developmental patterns of marijuana use and delinquency found here, as well as elsewhere, further negate the assumption of a general tendency towards deviance. Experimentation with both behaviors generally begins during the period from early to middle adolescence. Most adolescents mature out of delinquency by late adolescence, while, for the majority of drug users, drug use increases during adolescence and generally remains stable into young adulthood (Elliott et al. 1989; Kandel et al. 1986). Because adolescence is the period of initiation and experimentation with both marijuana use and various types of delinquent behavior, the marijuana use-delinquency relationship may simply be the result of the synchronous occurrence of both behaviors during the same period in adolescence. Thus, the relationship between marijuana use and delinquency may be better explained by a coincident hypothesis than a common cause hypothesis.

Third, the cluster analyses confirm that marijuana use and delinquency do not necessarily cluster together in one group of adolescents, but that some adolescents are not heavily involved in either behavior, some are more involved than their peers in marijuana use but less involved in delinquency and vice versa, and a small minority of adolescents are involved heavily in both behaviors. While the first and last groups might fit the expectation of a generality of deviance assumption, the middle groups suggest that certain adolescents are primarily delinquent and others are primarily marijuana users, thus, supporting a specificity of deviance hypothesis (Fagan et al. 1987; White et al. 1987).

Finally, the data suggest that independent influences, specifically the relative proportion of peers who engage in one or the other activity, clearly affect the type of deviance engaged in by individuals. Thus, these data support differential association theory's general prediction that peer behaviors are strongly related to adolescent behaviors (e.g., Akers et al. 1979) and further qualify this assumption. For example, Elliott and his colleagues (1985) reported that attachment to deviant (i.e., delinquent) peers is strongly related to adolescent

drug use. But present findings suggest that it is the specific *type* of deviance that is engaged in by peers which helps predict the specific type of deviant behavior, thereby confirming that marijuana users and delinquents are not necessarily an equivalent group of individuals, certainly in terms of their peer associations (Jackson, Tittle and Burke 1986; Wells et al. 1987; White, Johnson and Garrison 1985). While our findings suggest that differences in peer group are important, they do not address the question of selection versus socialization (Elliott et al. 1985; Kandel 1985).

On the other hand, the data do not confirm that these two distinct types of deviants differ in terms of any of the personality variables studied here. While emotional outbursts might be a common occurrence among delinquents and impulsivity might be a salient characteristic of drug users, neither of these variables differ reliably between these types of deviants. The fact that the findings for the personality variables are less consistent than those for the peer variables might result from the selection of variables and perhaps there are alternative personality variables which distinguish between deviants. Alternatively, peer behaviors may in some ways be proxy measures of adolescent behaviors causing the observed relationships to be very strong, while personality characteristics may be underlying factors only indirectly related to the behaviors of interest. More research in the area of personality differences will help clarify this issue.

There are several other factors that have not been considered here which could differentially influence marijuana use and delinquency outcomes. For example, a possible explanation for why some adolescents become more involved in delinquency and others in marijuana use is differential opportunity (Cloward and Ohlin 1960). One might speculate that demographic characteristics or neighborhood composition affect access to certain peer groups, to opportunities to learn certain behaviors, or to specific drugs (Fagan 1989).

Another fruitful avenue for exploration may be found in the reinforcements derived from behaviors. That is, we may need to look more closely at personal motivations for using drugs and engaging in delinquency in order to gain a better understanding of the reasons why certain individuals are drawn to certain forms of deviance. Pharmacological and social reinforcements of alcohol and drugs have been demonstrated to be important determinants of continued use (Akers 1985; Labouvie 1986; White, Bates and Johnson 1990). In addition, the reasons for committing delinquent acts have been found to vary for different types of delinquency (Agnew 1988). More of this type of research is needed.

Before concluding, two comments deserve mention. First, while I have argued here that marijuana use and delinquency are independent forms of deviance, this does not exclude the possibility that they also share common influences. That is, I support the view that marijuana use and delinquency have some influences in common and some that are specific (Osgood et al. 1988).

This research, in conjunction with my earlier research (White et al. 1987) and that of others (e.g. Wells et al. 1987), suggests that the constructs of social learning theory (Akers 1985) and differential association theory (Sutherland and Cressey 1978) may help explain variations in specific deviant behavior beyond that shared by other forms of deviance, while constructs from other theories, such as control theory (Hirschi 1969), may be useful for explaining a general tendency toward deviance (Wells et al. 1987:14). Second, this study examined the relationship between marijuana use and delinquency in a predominantly white, working and middle-class sample with a relatively low rate of serious crime. An examination of more serious behaviors (e.g., crack/cocaine use or index offenses) or high-risk populations (e.g., gang members or inner-city residents) could yield different results and might have more relevance for crime control and drug control policies.

NOTES

1. In this paper, as is common in most of the current research in this area, drug use is distinguished from other forms of delinquency. Specifically, marijuana use, meaning patterns of use, will be distinguished from *non-drug* delinquent behaviors (i.e., excluding illicit drug use, possession, distribution, and importation).
2. It is important to recognize that the study population is not unusually high in delinquency, yet a significant number of subjects have reported involvement in serious crime (Pandina and White in press).
3. The reliability of some of the intrapersonal variables is lower than is desirable. However, some amount of the low reliability is accounted for by the small number of items in each scale. Also, these scales have been validated in other studies (Labouvie 1987; Zuckerman 1979; Jackson 1968; Derogatis 1977).
4. The FASTCLUS procedure finds disjoint clusters using a *k*-means method and is especially suited for large data sets. It uses "nearest centroid sorting" and the clustering is done on the basis of Euclidean distances computed from one or more numeric variables (SAS 1985; Everitt 1980; Anderberg 1973).
5. There was also a sixth group of subjects whose marijuana use scores were significantly higher than those of the low group (LM-LD) members (-.49 vs. 1.69 at T1 and 1.95 vs. -2.48 at T2, respectively), but whose delinquency scores were the same. However, the marijuana use scores of the members of the sixth group were significantly lower than those for the members of the high marijuana group (HM-LD) and the high group (HM-HD). Thus, this sixth group did not constitute a distinct enough group of marijuana users and was merged with the low group.

MARIJUANA USE AND DELINQUENCY

6. A sixth group was also identified whose members were high on marijuana at T2, but were low at T1. Yet, the marijuana use for the low group (LM-LD) and both delinquency groups (LM-HD1 and LM-HD2) at T1 was lower than that observed for this sixth group (mean = .54), so that this group was combined with the group high on marijuana at both times (HM-HD).

REFERENCES

- Agnew, R.
1988 The Origins of Delinquent Events: An Examination of Offender Accounts. Presented at the American Society of Criminology Meetings. Chicago, Illinois.
- Akers, R.
1985 *Deviant Behavior*. Belmont, California: Wadsworth Publishing Co.
- Akers, R.L., M.D. Krohn, L. Lanza-Kaduce and M.J. Radosevich
1979 Social Learning and Deviant Behavior: A Specific Test of a General Theory. *American Sociological Review* 44:636-655.
- Anderberg, M.R.
1973 *Cluster Analysis for Applications*. New York: Academic Press.
- Bates, M.E., E.W. Labouvie and H.R. White
1986 The Effect of Sensation Seeking Needs on Alcohol and Marijuana Use in Adolescence. *Bulletin of the Society of Psychologists in Addictive Behaviors* 5(1):29-36.
- Braucht, G.N., D. Follingstad and K.L. Berry
1973 Deviant Drug Use in Adolescence. A Review of Psychosocial Correlates. *Psychological Bulletin* 79(2):92-106.
- Cloward, R.A. and L.E. Ohlin
1960 *Delinquency and Opportunity: A Theory of Delinquent Gangs*. Glencoe, Illinois: Free Press.
- Dembo, R., L. Williams, E., Wish and J. Schmeidler
1990 *Urine Testing of Detained Juveniles to Identify High-Risk Youth*. Washington, D.C.: U.S. Department of Justice.
- Derogatis, L.R.
1977 *SCL-90R (Revised version) Manual 1*. Baltimore: John Hopkins University School of Medicine.
- Donovan, J.E. and R. Jessor
1985 Structure of Problem Behavior in Adolescence and Young Adulthood. *Journal of Consulting and Clinical Psychology* 53:890-904.
- Dwyer, J.H.
1983 *Statistical Models for the Social and Behavioral Sciences*. New York: Oxford University Press.

- Elliott, D.S. and A.R. Ageton
1976 The Relationship Between Drug Use and Crime among Adolescents. In *Appendix to Drug Use and Crime: Report of the Panel on Drug Use and Criminal Behavior*, Research Triangle Institute (ed.). Springfield, Virginia: National Technical Information Service (NT15 No. PB 259,767).
- Elliott, D.S., D. Huizinga and S.S. Ageton
1985 *Explaining Delinquency and Drug Use*. Beverly Hills, California: Sage Publications.
- Elliott, D.S., D. Huizinga and S. Menard
1989 *Multiple Problem Youth: Delinquency, Substance Use and Mental Health Problems*. New York: Springer-Verlag.
- Everitt, B.S.
1980 *Cluster Analysis*. 2nd ed. London: Heineman Educational Books Ltd.
- Eysenck, H.J.
1977 *Crime and Personality*. London: Routledge and Kegan Paul.
- Fagan, J.
1989 The Social Organization of Drug Use and Drug Dealing among Urban Gangs. *Criminology* 27(4):63-667.
- Fagan, J., J.G. Weis, and Y-T. Cheng
1990 Drug Use and Delinquency among Inner City Students. *Journal of Drug Issues* 20(3):349-400.
- Fagan, J., J.G. Weis, Y-T. Cheng and J.K. Watters
1987 *Drug and Alcohol Use, Violent Delinquency and Social Bonding: Implications for Theory and Intervention*. San Francisco: The URSA Institute.
- Gandossy, R.P., J.R. Williams, J. Cohen and H.J. Harwood
1980 *Drugs and Crime: A Survey and Analysis of the Literature*. Washington, D.C.: U.S. Department of Justice.
- Glueck, S. and E. Glueck
1950 *Unraveling Juvenile Delinquency*. New York: Commonwealth Fund.
- Hindelang, M.J.
1972 The Relationship between Self-reported Delinquency to Scales of the CPI and MMPI. *Journal of Criminal Law, Criminology and Police Science* 63(1):75-81.
- Hindelang, M.J., T. Hirschi and J.G. Weis
1981 *Measuring Delinquency*. Beverly Hills, California: Sage Publications.
- Hirschi, T.
1969 *Causes of Delinquency*. Berkeley: University of California Press.
- Horwitz, A.V. and H.R. White
1987 Gender Role Orientations and Styles of Pathology among Adolescents. *Journal of Health and Social Behavior* 28:158-170.

MARIJUANA USE AND DELINQUENCY

Huizinga, D.H. and D.S. Elliott

- 1981 *A Longitudinal Study of Drug Use and Delinquency in a National Sample of Youth: An Assessment of Causal Order* (A Report of the National Youth Survey). Boulder: Behavioral Research Institute.

Jackson, D.N.

- 1968 *Personality Research Form*. Goshen, New York: Research Psychologists Press.

Jackson, E.F., C.R. Tittle and M.J. Burke

- 1986 Offense Specific Models of Differential Association Process. *Social Problems* 33:335-356.

Jessor, R. and S. Jessor

- 1977 *Problem Behavior and Psychosocial Development - A Longitudinal Study of Youth*. New York: Academic Press.

Johnson, V. and H.R. White

- 1989 An Investigation of Factors Related to Intoxicated Driving Behaviors among Youth. *Journal of Studies on Alcohol* 50(4):320-330.

Johnston, L.D., P.M. O'Malley and J.G. Bachman

- 1984 *Drug Use and American High School Students, 1975-1983*. Rockville, Maryland: National Institute on Drug Abuse.

Kandel, D.B. (ed.)

- 1978 *Longitudinal Research on Drug Use: Empirical Findings and Methodological Issues*. New York: Hemisphere-Halsted.

Kandel, D.B.

- 1985 On Processes of Peer Influences in Adolescent Drug Use: A Developmental Perspective. *Advances in Alcohol and Substance Abuse* 4:139-163.

Kandel, D.B., O. Simcha-Fagan and M. Davies

- 1986 Risk Factors for Delinquency and Illicit Drug Use from Adolescence to Young Adulthood. *Journal of Drug Issues* 16:67-90.

Kaplan, H.B.

- 1975 *Self-Attitudes and Deviant Behavior*. Pacific Palisades, California: Goodyear Publishing Company.

Labouvie, E.W.

- 1986 The Coping Function of Adolescent Alcohol and Drug Use. In *Development as Action in Context*, R. K. Silbereisen, K. Eyferth and G. Rudinger (eds.), 228-240. New York: Springer-Verlag

Labouvie, E.W.

- 1987 Relation of Personality to Adolescent Alcohol and Drug Use: A Coping Perspective. *Pediatrician* 14:19-24.

Labouvie, E.W. and C.R. McGee

- 1986 Relation of Personality to Alcohol and Drug Use in Adolescence. *Journal of Consulting and Clinical Psychology* 54(3):289-293.

- LaGrange, R.L. and H.R. White
1985 Age Differences in Delinquency: A Test of Theory. *Criminology* 23(1):19-47.
- Linden, R.
1978 Myths of Middle-Class Delinquency: A Test of the Generalizability of Social Control Theory. *Youth and Society* 9(4):407-31.
- Loeber, R.
1988 Natural Histories of Conduct Problems, Delinquency, and Associated Substance Use. In *Advances in Clinical Child Psychology* Vol. 11: 73-124, B.B. Lahey and A.E. Kazdin (eds.). New York: Plenum Press.
- Marcos, A.C., S.J. Bahr and R.E. Johnson
1986 Test of a Bonding/Association Theory of Adolescent Drug Use. *Social Forces* 65(1):135-161.
- Massey, J.L. and M.D. Krohn
1986 A Longitudinal Examination of an Integrated Social Process Model of Deviant Behavior. *Social Forces* 65(1):106-134.
- Matsueda, R.L.
1982 Testing Control Theory and Differential Association Theory: A Causal Modeling Approach. *American Sociological Review* 47:498-504.
- Osgood, D.W., L.D. Johnston, P.M. O'Malley and J.G. Bachman
1988 The Generality of Deviance in Late Adolescence and Early Adulthood. *American Sociological Review* 53:81-93.
- Pandina, R.J., E.W. Labouvie and H.R. White
1984 Potential Contributions of the Life Span Developmental Approach to the Study of Adolescent Alcohol and Drug Use: The Rutgers Health and Human Development Project, A Working Model. *Journal of Drug Issues* 14(2):253-268.
- Pandina, R.J. and H.R. White
in press The Relationship between Alcohol and Marijuana Use and Crime: Implications for Intervention and Prevention. In *Juvenile Offenders with Drug, Alcohol and Mental Health Problems*, C. Hampton and I. Silverman (eds.) 238-281. Rockville, Maryland: ADAMHA and OJJDP.
- Rouse, B.A., N.J. Kozel, L.G. Richards (eds.)
1985 *Self-Report Methods of Estimating Drug Use: Meeting Current Challenges to Validity* (NIDA Research Monograph 57). Rockville, Maryland: NIDA.
- SAS Institute, Inc.
1985 *SAS User's Guide, Statistics*. Version 5 Edition. Cary, North Carolina: SAS Institute, Inc.

MARIJUANA USE AND DELINQUENCY

Single, E., D. Kandel and B. Johnson

1975 The Reliability and Validity of Drug Use Responses in a Large Scale Longitudinal Survey. *Journal of Drug Issues* 5(4):426-433.

Sutherland, E.H. and D.R. Cressey

1978 *Criminology*. 10th ed. Philadelphia: Lippincott.

U.S. Bureau of the Census

1981 Current Population Survey: Money, Income and Poverty Status of Families and Persons in the United States: 1980. *Current Population Reports, Series P-60. No. 127*. Washington, D.C.: Government Printing Office.

Watters, J.K., C. Reinerman and J. Fagan

1985 Causality, Context, and Contingency: Relationships between Drug Abuse and Delinquency. *Contemporary Drug Problems: A Law Quarterly* 12:351-373.

Wells, E.A., R. Catalano, J.D. Hawkins, J.M. Jenson and C.K. Stevens

1987 Drug Use among Delinquents: More Evidence for the Common Cause/Separate Cause Debate. Presented at the American Society of Criminology Meetings, Montreal, Quebec, Canada.

White, H.R.

1990 The Drug Use-Delinquency Connection in Adolescence. In *Drugs, Crime and the Criminal Justice System*, R. Weisheit (ed.) 215-256. Cincinnati, Ohio: Anderson.

White, H.R., M.E. Bates and V. Johnson

1990 Social Reinforcers of Alcohol Consumption. In *Why People Drink: Parameters of Alcohol as a Reinforcer*, W.M. Cox (ed.) 233-261. New York: Gardner Press.

White, H.R. and V. Johnson

1988 Risk Taking as a Predictor of Adolescent Sexual Activity and Use of Contraception. *Journal of Adolescent Research* 4:317-331.

White, H.R., V. Johnson and C. Garrison

1985 The Drug-Crime Nexus among Adolescents and Their Peers. *Deviant Behavior* 6(2):183-204.

White, H.R., V. Johnson and A. Horwitz

1986 An Application of Three Deviance Theories to Adolescent Substance Use. *International Journal of the Addictions* 21(3):347-366.

White, H.R., E.W. Labouvie and M.E. Bates

1985 The Relationship between Sensation Seeking and Delinquency: A Longitudinal Analysis. *Journal of Research in Crime and Delinquency* 22(3):197-211.

White, H.R., R.J. Pandina and E.W. Labouvie

1985 The Drug-Crime Nexus: A Longitudinal Analysis. Presented at the Society for the Study of Social Problems Meeting, Washington, D.C.

WHITE

White, H.R., R.J. Pandina and R.L. LaGrange

1987 Longitudinal Predictors of Serious Substance Use and Delinquency.
Criminology 25:715-740.

Zuckerman, M.

1979 *Sensation Seeking: Beyond the Optimal Level of Arousal*. Hillsdale,
New Jersey: Lawrence Erlbaum Associates.