

The At-risk Adolescent Marijuana Nonuser: Expanding the Standard Distinction

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Abstract This research expands the user/nonuser dichotomy commonly used in research on marijuana. By conceptualizing nonusers as homogeneous, vital nuances in susceptibility to risk and protective factors may be overlooked. Research operations tested the predictive validity of a brief measure that divided nonusers into resolute and vulnerable subcategories; determined whether variables that distinguished nonusers and users were more informative when a tripartite classification was used; and with an eye on future prevention, examined variables on which resolute nonusers were similar to vulnerable nonusers or users, and on which they differed from both. A nationally representative sample of respondents ($N=2,111$; ages 12–16 years) from the National Survey of Parents and Youth was used in this secondary analysis. Panel data gathered yearly over four rounds included information on intentions and use of marijuana and other illicit substances, along with social, demographic, intrapersonal, and parental variables. The three groups differed significantly on associates' marijuana use, participants' approval of others' use, and cigarette and alcohol use. Resolute nonusers differed from vulnerable nonusers and users alike on religiosity, delinquency (self and friends'), refusal strength, sensation seeking, parental monitoring and warmth, and adult supervision. Results support the utility of distinguishing vulnerable from resolute nonusers, counsel against considering nonusers as a homogeneous group, and provide insight into variables that might prove useful in future prevention efforts.

Keywords Marijuana usage · Risk taking · Adolescent attitudes · Drug initiation · Drug abuse · Risk factors · Secondary analysis · Vulnerability

Despite massive public expenditures to curtail its adoption, marijuana remains the illicit drug most widely used by adolescents in the United States (Johnston et al. 2006). Consequences of marijuana use include increased risk of sexually transmitted diseases (Boyer et al. 1999), problems at school (Lynskey and Hall 2000), motor vehicle accidents (Smiley 1999), and lung and bronchial cancers (Sidney et al. 1997). The most common substance reported in adolescents' emergency department admissions (Office of Applied Studies 2000), marijuana can impair adolescent development (Hall and Solowij 1998); heavy usage can attenuate learning and mental flexibility (Lundqvist 2005), and may precipitate psychosis and schizophrenia in vulnerable youth (Ferdinand et al. 2005; Hall 1998; Smit et al. 2004). These stark findings clearly counsel prevention. To maximize scarce resources, youth most vulnerable to marijuana initiation must be identified (Crano and Burgoon 2002; Kosterman et al. 2000). Early marijuana risk research traditionally focused on differences between users and nonusers. Later studies explored differences among users (Jessor and Jessor 1977; Kandel et al. 1992), a reasonable tactic if the research is concerned with treatment variations; but if prevention is central, then factors that identify differences among *nonusers* may be critical (Siegel et al. 2003). The goal of this study is to expand prior research differentiating within-group differences among marijuana nonusers.

Across substances, investigation of differences among nonusers is rare. The few published studies generally divide nonusers into two subcategories, which we have termed

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resolute and vulnerable (Crano et al. 2007), although specific terminology varies (Anderson et al. 2002; Pierce et al. 1996). Vulnerable nonusers have not used the substance, but are expected to do so. Most of this research is concerned with tobacco use. There are systematic differences between resolute and vulnerable nonusers in exposure to tobacco ads (Wakefield et al. 2006), outcome expectancies (Anderson et al. 2002), ease of quitting (Siegel et al. 2003), reactions to anti-industry messages, and sensation seeking (Thrasher et al. 2006).

Comparable differences have emerged among nonusers of illicit drugs. Relative to resolute nonusers, vulnerable nonusers were less satisfied with their lives at home and school, had higher positive and lower negative expectancies regarding drug use, and greater levels of home and school deviance (McCusker et al. 1995). Crano et al. (2007) found resolute inhalant nonusers significantly more susceptible to persuasive anti-inhalant communications. This susceptibility was significantly related to lower usage intentions. In research on marijuana, Olds et al. (2005) found vulnerable nonusers more likely than resolute nonusers to report higher close-friend approval of usage, higher anticipated usage frequency, lower academic performance, and more close friends who used.

Together, these results indicate nonusers do not constitute a homogeneous group; yet, research on marijuana rarely considers variations among them. Assuming homogeneity can lead to crucial factors being ignored (McMillan et al. 2003). Moreover, studying distinctions among nonusers may provide insights into which variables follow marijuana initiation, and which anticipate its use. Prevention researchers may find it advantageous to know which variables change prior to, or after, marijuana uptake. Our goal is to draw attention to the utility of discriminating among nonusers by testing the predictive utility of a brief categorization measure; using discriminant function analysis (DFA) to determine if variables that in past research have been found to distinguish between nonusers and users are more informative when a tripartite (user vs vulnerable or resolute nonuser) model is used; and to examine variables on which vulnerable nonusers are similar to, or different from, respondents in other user categories.

The first step in assessing the utility of partitioning nonusers is devising a practical categorization scheme. In research on tobacco, participants usually are asked a series of questions about smoking intentions. Those answering “definitely no” to all intent items are considered resolute, and are predicted not to initiate use; those who respond in any other way are considered vulnerable (Pierce et al. 1996). The predictive validity of this measurement approach has not been tested in research on marijuana, and would seem a necessary first step in developing evidence-based prevention approaches. Accordingly, the first anal-

ysis is designed to determine if abstinent adolescents classed as vulnerable will prove more susceptible to later use than resolute nonusers. If the classification scheme distinguishes between nonusers who remain abstinent and those who progress to usage, the next question becomes whether the distinction facilitates understanding. A classification that merely differentiates nonusers based on likelihood of future use may be mute with respect to factors relevant to usage.

To assess the utility of the differentiation, operations turn to construct validation using variables established in past research to discriminate users from nonusers. Social, demographic, academic, behavioral, parental, and intrapersonal variables are used in Analysis 2, which is concerned with the question of whether the proposed differentiation offers a parsimonious and useful explication of variables known to distinguish between nonusers and users.

A final analysis may prove critical for prevention efforts. Analysis 3 will illuminate the variables on which the groups differ, and will identify the variables that are coincident with or follow marijuana use, and those whose change anticipates initiation. If we are to prevent use, it would seem most functional to distinguish variables that change prior to marijuana uptake from those that change after, or are concomitant with, marijuana initiation.

Method

Instrument Development

Data for this secondary analysis were collected in the National Survey of Parents and Youth (NSPY), research conducted in concert with the National Youth Anti-drug Media Campaign (NSPY undated). The NSPY affords the opportunity to test the predictive validity of the proposed categorization, and provides a host of variables potentially associated with usage. In the NSPY, respondents were identified in a face-to-face screening of a scientifically selected random sample of 81,000 dwelling units within 90 geographic areas (primary sampling units: PSUs). The screening sample used two sampling frames. The primary frame was a subset (90 of 100 PSUs) of a housing unit list compiled for an earlier nationally representative survey on adult literacy. The second frame was a permit list of housing units constructed between January 1990 and December 1998 in the sampled PSUs. It ensured that dwellings built after the original frame was developed would be sample-eligible. Selection of dwelling units occurred in three stages: PSUs were selected; segments (blocks, or contiguous blocks of at least 60 housing units) were chosen from within sampled PSUs; dwellings were selected. After dwelling selection, letters were mailed to

potential respondents indicating that they would be contacted to determine eligibility, which required that the household contain respondents of an age specified by the sampling methodology and that the housing unit was built in the appropriate time frame. Non-sensitive data were collected via computer-assisted personal interviews. Sensitive data (drug-relevant perceptions and behaviors) were collected via audio computer-assisted self-administered interviewing: Respondents completed items privately using headphones and touch-sensitive screens. Respondents were interviewed four times, at approximately yearly intervals, from November 1999 to June 2004. They received \$20 for each interview.

Sampling Weights

Weights were calculated to offset disproportionate selection probabilities used in the sampling design. The probability of selection depended on respondents' ages and that of their siblings, if any, living in the household. Youth 12–13 years of age were oversampled relative to older respondents. Weights were used to offset this disproportionality. Weights also offset differences between the sample distributions and the population distributions that resulted from differences in (non)response rates and coverage (NSPY, undated). The overall cross-sectional response rate for all youth (ages 9–18) at each round, defined as the product of (a) the percent of sampled households that were eligible, (b) the eligible households that completed the screening roster, (c) eligible households selected for follow-up, and (d) completion rate of youth in the round, was 64.8% in Round 1. Follow-up (conditional) response rates for eligible participants were 86.3%, 92.3%, and 93% in Rounds 2–4 respectively. WesVar 4.2 (Westat 2000) was used to compensate statistically for these artifacts, ensuring a nationally representative sample.

Respondents

Only responses of youth 12 to 16 years of age at Round 1 were analyzed. Nine to 11 year olds were excluded as they answered different, abbreviated, surveys. Older respondents (17–18 year olds) also were excluded, as they would have aged out of the analysis before completing Round 4. The resulting sample consisted of 2,111 respondents, split approximately evenly on gender (48.9% female). Most respondents (67.0%) were white. Black (15.6%), Latino (14.0%), and Asian (3.4%) adolescents comprised the remainder of the sample. Respondents from Round 1 were re-contacted over the next three years for follow-up surveys. Youth remained eligible until their 19th birthday. Mean respondent age was 13.38, 14.66, 15.66, and 16.66 years at Rounds 1 through 4, respectively.

Categorizing Marijuana Risk Status

Two items were used to develop the critical marijuana risk measure. Those responding affirmatively to “Have you ever, even once, used marijuana?” were defined operationally as users. Remaining respondents were asked, “How likely is it that you will use marijuana, even once or twice, over the next 12 months?” They selected from: *I definitely will not*; *I probably will not*; *I probably will*; *I definitely will*. Nonusers selecting the first option were categorized as resolute nonusers; all other nonusers were classed as vulnerable.

Demographics

Age/race/gender. Respondents provided their date of birth, and their race/ethnicity. Gender was noted by the interviewer.

Religiosity ($\alpha = .69$) was the mean of two items ($r = .54$): (a) “How often do you attend church, synagogue, mosque, or other religious services?” (b) “How important is religion in your life?” Response options on the first item ranged from 1 (*never*) to 4 (*about once a week or more often*). The second item was scored from 1 (*not important*) to 4 (*very important*).

Academic

Academic performance was assessed with: “Which of the following best describes your average grade in school?” Response options on this item ranged from 1 (*D {69 or below}*) to 9 (*A {93–100}*).

Academic aspiration was tapped with: “Suppose you could do just what you’d like and nothing stood in your way...[W]hich of the following things you would want to do. Choose all that apply:” (a) “*Serve in the armed forces*” (b) “*Attend a technical or vocational school.*” (c) “*Graduate from a two-year college program.*” (d) “*Graduate from a four-year college.*” (e) “*Attend graduate or professional school after college.*” The respondent’s highest academic aspiration was used.

Social

Involvement in clubs or activities was measured with: “In the last 12 months, have you ever participated in the following types of organized activities or groups:” “Music, dance, theater or other performing arts, in or outside of school?” “Athletic teams or organized sports, in or outside of school?” “Boys or girls clubs, such as Boy Scouts or Girl Scouts?” “Youth groups sponsored by a church, synagogue, mosque, or other religious institution?” “Another club or activity, in or outside of school, or volunteer work?” The

number of activities was summed, yielding a score from 0 to 5.

Peer marijuana use ($\alpha=.89$) was the mean of two items ($r=.81$): (a) “How many {kids in your grade at school/kids your age} have used marijuana, even once or twice in the last 12 months?” (b) “How many {kids in your grade at school/kids your age} have used marijuana, nearly every month in the last 12 months?” Item stem variants depended on whether the youth had been going to school at any time in the last year. Options ranged from 1 (*none*) to 5 (*all*).

Friends’ marijuana use was tapped with: “How many of your friends do you think have used marijuana (*even once or twice/nearly every month*) in the last 12 months?” Respondents received one of the variants. Options ranged from 1 (*none*) to 5 (*all*).

Adult supervision was assessed with: “How often do you spend your free time in the afternoons hanging out with friends without adults around?” Response options ranged from 1 (*always or almost always*) to 5 (*never*).

Self-delinquency ($\alpha=.56$) was the mean of three items: “During the last 12 months, how often have you:” (a) “Gotten into a serious fight in school or at work?” (b) “Taken something not belonging to you worth under \$50?” (c) “Damaged school property on purpose?” Options ranged from 1 (*not at all*) to 5 (*5 or more times*).

Peer delinquency ($\alpha=.77$) was the mean of three items: “In the last 7 days, how many times did you get together with friends who:” (a) “Get into trouble a lot?” (b) “Fight a lot?” (c) “Take things that don’t belong to them?” Options ranged from 0 (*never*) to 6 (*> than 7 times*).

Parents

Parental monitoring ($\alpha=.74$) was the mean of two items ($r=.59$): “In general, how often does at least one of your {parents/caregivers}” (a) “Know what you are doing when you are away from home?” (b) “Have a pretty good feeling of your plans for the upcoming day?” Response options ranged from 1 (*never or almost never*) to 5 (*always or almost always*).

Parental warmth ($\alpha=.71$) was the mean of: “Think about the last 30 days. How true are the following statements for you:” (a) “I really enjoyed being with my {parents/caregivers}.” (b) “There was a feeling of togetherness in our family.” (c) “I fought or argued with one of my {parents/caregivers}.” The last item was reverse scored. Response options ranged from 1 (*never or almost never true*) to 5 (*always or almost always true*).

Intrapersonal

Refusal strength ($\alpha=.92$) was the mean of five items. “How sure are you that you can say no to marijuana, if you really

wanted to, if:” (a) “You are at a party where people are using it.” (b) “A very close friend suggests you use it.” (c) “You are home alone and feeling sad or bored.” (d) “You are on school property and someone offers it.” (e) “You are hanging out at a friend’s house whose parents aren’t home.” Response options ranged from 1 (*not at all sure I can say no*) to 5 (*completely sure I can say no*).

Sensation seeking ($\alpha=.80$) was the mean of four items: (a) “I would like to explore strange places.” (b) “I like to do frightening things.” (c) “I like new and exciting experiences, even if I have to break the rules.” (d) “I prefer friends who are exciting and unpredictable.” Response options ranged from 1 (*strongly disagree*) to 5 (*strongly agree*).

Approval of others’ marijuana use ($\alpha=.78$) was the mean of two items ($r=.66$): “Do you disapprove or approve of people doing each of the following:” (a) “Trying marijuana once or twice.” (b) “Using marijuana nearly every month for 12 months.” Response options ranged from 1 (*strongly disapprove*) and 5 (*strongly approve*).

Non-Marijuana Substance Use

Cigarettes “Have you ever smoked part or all of a cigarette?” Responses were scaled from 1 (*never*) to 5 (*I have smoked in the last 30 days*).

Alcohol “Have you ever, even once, had a drink of any alcoholic beverage, that is, more than a few sips?” Those responding *yes* were asked, “How long has it been since you last drank an alcoholic beverage, more than a few sips?” Respondents answering no received a score of 1; other answers were scored as follows: 2 (*yes, more than 12 months ago*), 3 (*yes, more than 30 days but within the last 12 months*), or 4 (*yes, during the last 30 days*).

Inhalants “Have you ever, even once, used an inhalant for kicks or to get high? Respondents answering *yes* to this question were asked “How long has it been since you last used an inhalant for kicks or to get high?” Scoring was the same as that used with alcohol; scores could range from 1 (*no*) to 4 (*during the last 30 days*).

Results

Analysis 1 examined whether nonusers defined as vulnerable at Round 1 were more likely than resolute nonusers to initiate marijuana use over the four-year course of the study. Data from Rounds 1 to 4, weighted to reflect US population values, are summarized in Fig. 1. Significant differences in odds ratios (*OR*) of usage emerged in Rounds 2 through 4

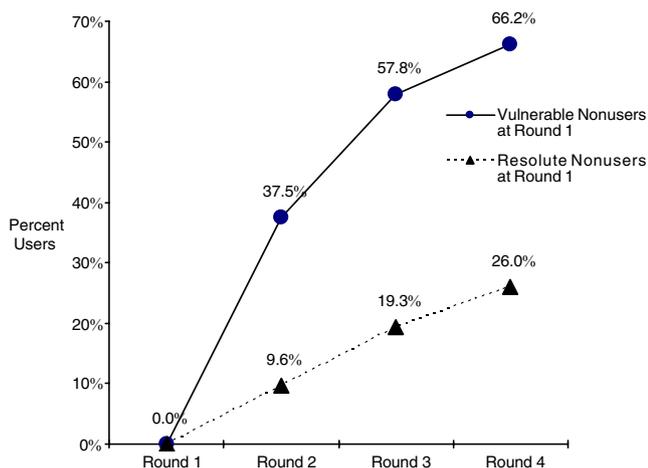


Fig. 1 Trajectories of round 1 resolute nonusers and vulnerable nonusers across four measurement rounds

between those classified in Round 1 as vulnerable or resolute nonusers. The odds ratio of a vulnerable nonuser at Round 1 becoming a user at Round 2 was 5.63 times greater than for resolute nonusers in that timeframe, $Z=11.28, p<.0001$; this same pattern was found in Round 3 ($OR=5.77, Z=12.26, p<.0001$) and Round 4 ($OR=5.61, Z=11.76, p<.0001$), supporting the predictive validity of the classification system.

Analysis 2 examined features that differentiated users and (resolute and vulnerable) nonusers. Round 1 data were used to predict usage status in a DFA. This analysis is not necessarily representative of the nation’s youth, because unweighted data were used, as no population weighting software compatible with DFA currently exists. Nonetheless, results are certainly more representative of national adolescent usage than would be obtained by non-purposive sampling. All predictors (Table 1) were entered simultaneously. Outcome categories were the three mutually exclusive and exhaustive user status groupings. The full model with two discriminant functions was statistically significant, Wilks’ $\lambda=.47, \chi^2(44, N=2,111)=1,584.01, p<.0001$. Canonical discriminant function coefficients are presented in Table 1. The first function (which we have labeled *dangerous associations*) was determined largely by respondents’ cigarette and illicit drug usage, attitudes toward marijuana, and friend and peer norms. It was responsible for 94.3% of the separation across groups, $F(2, 2,108)=1,060.50, p<.0001$. Function 1 means (group centroids) were as follows: resolute nonuser= $-.40$; vulnerable nonuser= 1.55 ; and user= 3.39 . Differences between all pairings of the three group centroids were statistically significant (all $p<.0001$). The second function (labeled *individual differences*) explained 5.7% of the separation across groups and was determined largely by respondents’ sensation seeking scores and refusal strength, $F(2, 2,108)=64.02, p<.0001$. Function 2 group centroids were as

follows: vulnerable nonuser= $-.67$; resolute nonuser= $.04$; and user= $.57$. Significant differences were found between all pairs of these three group centroids (all $p<.0001$), indicating that both functions separated all three-user groups, and supporting the three-part user/nonuser distinction.

Overall, 83.1% of all participants were classified accurately in the DFA (Table 2). Had the most frequent category (resolute nonuser) been predicted for all respondents, 74% of the sample would have been identified correctly. The proportional reduction in error using the model is nearly 35%. The DFA classification results, based

Table 1 Correlations between discriminant functions and measures

Measure	Function 1 ^a	Function 2 ^b
Demographics		
Age	.22 ^c	.08
Religiosity	-.14 ^c	-.01
Gender: Male	.00	.05 ^c
Race: Black	-.01	.03 ^c
Race: Hispanic	.07	.08 ^c
Race: Asian	.02	-.04 ^c
Academic		
Academic performance	-.15	-.18 ^c
Academic aspiration	-.08	-.20 ^c
Social		
Involvement in club/activity	-.10 ^c	-.03
Peer marijuana use	.41 ^c	.03
Friend marijuana use	.55 ^c	-.08
Adult supervision	-.26 ^c	.08
Self delinquency	.42 ^c	-.10
Peer delinquency	.29	-.39 ^c
Parental variables		
Parental monitoring	-.23 ^c	.12
Parental warmth	-.29 ^c	.26
Intrapersonal variables		
Refusal strength	-.30	.42 ^c
Sensation seeking	.36	-.44 ^c
Approval of others’ marijuana use	.65 ^c	-.37
Non-marijuana substance use		
Cigarette use	.65 ^c	.42
Alcohol use	.49 ^c	.00
Inhalant use	.31 ^c	.27
Canonical R	.71	.24
Eigenvalue	1.01	.06
Percent variance in discrimination explained by function	94.31	5.69

Note. Displayed is the structure matrix. Race categories were dummy coded. Caucasian was not entered because of singularity with other race categories.

^aFunction 1 group centroids: resolute nonuser ($-.40$), vulnerable nonuser (1.55), and user (3.39).

^bFunction 2 group centroids: vulnerable nonuser ($-.67$), resolute nonuser ($.04$), and user ($.57$).

^cIndicates that the variable has the larger absolute correlation in this function.

Table 2 DFA classification: Percent and number correctly and incorrectly classified within each observed status group

Observed group	Predicted group		
	Resolute nonuser	Vulnerable nonuser	User
Resolute nonuser	86.9% (1,559)	11.3% (203)	1.8% (33)
Vulnerable nonuser	22.8% (45)	60.9% (120)	16.2% (32)
User	5.0% (6)	31.1% (37)	63.9% (76)

Note. 83.1% of all cases correctly classified. Observed group status is based on respondents' self-report of marijuana usage or intention to use or abstain in the future. Predicted group status is based on the outcome of the DFA.

on a set of psychosocial measures, were substantially better than chance. Further support for the classification was lent by a cross-validation analysis conducted with a 25%

random subsample, which replicated the results of Analysis 2. Despite these strong results, the DFA is merely a stepping stone to the third analysis.

Analysis 3 examined pair-wise differences between the three respondent groups to determine whether the pattern of differences corresponded with expectations based on prior literature. Correspondence supports the construct validity of the measure. To examine this issue, one-way analyses of covariance (or chi-square tests, where appropriate) were conducted on each of the predictor variables of Analysis 2; user status was the independent variable. Data were weighted and, therefore, are nationally representative. Omnibus group differences were found on most measures (Table 3). Two patterns of between-group variation were most salient. In the most common pattern, resolute nonusers differed significantly from vulnerable nonusers and users. Thus, as shown, resolute nonusers reported significantly

Table 3 Mean differences across status groups

Measure	Resolute nonusers		Vulnerable nonusers		Users		Omnibus test	Partial η^2
	Mean	(SD)	Mean	(SD)	Mean	(SD)		
Demographics								
Age ^{bcd}	13.28	(1.03)	13.65	(1.06)	14.02	(0.91)	$F=31.62^a$	.043
Religiosity ^{bc}	3.16	(0.84)	2.92	(0.86)	2.74	(0.87)	$F=14.03^a$	.023
Gender: Male [†]	0.52	(0.50)	0.45	(0.50)	0.51	(0.50)	$\chi^2=3.11$	.001
Race: Caucasian [†]	0.67	(0.47)	0.68	(0.47)	0.62	(0.49)	$\chi^2=2.23$	.001
Race: Black [†]	0.16	(0.37)	0.12	(0.32)	0.11	(0.32)	$\chi^2=5.31$	.003
Race: Hispanic ^{†b}	0.13	(0.33)	0.15	(0.36)	0.25	(0.43)	$\chi^2=17.39^a$	.008
Race: Asian [†]	0.03	(0.18)	0.05	(0.22)	0.02	(0.15)	$\chi^2=2.93$	.001
Academic								
Academic performance ^{bd}	6.43	(2.08)	6.39	(2.01)	5.28	(2.31)	$F=7.72^a$	.020
Academic aspiration	3.86	(1.27)	3.94	(1.18)	3.49	(1.50)	$F=2.63$	.007
Social								
Involvement in clubs/activities	2.44	(1.27)	2.33	(1.24)	2.08	(1.23)	$F=3.14$	.005
Peer marijuana use ^{bcd}	2.04	(0.90)	2.61	(0.82)	3.24	(0.74)	$F=109.59^a$	.100
Friend marijuana use ^{bcd}	1.49	(0.75)	2.26	(0.97)	2.95	(0.99)	$F=71.86^a$	.200
Adult supervision ^{bc}	3.30	(1.19)	2.73	(1.14)	2.53	(1.19)	$F=21.90^a$	.034
Self delinquency ^{bc}	1.17	(0.37)	1.48	(0.63)	1.73	(0.82)	$F=41.48^a$	.119
Peer delinquency ^{bc}	1.65	(1.01)	2.30	(1.33)	2.25	(1.37)	$F=40.46^a$	.048
Parental								
Parental monitoring ^{bc}	3.98	(1.08)	3.44	(1.14)	3.29	(1.14)	$F=21.69^a$	.047
Parental warmth ^{bc}	3.84	(0.91)	3.10	(1.03)	2.98	(1.08)	$F=56.85^a$	.080
Intrapersonal								
Refusal strength ^{bc}	4.71	(0.73)	4.11	(0.88)	4.16	(0.96)	$F=81.55^a$	.084
Sensation seeking ^{bc}	2.43	(0.87)	3.27	(0.77)	3.37	(0.74)	$F=100.09^a$	.121
Approval of others' mar. use ^{bcd}	1.39	(0.62)	2.39	(0.72)	2.84	(0.85)	$F=251.18^a$	.317
Non-marijuana substance use								
Cigarette use ^{bcd}	1.17	(0.55)	1.79	(1.14)	3.04	(1.39)	$F=108.99^a$	.317
Alcohol use ^{bcd}	1.38	(0.80)	2.29	(1.15)	2.82	(0.96)	$F=117.08^a$	.193
Inhalant use ^{bcd}	1.01	(0.15)	1.12	(0.46)	1.28	(0.63)	$F=12.29^a$	.070

Note. Age was statistically controlled in all analyses involving the non-demographic measures via analysis of covariance.

[†] For dichotomous measures, mean values represent the proportion responding affirmatively in each status group.

^a Significant omnibus test, $p < .01$.

^b Significant difference between Resolute Nonusers and Users, $p < .01$.

^c Significant difference between Resolute Nonusers and Vulnerable Nonusers, $p < .01$.

^d Significant difference between Vulnerable Nonusers and Users, $p < .01$.

higher levels of parental monitoring, warmth, and adult supervision than either vulnerable nonusers or users, who did not differ. Further, they had greater refusal strength, lower sensation seeking, and were less likely to approve of others' marijuana or use inhalants. This result is consistent with, and extends, the usual user/nonuser distinction. The other common pattern reflected significant differences among all three groups. Resolute nonusers were less likely to use tobacco, drink alcohol, or use inhalants than vulnerable nonusers, who were less likely than users to do so (see also Sequeira and Brook 2003; Wagner and Anthony 2002). Academic performance of the two nonuser groups was better than that of the users. Gender was represented equally across the three groups. The proportion of Caucasian, Black, or Asian respondents within each group did not differ.

Discussion

The goal of this research was to illuminate the advantages of assessing differences within nonuser groups—groups treated as homogeneous in most marijuana studies. The first step validated an efficient classification method for discriminating between nonusers who are likely to remain abstinent and nonusers likely to initiate marijuana use. The two-item index was successful: nearly 37.5% of Round 1 vulnerable nonusers had used marijuana after a year, compared to 9.6% of resolute nonusers. In Round 3, the relevant proportions were 57.8% vs 19.3%; in Round 4 the differences were even greater, 66.2% vs 26%. Though measured with only two items, the differentiation afforded was remarkable, suggesting the index's potential utility in large scale survey research, where its inclusion would not add appreciably to cost or respondent load. The utility of longitudinal data also was highlighted in this analysis, and argues for more long-term analyses of adolescent substance initiation.

The second step in the analytic series made use of DFA to validate the classification scheme. If nonusers were indeed heterogeneous, as expected, then the DFA would support the three-group model. The predictors used in the DFA effectively differentiated the three user/nonuser groups (83.1% of respondents were categorized correctly). Dangerous associations with peers and substances, along with individual susceptibility differences (e.g., sensation seeking) contributed to the discrimination.

In Analysis 3, the analytic approach was reversed, and the user, vulnerable, and resolute nonuser groupings were used to identify variations in the predictor variable set. The findings of this analysis replicate much of what is known, but this is precisely the sought-after outcome of a construct validation (Crano and Brewer 2002). Further, this analysis

shed light on important differences between resolute nonusers, vulnerable nonusers, and users. Results indicated marijuana users were significantly more likely to smoke and to drink alcohol than vulnerable adolescents, who were significantly more likely than their resolutely abstinent peers to do so. This association of smoking and drinking with marijuana use is well established; Analysis 3 demonstrates that use of these substances separate vulnerable from resolute nonusers as well. Similarly, users reported having more friends and peers who used marijuana, and expressed greater approval of its use, than vulnerable nonusers, who were significantly more likely than their resolutely abstinent peers to do so. These results extend and refine research that reported differences in normative estimates between users and nonusers but did not differentiate resolute from vulnerable abstainers (Chabrol et al. 2006; Ramirez et al. 2004).

A second common pattern of differences also emerged. Resolute nonusers reported greater parental warmth, and more intense monitoring, than vulnerable nonusers and users, who did not differ. These findings refine earlier research reporting parental differences between users and nonusers (Parker and Benson 2004; Ramirez et al. 2004; van den Bree and Pickworth 2005). This same pattern emerged in analyses of adult supervision, religiosity, refusal strength, peer and self-delinquency, sensation seeking, and inhalant use. Note that vulnerable nonusers and users are indistinguishable in these comparisons. This suggests that detrimental changes in these variables may have anticipated the shift from vulnerability to use. This pattern interpretation is presented tentatively, but it provides a basis for informed hypothesis generation that may be useful in future research. This common pattern of differences among the groups also suggests that inhalant use generally anticipates marijuana use, consistent with earlier research (Johnson et al. 1995; Schutz et al. 1994).

Reports of an inverse relationship between academic performance and drug use are common (Ellickson et al. 2004; van den Bree and Pickworth 2005), and significant differences were revealed between users and nonusers in the present analyses as well. This study extends prior research by revealing that among nonusers, vulnerable respondents' academic performance was not different from that of resolute nonusers. This suggests that rather than predicting use, academic performance deficits may be the result of usage. Rather than signaling vulnerability to future drug involvement, a precipitous drop in academic performance may indicate usage.

The extension of the standard user/nonuser distinction to one in which nonusers are differentiated in terms of future vulnerability provides information and insights that may enhance understanding of the processes involved in moving from abstinence to use. Variations in patterns of differences

among the user, vulnerable, and resolute nonuser groups refine earlier results and suggest variables that may anticipate, or trail, marijuana initiation. This information may allow more precisely targeted interventions in future research, depending on the goal to prevent, or to promote cessation of, marijuana use. For example, the data pattern suggests that decrements in adult supervision, parental monitoring, and parental warmth anticipate a movement from vulnerable abstinence to use, as does inhalant involvement. If so, then prevention efforts developed to enhance parental involvement in children's drug-related activities clearly would seem to be in order, as would greater investment in inhalant prevention, which might have secondary preventive effects on marijuana use.

Despite the robust results presented in the analyses, some limitations must be considered. Other classification schemes, for example, using different operationalizations and operations, may have produced better categorizations. Such schemes, however, will likely have required more than two items, a key advantage of our approach. The study's dependence on self-reports may render the study susceptible to social desirability bias. The ACASI approach used in the NSPY program was designed to mitigate this possibility (see Turner et al. 1998), but this question is not answerable definitively given the secondary nature of the dataset. The use of secondary data, too, imposes limitations. Although the NSPY dataset is invaluable, a longer and more complete item set would have been useful for present research purposes. With secondary analysis, the data sometime dictate the quality of measures; in the present instance, the restrictions imposed by the data were not severe, but a study using primary data would have allowed a more complete assay of respondents' thoughts and actions. Such a study, however, would have been exceptionally expensive, and is it not obvious that its results would differ appreciably from those presented.

Although not a limitation per se, our results revealed that not all vulnerable marijuana nonusers eventually became users, and not all resolute nonusers remained nonusers. Why some youth resisted initiation, while their similarly categorized peers did not, is not evident from the present analyses. We hope that the approach developed in this research will motivate research that facilitates development of a more precise understanding and prediction of the subtle factors that affect the movement from marijuana abstinence to initiation in adolescents.

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References

- Anderson, C. B., Pollak, K. I., & Wetter, D. W. (2002). Relations between self-generated positive and negative expected smoking outcomes and smoking behavior: An exploratory study among adolescents. *Psychology of Addictive Behaviors, 16*, 194–204.
- Boyer, C. B., Tschann, J. M., & Shafer, M.-A. (1999). Predictors of risk for sexually transmitted diseases in ninth grade urban high school students. *Journal of Adolescent Research, 14*, 448–465. Medline. DOI [10.1177/0743558499144004](https://doi.org/10.1177/0743558499144004).
- Chabrol, H., Chauchard, E., Mabila, J. D., R, M., Adele, A., & Rousseau, A. (2006). Contributions of social influences and expectations of use to cannabis use in high-school students. *Addictive Behaviors, 31*, 2116–2119. Medline. DOI [10.1016/j.addbeh.2006.01.005](https://doi.org/10.1016/j.addbeh.2006.01.005).
- Crano, W. D., & Brewer, M. B. (2002). *Principles and methods of social research*. Mahwah, NJ: Erlbaum.
- Crano, W. D., & Burgoon, M. (Eds.) (2002). *Mass media and drug prevention: Classic and contemporary theories and research*. Mahwah, NJ: Erlbaum.
- Crano, W. D., Siegel, J., Alvaro, E. M., & Patel, N. M. (2007). Overcoming adolescents' resistance to anti-inhalant messages. *Psychology of Addictive Behaviors, 21*, 516–524.
- Ellickson, P. L., Tucker, J. S., Klein, D. J., & Saner, H. (2004). Antecedents and outcomes of marijuana use initiation during adolescence. *Preventive Medicine, 39*, 976–984. Medline. DOI [10.1016/j.ypmed.2004.04.013](https://doi.org/10.1016/j.ypmed.2004.04.013).
- Ferdinand, R. F., Sondeijker, F., Van Der Ende, J., Selten, J., Huizink, A., & Verhulst, F. C. (2005). Cannabis use predicts future psychotic symptoms, and vice versa. *Addiction, 100*, 612–618. Medline. DOI [10.1111/j.1360-0443.2005.01070.x](https://doi.org/10.1111/j.1360-0443.2005.01070.x).
- Hall, W. (1998). Cannabis use and psychosis. *Drug and Alcohol Review, 17*, 433–444. Medline. DOI [10.1080/09595239800187271](https://doi.org/10.1080/09595239800187271).
- Hall, W., & Solowij, N. (1998). Adverse effects of cannabis. *Lancet, 352*, 1611–1616. Medline. DOI [10.1016/S0140-6736\(98\)05021-1](https://doi.org/10.1016/S0140-6736(98)05021-1).
- Jessor, R., & Jessor, S. L. (1977). *Problem behavior and psychosocial development: A longitudinal study of youth*. New York: Academic.
- Johnson, E. O., Schutz, C. G., Anthony, J. C., & Ensminger, M. E. (1995). Inhalants to heroin: A prospective analysis from adolescence to adulthood. *Drug and Alcohol Dependence, 40*, 159–164. Medline. DOI [10.1016/0376-8716\(95\)01201-X](https://doi.org/10.1016/0376-8716(95)01201-X).
- Johnston, L. D., O'Malley, P. M., Bachman, J. G., & Schulenberg, J. E. (2006). *Monitoring the Future national results on adolescent drug use: Overview of key findings, 2005*. (NIH Publication No. 06-5882). Bethesda, MD: National Institute on Drug Abuse.
- Kandel, D. B., Yamaguchi, K., & Chen, K. (1992). Stages of progression in drug involvement from adolescence to adulthood: Further evidence for the gateway theory. *Journal of Studies on Alcohol, 53*, 447–457. Medline.
- Kosterman, R., Hawkins, J. D., Guo, J., Catalano, R. F., & Abbott, R. D. (2000). The dynamics of alcohol and marijuana initiation: Patterns and predictors of first use in adolescence. *American Journal of Public Health, 90*, 360–366. Medline.
- Lundqvist, T. (2005). Cognitive consequences of cannabis use: Comparison with abuse of stimulants and heroin with regard to attention, memory and executive functions. *Pharmacology Biochemistry and Behavior, 81*, 319–330. Medline. DOI [10.1016/j.pbb.2005.02.017](https://doi.org/10.1016/j.pbb.2005.02.017).

- Lynskey, M., & Hall, W. (2000). The effects of adolescent cannabis use on educational attainment: A review. *Addiction*, *95*, 1621–1630. Medline. DOI 10.1046/j.1360-0443.2000.951116213.x.
- McCusker, C. G., Roberts, G., Douthwaite, J., & Williams, E. (1995). Teenagers and illicit drug use: Expanding the user vs. nonuser dichotomy. *Journal of Community and Applied Social Psychology*, *5*, 221–241. DOI 10.1002/casp.2450050402.
- McMillan, B., Sherlock, K., & Conner, M. (2003). Expanding the traditional user versus non-user dichotomy amongst ecstasy users. *Journal of Community and Applied Social Psychology*, *13*, 15–28.
- NSPY. (undated). *The role of weights in analysis*. Retrieved February 7, 2007, from https://www.nspycenter.com/scripts/NSPYDataUsersGuide/References.asp?open1=1&cat=1&strPageID=156&strSectionID=16&strTopDataID=254&strPageParentID=254&level=3&data_id=255&has_data_file=1.
- Office of Applied Studies. (2000). National household survey on drug abuse: Main findings 1998 (Rep. No. SMA 00-3381). Rockville, MD: Substance Abuse and Mental Health Services, : <http://oas.samhsa.gov/NHSDA/98MF.pdf>. Accessed 27 February 2007.
- Olds, R. S., Thombs, D. L., & Tomasek, J. R. (2005). Relations between normative beliefs and initiation intentions toward cigarette, alcohol, and marijuana. *Journal of Adolescent Health*, *37*, 75.e7–75.e13.
- Parker, J. S., & Benson, M. J. (2004). Parent-adolescent relations and adolescent functioning: self-esteem, substance abuse, and delinquency. *Adolescence*, *39*, 519–530. Medline.
- Pierce, J. P., Choi, W. S., Gilpin, E. A., Farkas, A. J., & Merritt, R. K. (1996). Validation of susceptibility as a predictor of which adolescents take up smoking in the United States. *Health Psychology*, *15*, 355–361. Medline. DOI 10.1037/0278-6133.15.5.355.
- Ramirez, J. R., Crano, W. D., Quist, R., Burgoon, M., Alvaro, E. M., & Grandpre, J. (2004). Acculturation, familism, parental monitoring, and knowledge as predictors of marijuana and inhalant use in adolescents. *Psychology of Addictive Behaviors*, *18*, 3–11. Medline. DOI 10.1037/0893-164X.18.1.3.
- Schutz, C. G., Chilcoat, H. D., & Anthony, J. C. (1994). Breach of privacy in surveys on adolescent drug use: A methodological inquiry. *International Journal of Methods in Psychiatric Research*, *4*, 183–188.
- Sequeira, L. M., & Brook, J. S. (2003). Tobacco use as a predictor of illicit drug use and drug-related problems in Colombian youth. *Journal of Adolescent Health*, *32*, 50–57. Medline. DOI 10.1016/S1054-139X(02)00534-7.
- Sidney, S., Beck, J. E., Tekawa, I. S., Quesenberry, C. P., & Friedman, G. D. (1997). Marijuana use and mortality. *American Journal of Public Health*, *87*, 585–590. Medline.
- Siegel, J. T., Alvaro, E. M., & Burgoon, M. (2003). Perceptions of adolescent at-risk non-smokers: Are potential intervention topics being overlooked? *Journal of Adolescent Health*, *33*, 458–461. Medline. DOI 10.1016/S1054-139X(03)00139-3.
- Smiley, A. (1999). Marijuana: On-road and driving-simulator studies. In H. Kalant, et al. (Ed.), *The health effects of cannabis* (pp. 173–191). Toronto: Center for Addiction and Mental Health.
- Smit, F., Bolier, L., & Cuijpers, P. (2004). Cannabis use and the risk of later schizophrenia: A review. *Addiction*, *99*, 425–430. Medline. DOI 10.1111/j.1360-0443.2004.00683.x.
- Thrasher, J. F., Niederdeppe, J., Farrelly, M. C., & Jackson, C. (2006). Using anti-tobacco industry messages to prevent smoking among high-risk adolescents. *Health Education and Behavior*, *21*, 325–337.
- Turner, C. F., Ku, L., Rogers, S. M., Lindberg, L. D., Pleck, J. H., & Sonenstein, F. L. (1998). Adolescent sexual behavior, drug use, and violence: Increases reporting with computer survey technology. *Science*, *280*, 867–873. Medline. DOI 10.1126/science.280.5365.867.
- van den Bree, M. B. M., & Pickworth, W. B. (2005). Risk factors predicting changes in marijuana involvement in teenagers. *Archives of General Psychiatry*, *62*, 311–319. Medline. DOI 10.1001/archpsyc.62.3.311.
- Wagner, F. A., & Anthony, J. C. (2002). Into the world of illegal drug use: Exposure opportunity and other mechanisms linking the use of alcohol, tobacco, marijuana, and cocaine. *American Journal of Epidemiology*, *155*, 918–925. Medline. DOI 10.1093/aje/155.10.918.
- Wakefield, M., Germain, D., & Henriksen, L. (2006). An experimental study of effects on schoolchildren of exposure to point-of-sale cigarette advertising and pack displays. *Health Education Research*, *21*, 338–347. Medline. DOI 10.1093/her/cyl005.
- Westat (2000). *WesVar 4.0, User's Guide*. Rockville: Westat.