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The Role of Distal Variables in Behavior Change: Effects of Adolescents' Risk for Marijuana Use on Intention to Use Marijuana[1]

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Abstract

This study uses an integrative model of behavioral prediction as an account of adolescents' intention to use marijuana regularly. Adolescents' risk for using marijuana regularly is examined to test the theoretical assumption that distal variables affect intention indirectly. Risk affects intention indirectly if low-risk and high-risk adolescents differ on the strength with which beliefs about marijuana are held, or if they differ on the relative importance of predictors of intention. A model test confirmed that the effect of risk on intention is primarily indirect. Adolescents at low and high risk particularly differed in beliefs concerning social costs and costs to self-esteem. Not surprisingly, at-risk adolescents took a far more positive stand toward using marijuana regularly than did low-risk adolescents. On a practical level, the integrative model proved to be an effective tool for predicting intention to use marijuana, identifying key variables for interventions, and discriminating between target populations in terms of determinants of marijuana use.

Over the last four decades, a relatively large number of theories have been used to explain and predict a wide variety of behaviors. From the perspective that each behavior is unique, it is understandable that separate theories have been derived to account for a specific behavior or behavioral category. Recently, however, it has been proposed that only a limited number

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of theoretical variables determine any given behavior (Fishbein, 2000; Fishbein et al., 2001). These variables have been identified in the theory of reasoned action (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975), the theory of planned behavior (Ajzen, 1991), social cognitive theory (Bandura, 1986), and the health belief model (Janz & Becker, 1984; Rosenstock, 1974). The variables and their interrelationships are described in an integrative model that is displayed in Figure 1 (cf. Fishbein, 2000).

The model suggests that at the most global level, people will perform a behavior when they have formed the intention to perform the behavior. A requirement for a strong intention–behavior relationship is that people have the skills to perform the behavior and that there are no environmental constraints that impede performance of the behavior. Intention is determined by the attitude toward the behavior (i.e., one's overall feeling of favorableness or unfavorableness toward performing the behavior), the subjective norm concerning the behavior (i.e., the perception of whether important others think one should or should not perform the behavior), and self-efficacy concerning the behavior (i.e., one's belief that one can perform the behavior under a variety of difficult circumstances). Attitude, norms, and self-efficacy are themselves viewed as a function of underlying beliefs. For attitudes, these beliefs pertain to expectancies that performing the behavior leads to specific consequences or outcomes multiplied by the evaluation of how good or bad these outcomes are. Norms are a function of perceived normative proscriptions of specific referent others multiplied by the motivation to comply with these referents. Self-efficacy reflects specific impediments to performing the behavior.

The model can effectively explain variation in any behavior because it recognizes that the model fit is specific to the behavior and population under study. More specifically, the model posits that the relative importance of the model variables as predictors of a particular behavior may vary among different behaviors and among different populations. For example, marijuana use may be predicted primarily by the subjective norm, while cocaine use may be primarily attitudinally driven. As another example, suppose that both males and females strongly believe that most people think they should not use marijuana. It may be, however, that the subjective norm is an important determinant of intention among females but not among males.

While the uniqueness of each behavior is, at least in part, reflected by variation in the relative importance of the model variables as predictors of different behaviors, the substantive uniqueness of different behaviors is seen most clearly by considering underlying beliefs. That is, beliefs about one behavior may be very different from beliefs about another behavior. For example, the beliefs one has about the consequences of using marijuana may be quite different from the beliefs one has about the consequences of using cocaine. These observations are very important because, ultimately, a change in a behavior is the result of changes in beliefs about performing the behavior. In other words, if one seeks to change a particular behavior, an intervention should be designed at the level of changing specific beliefs about the behavior. Because beliefs will differ between behaviors and populations, and because of the role of beliefs in behavior change, it is essential to understand a behavior from the perspective of the target population before one attempts to change the behavior.

There are many variables that have been used in other theoretical approaches to explain behavior change that have not been specified as central variables in the integrative model. Examples of these variables are personality traits, demographic variables, and one's attitudes toward other people. Corresponding to the original specifications of the theory of reasoned action, the integrative model does not suggest that such distal variables cannot affect intention or behavior, but rather posits that their impact on intention or behavior is indirect (Figure 1). That is, the theory suggests that the effects of distal variables on intention or behavior are mediated by proximal variables; that is, by the variables specified as internal to the model (cf. Ajzen & Fishbein, 1980). In some instances, a distal variable may be correlated with intention or behavior, but according to the assumptions underlying the integrative model, this must mean that the distal variable is related to one or more of the proximal model variables as well.

The present study tests this assumption. Specifically, we examine if adolescents' status of being at risk for using marijuana regularly is related to their intention to use marijuana regularly and, if so, how risk impacts on intention. Marijuana use is an important issue for adolescents in the United States. Prevalence data suggest that in the United States, adolescent marijuana use increased substantially over the last decade. Between 1991 and 1999, the proportion of 8th, 10th-, and 12th-grade students who had used marijuana in the previous year increased from 6%, 17%, and 24% in 1991 to levels of 17%, 32%, and 38% in 1999, respectively (Johnston, O'Malley, & Bachman, 2000). The theoretical question about the mediated impact of risk for marijuana use on adolescents' intention to use marijuana is therefore important and may have consequential practical implications.

There are several possible mediated relationships between being at risk for marijuana use and intention. Let us review these relationships by taking the example of the belief that using marijuana leads to performing poorly in school. A first possibility is that the strength with which the belief about poor academic performance is held differs for low-risk and high-risk adolescents. For example, low-risk adolescents may believe that this outcome is likely, whereas high-risk adolescents believe that this outcome is unlikely. These different beliefs may translate into a more negative attitude and intention for low-risk adolescents relative to high-risk adolescents. Second, both low-risk and high-risk adolescents may believe that marijuana use leads to poor academic performance, but low-risk adolescents evaluate this outcome as very bad, whereas high-risk adolescents evaluate this outcome as only slightly bad. This would result in a more negative attitude and intention for low-risk adolescents than for high-risk adolescents. Although these examples focus on beliefs about outcomes of the behavior, similar mediated relationships are expected between normative beliefs and intention and between efficacy beliefs and intention.

This study examines the theoretical assumption that being at risk for regular marijuana use indirectly affects the intention to use marijuana regularly. Specifically, we examine how well the integrative model predicts adolescents' intentions to use marijuana regularly, and whether risk adds to the prediction of intention. We expect that risk is indirectly related to intention. To examine how risk operates on intention, we proceed by testing the aforementioned mediated relationships between risk for regular marijuana use and the intention to use marijuana regularly. For this purpose, we examine whether adolescents at

low risk and at high risk for regular marijuana use have different outcome, normative, and efficacy beliefs with respect to using marijuana regularly and whether they have different outcome evaluations and motivations to comply.

Method

Participants and Procedure

The data used in the present study were gathered in middle schools and high schools in metropolitan Philadelphia. The sample consisted of 1,175 adolescents, of whom 494 (42%) were male and 681 (58%) were female. Mean age was 14.83 years (*SD* = 1.90 years, range = 11 to 19 years). Ethnically, 65% were Caucasian, 22% were African American, and 13% were from other ethnic or racial groups.

The data are part of a larger research project designed to evaluate the effectiveness of anti-marijuana advertisements. As part of the larger research project, anti-marijuana public service announcements were presented to participants in treatment conditions, but not to participants in control conditions. Participants watched the ads (embedded in a television program) on laptop computers and filled out a computer-assisted questionnaire. Study sessions consisted of small groups of up to 18 students who were randomly assigned to control or experimental conditions. Sessions were conducted in a school's classroom, library, or auditorium. For purposes of the present study, data from the control and treatment groups were combined. This was appropriate because tests of the model produced similar results for the control and treatment groups.

Measures

Deriving the risk measure—Prior behavior is one of the best predictors of future behavior. Therefore, adolescents' marijuana use in the past 12 months provides a very good measure of risk for marijuana use in the next 12 months. Because our data were gathered in a school setting, we chose not to ask the students if they were engaging in illegal activities and, thus, we did not have data on adolescents' past marijuana use. Therefore, we needed a proxy measure of marijuana use in the past 12 months in order to classify the students into those at high risk or low risk for future marijuana use. The measure selected was an index estimating past marijuana use that had been developed previously using data from a mall-based survey on regular marijuana use among 600 adolescents (Sayeed, 2000).

The index was constructed using logistic regression models to examine a large set of potential correlates of self-reported marijuana use. The analyses showed that age (*b* = .19), number of times marijuana was offered (*b* = .66), number of friends who use marijuana (*b* = .62), and sensation seeking (i.e., a drive for novel, complex, and intense sensations and experiences; Donohew, 1990; Zuckerman, 1990; *b* = .11) were significant predictors of prior marijuana use. More specifically, the four variables explained 51% of the variance in past marijuana use. Among the variables that did not account for past marijuana use were gender, ethnicity, spending free time without supervision, peer influence, and parental monitoring. Using the parameters from the final equation, the four variables that were significant

predictors were combined to form an index of marijuana use in the past 12 months. This index correlated strongly with past marijuana use (r = .60).

In order to construct an index of being at risk for regularly using marijuana for the present sample, we applied the survey's final equation for predicting marijuana use in the past 12 months to the present data. More specifically, the equation parameters (constant, age, sensation seeking, times offered, and friend's use) were applied to the corresponding variables in the present data to create a proxy of prior use or risk score. This procedure was appropriate because the survey and the present study used identical measures to assess these four variables. Also, the present sample matched the survey sample with respect to age, gender, and ethnicity.

Participants' risk scores were used to categorize people as low risk or high risk. To establish the cutoff score, we examined the data from the aforementioned mall-based survey to determine the proportion of people who actually had used marijuana in the last 12 months. This proportion was about 25% for 11- to 19-year-old adolescents. Data from another independent, national survey reaffirmed that in a similar age group about 25% had used marijuana in the past 12 months (Westat & The Annenberg School for Communication, 2001). Based on these results, we classified the lowest 75% scores on the risk measure as *low risk*, and the highest 25% scores on the risk measure as *high risk*.

Model variables—The constructs of interest for our analyses are operationalized consistent with theory and measurement recommendations (Ajzen & Fishbein, 1980; Fishbein et al., 2001). The measures correspond with "using marijuana nearly every month in the next 12 months," so to save space, we discuss the measures in terms of *regular marijuana use*.

To measure *intention* to use marijuana regularly, participants were first asked how likely it is that they would use marijuana even once or twice in the next 12 months using a 4-point scale ranging from 1 (*I definitely will not*) to 4 (*I definitely will*). Those participants who gave any answer other than *I definitely will not* were then asked to indicate how likely it is that they would use marijuana nearly every month in the next 12 months (1 = *I definitely will not* to 4 = *I definitely will*). The resulting intention measure was a 4-point intention scale with the options *I definitely will not try*, *I definitely will not use regularly*, *I probably will not use regularly*, and *I probably or definitely will use regularly*.

Four 7-point semantic differential items ranging from −3 to +3 measured *attitude* toward regular marijuana use. Participants were asked "Your using marijuana nearly every month for the next 12 months would be," which was followed by semantic differentials: *bad–good*, *dumb–smart*, *unenjoyable–enjoyable*, and *unpleasant–pleasant*. Scores on the four items were averaged to yield an indicator of attitude toward regular marijuana use (α = .88).

The *subjective norm* concerning regular marijuana use was assessed by asking students to indicate on a 5-point scale the extent to which they thought people who are important to them would approve or disapprove of their using marijuana nearly every month for the next 12 months. The scale ranged from −2 (*strongly disapprove*) to +2 (*strongly approve*).

Self-efficacy items asked students how sure they were that they could say "No" to marijuana, if they really wanted to, in five specific situations.[3] The situations were described as follows: (a) "You are at a party where most 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"; and (e) "You are hanging out at a friend's house whose parents aren't home." Responses were rated on a 5-point scale ranging from −2 (*not at all sure I can say "No"*) to +2 (*completely sure I can say "No"*). The item scores were averaged to yield a scale of self-efficacy (α = .92).[4]

Outcome beliefs were assessed by asking students to indicate on 5-point scales the extent to which they thought that using marijuana nearly every month for the next 12 months would lead to 36 outcomes, such as losing one's athletic skills and being more creative (−2 = *very unlikely* to +2 = *very likely*). Given the large number of outcome beliefs, it seemed parsimonious to cluster them into four conceptually consistent scales. The scales were labeled *positive outcomes* (e.g., be like the coolest kids, have a good time; α = .76), *physical and mental costs* (e.g., damage my brain, become depressed; α = .93), *social costs* (e.g., lose friends, feel lonely; α = .88), and *self-esteem costs* (e.g., mess up my life, be a bad role model; α = .93). Note that the cost clusters are consistent with Bandura's (1986) three classes of outcome expectancies.

For each outcome belief, participants were also asked to evaluate the outcome on a 5-point scale ranging from −2 (*very bad*) to +2 (*very good*). Each belief was then multiplied by its evaluation. The sum of these products was used as the weighted sum of the outcome beliefs, denoted as Σbe.

Six *normative beliefs* were assessed on 5-point scales, relating to perceived (dis)approval of the students' regular marijuana use by their close friends, dating partner, people their own age, parents, teachers, and grandparents (−2 = *strongly disapprove* to +2 = *strongly approve*). The first three normative beliefs were grouped together to form a scale of peer norms (α = .77), and the second three beliefs formed a scale of authority figures' norms (α = .69). Participants were further asked to indicate on 5-point scales their *motivation to comply* with each of the referents mentioned in the normative belief items. Specifically, participants indicated their agreement with the statement that in general they want to do what the specific referent wants them to do (1 = *strongly disagree* to 5 = *strongly agree*). Each normative belief was multiplied by the corresponding motivation to comply item. The sum of these product terms formed the weighted sum of the normative beliefs, denoted as Σnb(mc).

[3]Note that the attitude and subjective norm measures are formulated in terms of regularly using marijuana, while the self-efficacy measures are formulated in terms of saying "No" to marijuana. Thus, attitude and subjective norm do correspond but self-efficacy does not correspond with intention, which is formulated in terms of regularly using marijuana (Fishbein & Middlestadt, 1989). Consequently, the effects for self-efficacy as a predictor of intention may be underestimated.

[4]Our data did not include efficacy beliefs. Therefore, we could not test the hypothesized relation between efficacy beliefs and self-efficacy. In our analyses, we used the self-efficacy scale or, where appropriate, the single self-efficacy items that form the scale.

Results

Descriptive Analyses

Table 1 shows that considering the sample as a whole, the adolescents do not intend to use marijuana, they have a negative attitude toward marijuana use, and they perceive that important others would disapprove of marijuana use. Further, a strong sense of self-efficacy over saying “No” to marijuana is reported, and negative outcomes of marijuana use are perceived as somewhat likely and positive outcomes are seen as somewhat unlikely. Stronger disapproval of marijuana use is expected from authority figures than from peers. The correlational pattern among the model variables is consistent with the integrative model; that is, attitude, subjective norm, and self-efficacy all significantly relate to intention. As expected, Σbe correlated strongly with attitude (r = .50). Σnb(mc) correlated strongly with subjective norm (r = .47).

In line with the theoretical assumptions about the role of distal variables, the risk measure is strongly related to intention, but is also related to some of the other model variables. Specifically, the risk measure is most strongly related to intention and, interestingly, to peer norms, weakly related to self-efficacy and authority norms, and moderately to strongly related to all other model variables. This result corresponds with the theorized role of distal variables. More specifically, to be indicative of an indirect effect on intention, a distal variable should not only be correlated with intention, but should also correlate with one or more of the more proximal or internal model variables (Ajzen & Fishbein, 1980).

Validating the Integrative Model

To test the integrative model's ability to account for adolescents’ intention to use marijuana regularly, a hierarchical regression analysis was performed. In the first step of this analysis, attitude, subjective norm, and self-efficacy were entered, followed in the second step by Σbe and Σnb(mc). Risk for marijuana use was entered in a third step. There would be evidence for an indirect effect of risk on intention if the risk measure adds little or nothing to the prediction of intention over and above the model variables. The results are presented in Table 2.

Attitude, subjective norm, and self-efficacy together explained 56% of the variance in intention, $F(3, 959) = 408.90$, $p < .001$. Adding Σbe and Σnb(mc) to the equation yielded a modest but statistically significant 2% increase in explained variance. Adding the risk measure in the third step further increased the explained variance by 5%. Note that at the zero-order level (i.e., if no other variables are taken into account), risk explained 38% of the variance in intention. This proportion dropped to 5% when we controlled for the internal model variables, suggesting that the risk measure primarily has an indirect effect on intention.

The final equation accounted for 63% of the variance in intention and shows that intention is best predicted by adolescents’ attitudes toward using marijuana regularly and the risk measure, while self-efficacy plays a modest role in predicting intention. The subjective norm and Σbe seem to be of little importance in predicting intention; although their beta weights

are significant, in an absolute sense the weights are small. Σnb(mc) did not significantly contribute to the prediction of intention.

After having established that risk primarily has an indirect effect on intention, we now examine how risk impacts on intention. For this purpose, we examine the differences between the risk groups on beliefs and more proximal determinants of marijuana use.

Differences Between Risk Groups on Strength of Beliefs

We employed MANOVAs to examine the differences between low-risk and high-risk groups on the following: (a) single outcome beliefs and their evaluations (for the four clusters separately; Tables 3, 4, 5, and 6), (b) single normative beliefs and the motivation to comply items (Table 7), and (c) single self-efficacy items (Table 8).

All results were highly significant at the multivariate level. For the sake of presentation, Tables 3 through 8 present only the univariate results. To provide an indication of the importance of the items, Tables 3 through 8 also include the correlation across both risk groups of each item with intention. In reporting on the differences between the two risk groups, we use *LRA* (low-risk adolescent) to refer to adolescents in the low-risk group and *HRA* (high-risk adolescent) to refer to adolescents in the high-risk group. A quick inspection of Tables 3 through 8 shows that, overall, the risk groups differed considerably. LRA and HRA differed significantly on about 90% of the variables on which the risk groups were compared.

The overall effects on outcome beliefs show that HRAs take a more positive position toward marijuana use than do LRAs. To inspect the results in more detail, we focus on those results that have a large effect size, which is an indication of the magnitude of the difference between LRAs and HRAs, and on those results that show different signs on the mean belief scores for LRAs and HRAs. Recall that the beliefs are scaled from −2 (*very unlikely*) to +2 (*very likely*), with 0 reflecting *neither unlikely nor likely*. Therefore, a mean belief score that is positive for LRAs and negative for HRAs implies that LRAs think that marijuana leads to the particular outcome, while HRAs think that marijuana does not lead to the outcome. Such findings would, of course, have important implications for interventions.[5]

The effect sizes and signs of the means in Tables 3 through 6 suggest that the risk groups differed most profoundly on beliefs with a strong social component and on beliefs about self-esteem costs. Specifically, HRAs believed that marijuana use leads to “having a good time” in general and to “having a good time with friends,” while LRAs did not believe that regular marijuana use leads to these outcomes. Similarly, HRAs did not believe that regular marijuana use leads to “losing friends,” “feeling lonely,” “losing their partner,” “losing their friends’ respect,” and “destroyed relationships,” while LRAs did believe that regular marijuana use has these outcomes. With respect to self-esteem costs, HRAs did not believe that after marijuana use one “is unable to get a job,” “is a bad person,” and “is a loser.” In contrast, LRAs did believe these outcomes to be likely.

[5]Note, however, that the specific mean scores for LRAs and HRAs are dependent on the cutoff we applied to categorize people as being at low risk and high risk.

Tables 3 through 6 further show that LRAs and HRAs generally agreed on whether the outcomes were good or bad. There was no outcome that was evaluated by one risk group as good and by the other risk group as bad. There were significant differences between the risk groups in their evaluation of the outcomes, but looking at the effect sizes, these differences are very small. Overall, negative outcomes were evaluated as clearly negative, and positive outcomes were evaluated as clearly positive. Exceptions to this rule are the outcomes “be like coolest kids,” “be like other teens,” and “get away from problems,” which were evaluated as neutral to somewhat positive in both risk groups.

In general, HRAs perceived less disapproval of their using marijuana by others than did LRAs. This was especially true for perceived disapproval by peers. Although the negative signs imply that both LRAs and HRAs expect disapproval, HRAs perceived far less disapproval from their close friends, their dating partners, and their peers than did LRAs (Table 7). While LRAs and HRAs differed on expected approval of their using marijuana by peers, they did not differ in their motivation to comply with peers. They differed somewhat in their motivation to comply with authority figures, such that LRAs want to do what authority figures want them to do more than do HRAs. Interestingly, both LRAs and HRAs seem to be more strongly motivated to comply with authority figures than with peers. An analysis contrasting the averaged motivation to comply items for peers (MTC–peers) and for authority figures (MTC–authority) shows that this difference was greater for LRAs than for HRAs: for LRAs, $M_{\text{MTC-peers}} = 2.79$, $M_{\text{MTC-authority}} = 3.44$, $F(1, 752) = 256.50$, $p < .001$; and for HRAs, $M_{\text{MTC-peers}} = 2.66$, $M_{\text{MTC-authority}} = 3.02$, $F(1, 258) = 23.46$, $p < .001$.

The effects on the self-efficacy items are among the weakest of all the results. Compared to LRAs, HRAs perceived less self-efficacy over saying “No” to marijuana when they are at a party, when friends suggest using marijuana, when they are home alone feeling sad, and when they are at a friend's house whose parents aren’t home (Table 8). LRAs and HRAs did not differ in their self-efficacy over saying “No” to marijuana when they are at school. In general, both LRAs and HRAs have a relatively strong sense of self-efficacy vis-à-vis saying “No” to marijuana.

For the sake of completeness, we not only examined beliefs, evaluations, and motivation to comply, but we also examined differences between low-risk and high-risk groups on the more proximal determinants of marijuana use (i.e., intention, attitude, subjective norm, and self-efficacy). The multivariate effect and four univariate effects were highly significant ($22.23 < F < 504.92$). The results show that compared to LRAs, HRAs have substantially stronger intention to use marijuana regularly ($M = 2.49$ vs. $M = 1.21$, measured on a scale from 1 to 4), have a less negative attitude toward using marijuana regularly ($M = -1.00$ vs. $M = -2.51$, measured on a scale from -3 to +3), perceive less disapproval of their regularly using marijuana by important referents ($M = -1.17$ vs. $M = -1.79$, measured on a scale from -2 to +2), and have a lower sense of self-efficacy over saying “No” to marijuana ($M = 1.09$ vs. $M = 1.44$, measured on a scale from -2 to +2).

Discussion

The present paper describes an integrative model of behavior change and reports on a test of the model's assumption that the impact of distal variables on intention to perform a behavior is indirect. Specifically, two possible mediated relationships between risk for and intention to regularly use marijuana were tested among a sample of adolescents. These mediated relationships refer to differences between low-risk adolescents (LRAs) and high-risk adolescents (HRAs) on the strength with which a belief about marijuana use is held, and the strength of the outcome evaluations or motivation to comply. Any one of these differences would result ultimately in a different intention for LRAs and HRAs. We examined the hypothesized indirect relationship between risk for regular marijuana use and intention to use marijuana regularly by testing the validity of the integrative model as an account of adolescents' intention to use marijuana regularly, and by systematically examining the suggested mediated relationships.

Before discussing the results, the distribution of intention needs to be considered. Our sample of adolescents predominantly did not intend to use marijuana regularly. Of the sample, 86 participants (8%) reported a positive intention to use marijuana regularly. In contrast, 862 participants (83% of the sample) reported that they definitely would not use marijuana. This suggests a skewed distribution of and limited variance in intention. A test of the integrative model's ability to explain the observed variance in intention nevertheless shows that attitude, subjective norm, and self-efficacy together accounted for 56% of the variance in intention. In correspondence with the model's postulations, the contribution of the weighted outcome and normative beliefs was minimal. Risk added 5% to the proportion of explained variance in intention. In decreasing order of importance, attitude, risk, and self-efficacy determined intention to use marijuana regularly.

The additional variance in intention explained by risk was unexpected. According to the model, risk is a distal variable and should affect intention indirectly by changing beliefs. How, then, should the risk effect be interpreted? Recall that the risk measure can be seen as a proxy of prior marijuana use. Several authors have suggested that, in general, additional variance in intention or behavior explained by prior behavior over and above the model variables reflects that the behavior is habitual and is not guided by attitude, norms, or self-efficacy (e.g., Norman & Smith, 1995; Ouellette & Wood, 1998; Verplanken, Aarts, van Knippenberg, & Moonen, 1998). This contention would be supported if attitude, norms, and self-efficacy do not explain variance after the effect of risk on intention has been accounted for. The current results do not support the habit contention. After risk was entered in a first step of a regression analysis, attitude, norms, and self-efficacy independently accounted for 23% of the variance in intention. A second interpretation is that a direct effect of prior behavior reflects common method variance because of similar measures used for prior behavior and intention/behavior (Ajzen, 1991). This interpretation does not apply to the current research either, since our risk measure was a composite of four variables and therefore did not match the intention measure.

Finally, variance explained by a distal or nonmodel variable might indicate that the model is incomplete and that one or more other variables need to be included as determinants of

intention and behavior. This would be a valid argument if a distal variable would explain a large proportion of the variance in intention after controlling for the model variables. Note that in the current research we found a zero-order correlation between risk and intention of .62, which equals 38% of shared variance. However, after accounting for attitude, norms, and self-efficacy, risk added only 5% to the variance explained in intention. Therefore, based on these results and our discussion of alternative explanations, we conclude that the influence of risk on intention is primarily indirect.

Given the indirect effect of risk on intention to use marijuana regularly, it is important to understand how risk operates on intention. That is, we must understand the manner in which the relation between risk and intention is mediated by the variables outlined in the model. Recall that such mediated relationships may be reflected in the strength with which people at low risk and high risk hold beliefs about marijuana use. Therefore, to test these kinds of mediated relationships, the variables that discriminate between adolescents at low risk and high risk for regular marijuana use need to be examined. In the current research, this examination revealed very consistent profiles of LRAs and HRAs. Contrasted with LRAs, HRAs: (a) believe that negative outcomes of regular marijuana use, especially social and self-esteem costs, are less likely and that positive outcomes are more likely; (b) believe that their peers will disapprove less of their using marijuana regularly; (c) have a more positive attitude toward regular marijuana use; (d) perceive less normative pressure not to use marijuana regularly; (e) have lower self-efficacy toward saying “No” to marijuana; and (f) have a stronger intention to use marijuana regularly.

In this study, we examined two possible mediated relationships between risk for regular marijuana use and intention to use marijuana regularly. The results on which the aforementioned profiles are based suggest that the relationship between risk and intention is mediated by the strength with which outcome and normative beliefs are held, but less so by belief evaluations and motivation to comply.

One can hypothesize a third mediated relationship between risk and intention. Possibly, the relative importance of attitude, subjective norm, and self-efficacy as predictors of intention differs between LRAs and HRAs. For example, whereas among LRAs intention to use marijuana may be predicted primarily by attitude, it may be predicted primarily by self-efficacy among HRAs. To test this relationship, we employed a regression analysis of intention to use marijuana regularly by a method suggested by Aiken and West (1991). This analysis tested the extent to which the relation of attitude, norms, and self-efficacy with intention is different at varying levels of the risk variable. The results show that whereas attitude was the strongest predictor of intention for both LRAs and HRAs, the predictive power of attitude was stronger for HRAs ($b = .60$, $p < .001$) than for LRAs ($b = .32$, $p < .001$). This analysis provides further evidence that risk primarily affects intention indirectly. Note, however, that although the regression method we used is less sensitive to limited variance in intention than correlational analyses within selected risk groups, the regression results are not independent of the variance in intention. In our sample, variance for intention was $S^2_{LRA} = 0.30$ and $S^2_{HRA} = 1.51$. Therefore, when interpreting the regression results, one should recognize that the weak regression weights for LRAs might be confounded with low variability in adolescents’ intention. Thus, while the stronger relation between attitude and

intention for HRAs than for LRAs suggests a third kind of mediation between risk and intention, it is not clear if this effect is robust.

On a more practical level, the results have important implications for interventions designed to prevent or decrease regular marijuana use. First of all, it is clear that very different interventions are needed for LRAs and HRAs. For LRAs, who predominantly do not intend to use marijuana, there is relatively little to be gained by trying to change intention. Rather, efforts should be made to help LRAs maintain and act on their intention to not use marijuana. In contrast, interventions that target HRAs should attempt to change intentions. Following the integrative model, such an intervention should change the beliefs that HRAs hold about regular marijuana use. The current results suggest that messages are needed that increase at-risk adolescents' beliefs that marijuana use yields social and self-esteem costs, and that peers oppose marijuana use. Unfortunately, such beliefs are very hard to change because they are likely to be based on direct experience with marijuana use. For example, it will prove very hard if not impossible to convince users that marijuana use leads to losing your partner if their own experience tells them that it does not.

To be candidate targets, beliefs should not only be amenable to change, but they should also be strongly related to intention (Hornik & Woolf, 1999). According to the model and confirmed in our data, beliefs about outcomes of marijuana use predict attitude toward marijuana use. Only when attitude is a strong predictor of intention do outcome beliefs become important to consider. In the current research, attitude was a strong predictor of intention, especially among HRAs. The finding that HRAs actually may believe that it is unlikely that marijuana use leads to social and self-esteem costs, or more generally to negative outcomes, therefore, is a critical result. On the one hand, these beliefs are important in predicting attitude and intention; but on the other hand, these beliefs are very hard to change. Similarly, the results for normative beliefs showed that, to some extent, HRAs expect relatively little disapproval of their using marijuana regularly from their peers. This is an adverse result, given the strong correlation between normative beliefs and subjective norm, and between subjective norm and intention. The results for efficacy beliefs are less adverse. Although HRAs have somewhat lower self-efficacy toward saying "No" to marijuana than do LRAs and self-efficacy is moderately related to intention, in an absolute sense both LRAs and HRAs have high self-efficacy.

In closing, the results provide support for the validity of the integrative model as an account of adolescents' intention to use marijuana regularly. The model variables accounted for a substantial proportion of the variance in intention. The effect of adolescents' risk for regular marijuana use on intention was primarily indirect, which corresponds to the model's assumptions about the role of distal variables. On a more practical level, the analytical approach to the integrative model used in this paper provides health educators with a tool that can be used to decide which variables are candidate targets in an anti-marijuana or other health intervention. Note, however, that while the integrative model helps to identify target beliefs for an intervention, it cannot provide a blueprint for the message designer as to how beliefs should be translated into successful communications (Fishbein et al., 2002). The model does help health educators obtain a clear understanding of the behavior of interest,

which is the key to addressing the promoted behavior from the perspective of the target population.

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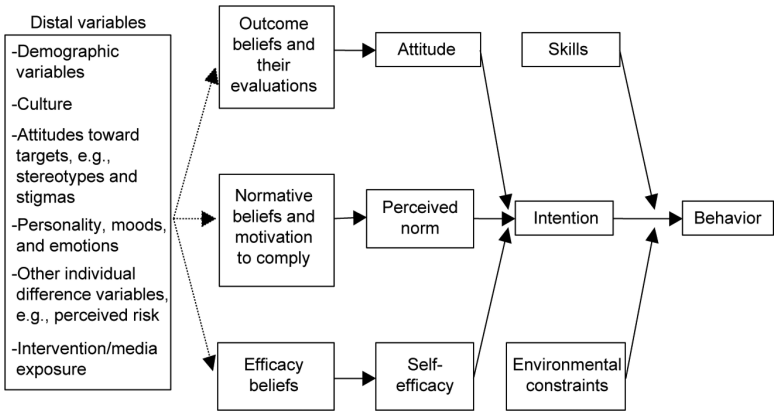

Figure 1.
An integrative model of behavioral prediction.

Table 1

Descriptive Statistics: Correlations and Means of Key Variables

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Intention	—												
2. Attitude	.72	—											
3. Subjective norm	.46	.54	—										
4. Self-efficacy	−.37	−.33	−.20	—									
5. Σbe	.49	.50	.40	−.29	—								
6. Σnb(mc)	.48	.52	.47	−.30	.48	—							
7. Physical costs	−.46	−.44	−.36	.23	−.91	−.42	—						
8. Positive outcomes	.43	.49	.36	−.27	.43	.36	−.30	—					
9. Social costs	−.51	−.53	−.40	.26	−.89	−.50	.87	−.38	—				
10. Self-esteem costs	−.51	−.51	−.40	.27	−.92	−.46	.91	−.37	.88	—			
11. Peer norms	.57	.66	.53	−.22	.43	.65	−.37	.45	−.50	−.42	—		
12. Authority norms	.40	.48	.48	−.25	.29	.56	−.27	.28	−.32	−.30	.44	—	
13. Risk measure	.62	.57	.39	−.16	.44	.46	−.39	.45	−.48	−.45	.61	.28	—
M	1.54	−2.12	−1.63	1.32	−46.39	−25.98	0.87	−0.68	0.70	0.86	−1.06	−1.80	−3.53
SD	0.96	1.27	0.76	1.05	56.82	15.33	1.03	0.84	1.10	1.05	0.88	0.48	1.70

Note. To save space, we did not include the belief evaluations and motivation to comply items. Range of measures: intention = 1 to 4; risk measure is a continuous measure with insignificant range; attitude = −3 to +3; Σbe = −144 to +144; Σnb(mc) = −60 to +60; all other constructs = −2 to +2. For self-efficacy, higher scores indicate a stronger perceived ability to say “No” to marijuana. For beliefs about costs and positive outcomes, higher scores reflect a higher perceived likelihood that marijuana leads to the particular outcome. For the risk measure, higher scores indicate being at higher risk for using marijuana. For all other constructs, higher scores indicate a more favorable position toward marijuana use.

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Table 2

Hierarchical Regression of Intention on Attitude, Subjective Norm, and Intention (Step 1), Sum of the Belief Product Terms (Step 2), and Risk for Regular Marijuana Use (Step 3)

	β				
Predictor	**Step 1**	**Step 2**	**Step 3**	F_{change}	ΔR^2
Attitude	.62***	.56***	.44***		
Subjective norm	.11***	.07**	.06*		
Self-efficacy	−.14***	−.12***	−.14***	408.90***	.56***
Σbe	—	.11***	.07**		
Σnb(mc)	—	.08**	.02	17.47***	.02***
Risk	—	—	.29***	129.25***	.05***

* $p < .05$.

** $p < .01$.

*** $p < .001$.

Table 3

Mean Differences Between Low-Risk Adolescents (LRA) and High-Risk Adolescents (HRA) on Outcome Beliefs and Their Evaluations: Physical and Mental Costs

	Belief						Evaluation					
Item description	**LRA**	**HRA**	***d***	***F***	**ES**	r_{int}	**LRA**	**HRA**	***d***	***F***	**ES**	r_{int}
Lose ambition	0.92	−0.05	0.97	113.91***	.10	−.39	−1.45	−1.36	0.09	2.79	.00	.22
Become anxious	0.67	0.05	0.61	48.38***	.05	−.27	−0.75	−0.58	0.17	5.21*	.01	.11
Lose athletic skills	1.09	0.15	0.94	113.07***	.10	−.42	−1.48	−1.25	0.23	17.33***	.02	.20
Avoid problems	0.65	0.16	0.49	24.28***	.02	−.27	−0.98	−0.85	0.13	2.83	.00	.14
Damage brains	1.40	0.83	0.57	46.31***	.04	−.26	−1.84	−1.60	0.24	42.02***	.04	.35
Become depressed	1.03	−0.05	1.08	149.01***	.13	−.44	−1.57	−1.48	0.09	3.30	.00	.23
Decreased judgment	1.06	0.22	0.84	88.00***	.08	−.35	−1.32	−1.19	0.13	4.90*	.01	.21
Expressing thoughts	1.05	0.08	0.97	124.33***	.11	−.41	−1.29	−1.17	0.12	5.18*	.01	.18
Become forgetful	1.08	0.27	0.81	90.93***	.08	−.31	−1.26	−1.14	0.12	4.34*	.00	.19
Damage lungs	1.40	1.10	0.30	14.12***	.01	−.22	−1.81	−1.52	0.29	51.22***	.05	.39
Lose motivation	1.07	0.20	0.87	95.97***	.09	−.41	−1.50	−1.38	0.12	5.93*	.01	.23
Feel tired	1.11	0.66	0.45	33.96***	.03	−.26	−0.87	−0.67	0.20	9.39**	.01	.17
Use stronger drugs	0.59	−0.41	1.00	83.41***	.08	−.37	−1.76	−1.46	0.30	33.22***	.03	.29

Note. *d* = absolute difference between LRAs and HRAs; ES = effect size (η^2); r_{int} = correlation with intention. Beliefs and evaluations range from −2 to +2.

*$p < .05$.

**$p < .01$.

***$p < .001$.

Table 4

Mean Differences Between Low-Risk Adolescents (LRA) and High-Risk Adolescents (HRA) on Outcome Beliefs and Their Evaluations: Positive Outcomes

	Belief						Evaluation					
Item description	**LRA**	**HRA**	***d***	***F***	**ES**	r_{int}	**LRA**	**HRA**	***d***	***F***	**ES**	r_{int}
Be like coolest kids	−1.20	−0.81	0.39	21.88***	.02	.19	0.68	0.39	0.29	11.61**	.01	−.06
Fit in with group	−0.92	−0.29	0.63	48.69***	.05	.22	0.93	0.76	0.17	4.14*	.00	−.04
Good time friends	−0.79	0.37	1.16	171.19***	.15	.41	1.19	1.28	0.09	1.26	.00	.04
Be like other teens	−0.36	0.32	0.68	57.98***	.05	.15	0.01	−0.20	0.21	8.10**	.01	−.01
Good time	−0.86	0.39	1.25	183.51***	.15	.44	1.26	1.30	0.04	0.25	.00	.03
Away from problems	−0.93	−0.48	0.45	20.21***	.02	.15	0.30	0.56	0.26	8.25**	.01	.09
More creative	−1.11	−0.21	0.90	111.08***	.10	.35	1.07	1.10	0.03	0.12	.00	−.01

Note. ***d*** = absolute difference between LRAs and HRAs; ES = effect size (η^2); r_{int} = correlation with intention. Beliefs and evaluations range from −2 to +2.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

Table 5

Mean Differences Between Low-Risk Adolescents (LRA) and High-Risk Adolescents (HRA) on Outcome Beliefs and Their Evaluations: Social Costs

	Belief						Evaluation					
Item description	**LRA**	**HRA**	***d***	***F***	**ES**	r_{int}	**LRA**	**HRA**	***d***	***F***	**ES**	r_{int}
Lose friends	0.80	−0.61	1.41	211.50***	.17	−.44	−1.73	−1.60	0.13	8.57**	.01	.17
Feel lonely	0.77	−0.32	1.09	139.52***	.12	−.40	v1.43	−1.35	0.08	2.15	.00	.17
Lose partner	0.85	−0.47	1.32	189.95***	.16	−.43	−1.41	−1.41	0.00	0.00	.00	.09
Lose friends' respect	0.94	−0.40	1.34	195.48***	.16	−.44	−1.67	−1.45	0.22	21.70***	.02	.24
Destroy relationships	1.13	−0.02	1.15	157.38***	.14	−.47	−1.79	−1.61	0.18	21.37***	.02	.28
Upset parents	1.48	1.06	0.42	23.68***	.02	−.24	−1.51	−1.31	0.20	14.68***	.01	.26

Note. *d* = absolute difference between LRAs and HRAs; ES = effect size (η^2); r_{int} = correlation with intention. Beliefs and evaluations range from −2 to +2.

** $p < .01$.

*** $p < .001$.

Table 6

Mean Differences Between Low-Risk Adolescents (LRA) and High-Risk Adolescents (HRA) on Outcome Beliefs and Their Evaluations: Self-Esteem Costs

	Belief						Evaluation					
Item description	**LRA**	**HRA**	***d***	***F***	**ES**	r_{int}	**LRA**	**HRA**	***d***	***F***	**ES**	r_{int}
Unable to get a job	0.98	−0.21	1.19	162.55***	.14	−.43	−1.55	−1.44	0.11	5.05*	.01	.18
In trouble with law	1.15	0.31	0.84	92.60***	.08	−.33	−1.77	−1.50	0.27	33.96***	.03	.35
Mess up life	1.33	0.21	1.12	151.34***	.13	−.45	−1.68	−1.45	0.23	21.84***	.02	.28
Be a bad role model	1.38	0.97	0.41	22.94***	.02	−.24	−1.62	−1.43	0.19	15.11***	.02	.27
Spend much money	1.17	0.25	0.92	94.82***	.09	−.40	−1.36	−1.33	0.03	0.17	.00	.14
Act against morals	1.15	0.21	0.94	107.00***	.10	−.42	−1.49	−1.25	0.24	19.34***	.02	.28
Not be good person	0.76	−0.48	1.24	167.22***	.14	−.42	−1.64	−1.40	0.24	23.92***	.02	.29
Do worse in school	1.25	0.32	0.93	102.28***	.09	−.38	−1.67	−1.46	0.21	20.83***	.02	.29
Be a loser	1.00	−0.34	1.34	190.86***	.16	−.48	−1.63	−1.41	0.22	17.59***	.02	.22
Look stupid	1.14	0.03	1.11	154.19***	.13	−.41	−1.45	−1.24	0.21	14.47***	.01	.19

Note. *d* = absolute difference between LRA and HRA; ES = effect size (η^2); r_{int} = correlation with intention. Beliefs and evaluations range from −2 to +2.

*$p < .05$.

***$p < .001$.

Table 7

Mean Differences Between Low-Risk Adolescents (LRA) and High-Risk Adolescents (HRA) on Normative Beliefs and the Motivation to Comply

	Belief						Motivation to comply					
Item description	**LRA**	**HRA**	***d***	***F***	**ES**	r_{int}	**LRA**	**HRA**	***d***	***F***	**ES**	r_{int}
Close friends	−1.59	−0.42	1.17	310.37***	.26	.53	2.79	2.68	0.11	1.39	.00	.01
Parents	−1.92	−1.61	0.31	56.07***	.06	.35	3.55	3.12	0.43	18.22***	.02	−.16
Partner	−1.56	−0.40	1.16	298.23***	.25	.59	3.29	3.07	0.22	3.25	.00	−.00
Grandparents	−1.92	−1.61	0.31	57.14***	.06	.33	3.60	3.16	0.44	16.24***	.02	−.10
Teacher	−1.83	−1.62	0.21	21.46***	.02	.27	3.17	2.79	0.38	16.65***	.02	−.13
Peers	−0.94	0.02	0.96	167.81***	.16	.34	2.29	2.24	0.05	5.37*	.00	.04

Note. *d* = absolute difference between LRAs and HRAs; ES = effect size (η^2); r_{int} = correlation with intention. Normative belief items range = −2 to +2; motivation to comply items range = 1 to 5.

* $p < .05$.

*** $p < .001$.

Table 8

Mean Differences Between Low-Risk Adolescents (LRA) and High-Risk Adolescents (HRA) on Self-Efficacy Items

Item description	LRA	HRA	*d*	*F*	ES	r_{int}
At party	1.26	0.81	0.45	24.85***	.02	−.36
Friend suggests use	1.42	1.03	0.39	23.86***	.02	−.35
Home alone and sad	1.49	1.12	0.37	21.33***	.02	−.33
At school	1.59	1.47	0.12	2.28	.00	−.20
At friend's house	1.38	0.88	0.50	33.32***	.03	−.35

Note. *d* = absolute difference between LRAs and HRAs; ES = effect size (η^2); r_{int} = correlation with intention. Self-efficacy items range = −2 to +2.

*** $p < .001$.