PROSPECTIVE CORRELATES OF EXCLUSIVE OR COMBINED ADOLESCENT USE OF CIGARETTES AND SMOKELESS TOBACCO: A REPLICATION-EXTENSION

THOMAS R. SIMON, STEVE SUSSMAN, CLYDE W. DENT
Institute for Health Promotion and Disease Prevention Research, University of Southern California

DEE BURTON, and BRIAN R. FLAY
Prevention Research Center, University of Illinois at Chicago

Abstract — This one-year prospective study provides an extension of a previous cross-sectional investigation. The previous study found that the number of tobacco products used (i.e., smokeless tobacco, cigarettes), not type of tobacco product, was associated with higher scores on problem-prone variables. In the present study, a sample of 842 southern California seventh-grade adolescents who had not tried either cigarettes or smokeless tobacco were identified and surveyed one year later. Onset of tobacco use was examined as an outcome variable predicted by scores on four psychosocial and two alcohol use variables in seventh grade. Unlike the previous study, females were included in the current study, and the potential moderating effect of gender on the pattern of predictors was examined. Overall, these findings indicate that onset of cigarette smoking or use of both tobacco products is associated with alcohol use, risk taking, and low self-esteem. This study provides modest support for the previous investigation. In addition, two of the predictor variables were found to interact with gender. Risk-taking was found to have a stronger association with initiation of tobacco use for females than males. Susceptibility to social influence to use tobacco was found to be associated with initiation of tobacco use for males only.

Generally, researchers have investigated the association between adolescent problem-prone variables and use of cigarettes or smokeless tobacco separately, ignoring the use of the other tobacco product. This analytic design can lead to interpretational difficulties, because some research suggests that users of smokeless tobacco are more conservative than cigarette smokers (see Sussman, 1989). In order to examine the association of exclusive versus overlapping use of tobacco products with other psychosocial variables, we conducted an earlier cross-sectional study using two samples of male students (eighth grade and high school) who were categorized into groups according to their tobacco use status: neither product, cigarettes only, smokeless tobacco only, or both tobacco products (Simon, Sussman, Dent, Burton, & Flay, 1993). Triers and monthly users of both tobacco products reported a higher risk-taking preference, greater susceptibility to peer social influence to use tobacco products, and greater likelihood to have tried marijuana and alcohol than did subjects who were not users of either tobacco product. Adolescents who used either product, but not both, reported similar scores on most of the variables examined, which fell in between combined or nonuse categories. These results suggest that the number of tobacco products used, not the specific type of product, is associated with problem-prone attributes.

Although, the results of this earlier study support a problem-prone perspective of...
predictors of tobacco product use, the data from which this conclusion was drawn were cross-sectional. The focus of the current follow-up study is to examine over a seventh to eighth-grade transition period the association between the psychosocial and behavioral correlates of tobacco use and initiation of use of cigarettes and smokeless tobacco. Other prospective studies have found similar predictors of both tobacco products (e.g., Dent, Sussman, Johnson, Hansen, & Flay, 1987); however, these prospective studies did not distinguish between exclusive versus overlapping use of cigarettes and smokeless tobacco. The present study provides more definitive information about psychosocial predictors of specific tobacco use behaviors.

This study provides an investigation of the level of conventionality reported on six variables often studied in the prediction of adolescent tobacco use (Simon et al., 1993) as a function of change in tobacco use status. The specific variables examined included: risk taking, self-esteem, perceived stress, perceived susceptibility to peer social influence to use tobacco, and trial and current use of alcohol. A sample of seventh grade adolescents who reported trial of neither tobacco product were surveyed again in eighth grade. From our previous studies, two hypotheses were generated. First, problematic scores on the psychosocial/alcohol use variables, as measured in seventh grade, will be associated with initiation of tobacco use over the seventh- to eighth-grade transition. Second, initiation of use of both cigarettes and smokeless tobacco, compared to use of only one product, will be associated with the most problematic scores on the six psychosocial/alcohol use variables. Also, in the previous study, females were excluded from the analyses so the pattern of associations between correlates of tobacco use and product-specific use is unknown for females. However, since females are far less likely to initiate use of smokeless tobacco it seems plausible that the relative importance of certain correlates of use may vary by gender. Therefore, the potential moderating effect of gender on the association between each of the six psychosocial/alcohol use variables and initiation of tobacco use also was examined.

**METHOD**

**Subjects**

A total of 1,267 students completed the survey items used in this study. The ethnic breakdown of the sample was as follows: 57% of the subjects were White, 24% were Latino, 3% were African-American, 9% were Asian, and 7% were of other ethnicities. Fifty-one percent of the subjects were female. Half of the schools were urban and half were suburban/rural. The Bureau of the Census (1983) definition of urbanized areas was used for this distinction.

**Procedure**

The items used for this study were part of a larger tobacco use assessment project. In the fall of 1989, subjects completed a 20-page questionnaire that assessed tobacco and alcohol use as well as tobacco knowledge and attitudes, and a number of psychosocial variables. The questionnaire consisted of a core section at the front, which contained items that assessed demographic and behavioral information, followed by three sections that rotated in order on three different forms of the questionnaire (which were randomly distributed to the students). Students were instructed that they were not expected to complete the full questionnaire. Rather, they were to complete however many items they were able to in a single class period. The questionnaires were administered by trained data collectors who were not employees of
the schools. Approximately 80% of the students, based on classroom enrollment as
the denominator, participated in the survey in the seventh grade. Confidentiality was
assured in a verbal script, and carbon monoxide and saliva samples were collected as
part of a pipeline procedure to increase the validity of tobacco use self-reports (e.g.,
Stacy et al., 1990). The data initially were collected while the students were in the
seventh grade, and follow-up surveys were collected one year later when the stu-
dents were in the eighth grade. Each student received the same form of the question-
naire in both waves of data collection. Seventy-five percent of the students who
completed the scales used in this study in the seventh grade were also assessed in the
eighth grade. Tests of attrition revealed that the measured sample did not differ from
the initial sample in demographic composition or tobacco use.

Measures

Tobacco use. Subjects were asked “How many times have you tried smoking
cigarettes?” and “How many times have you tried smokeless tobacco?” The five
response choices offered were “Never, 1 time, 2 to 5 times, 6 to 10 times, or more
than 10 times.” The sample was divided into four categories: those who have ever
tried (a) both tobacco products, (b) cigarettes only, (c) smokeless tobacco only, or
(d) neither product at each time period. Only those subjects who reported trial of
neither tobacco product in the seventh grade were included in the main analysis (n =
842). It was then possible to place these subjects into one of three eighth-grade
tobacco use categories. The three categories used were initiation of neither tobacco
product, cigarettes only, or both cigarettes and smokeless tobacco. Too few subjects
reported initiation of use of smokeless tobacco-only to warrant an additional depen-
dent variable category (n = 6). These subjects were eliminated from further analysis.

Alcohol use. To assess lifetime use of alcohol, subjects were asked “How many
times have you tried drinking alcohol?” The response choices were “Never tried, 1
time, 2 to 5 times, 6 to 10 times, or More than 10 times.” To assess current use of
alcohol, subjects were asked “How often do you drink alcohol?” The eight response
choices offered ranged from “I never drink alcohol” to “Many times everyday.”

Psychosocial variables. Responses to three items assessing risk taking were com-
bined to form a mean risk-taking score (Collins et al., 1987; Sussman et al. 1990). These items included “I like to take chances,” “It is worth getting in trouble to have
fun,” and “I enjoy doing things people say should not be done” (Cronbach’s
alpha = .59).

Five items were adapted from Rosenberg’s 10-item scale to form a measure of self-
estee (Rosenberg, 1965). These items included “I have a number of good qualities”
and “I am able to do things as well as most other people” (Cronbach’s alpha = .64).

As a measure of perceived stress, three items were adapted from the Perceived
Stress Scale (Cohen, Kamarck, & Mermelstein 1983). These items were as follows:
“In the last month, I have often been upset because of something that happened,”
“In the last month, I have often felt unable to control the important things in my
life,” and “In the last month, I have often felt nervous and stressed” (Cronbach’s
alpha = .70).

A total of 12 items were used to evaluate perceived susceptibility to peer social
influence to use tobacco products (Stacy, Sussman, Dent, Burton, & Flay, 1992). Among these items were the following: “I can talk to students my age about lots of
things, not just tobacco” and “I don’t have to use tobacco to have fun with students my age” (Cronbach’s alpha = .65).

Analysis
First, descriptive statistics were calculated to determine the prevalence of trial of the two tobacco products by grade and gender. Next, change in initiation of tobacco use across grades was examined by gender. Finally, the main analysis examined the association between known cross-sectional correlates of tobacco use as measured in the seventh grade and initiation of product-specific tobacco use one year later. Eighth-grade tobacco use was categorized into three levels (neither tobacco product, cigarettes only, or both tobacco products). Discriminant analysis models were calculated for each of the six psychosocial/alcohol use measures. Ethnicity (white, non-white), gender, and region (urban, suburban/rural) were added to all of the models as covariates. The potential moderating effect of gender was examined by including, in each of the models, an interaction term that reflected the product of gender and the predictor variable of interest. Least squares means comparisons were calculated using t-test statistics. For ease of interpreting the findings across models, each of the 6 psychosocial/alcohol use measures were standardized to a mean of zero and a standard deviation of one.

RESULTS
Prevalence and incidence of tobacco use
As shown in Table 1, trial of cigarettes in the seventh and eighth grades was reported by 34% and 47% of the male sample and 31% and 43% of the female sample, respectively. Trial of smokeless tobacco in the seventh and eighth grades was reported by 9% and 17% of the male sample and 1% and 4% of the female sample, respectively. Exclusive use of smokeless tobacco was low at both time periods. Only 2% of the male sample reported trying only smokeless tobacco at either time. Among the females surveyed, less than 1% reported trial of only smokeless tobacco at either time. The majority of subjects who reported use of smokeless tobacco also reported use of cigarettes.

Although the number of females who initiated use of both smokeless tobacco and cigarettes was low, it was sufficient for the analytic procedures used (i.e., smokeless tobacco use cell size for females was greater than 5). In subsequent analyses, the sample consisted of the 836 students of both genders who reported trial of neither tobacco product in the seventh grade and use of neither, cigarettes only, or both cigarettes and smokeless tobacco in the eighth grade. Twenty-four percent of this

<table>
<thead>
<tr>
<th>Status</th>
<th>Males Seventh grade (%)</th>
<th>Males Eighth grade (%)</th>
<th>Females Seventh grade (%)</th>
<th>Females Eighth grade (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neither</td>
<td>393 (64)</td>
<td>314 (51)</td>
<td>449 (69)</td>
<td>373 (57)</td>
</tr>
<tr>
<td>Smokeless-only</td>
<td>11 (2)</td>
<td>13 (2)</td>
<td>2 (&lt;1)</td>
<td>1 (&lt;1)</td>
</tr>
<tr>
<td>Cigarettes-only</td>
<td>169 (27)</td>
<td>194 (32)</td>
<td>195 (30)</td>
<td>252 (39)</td>
</tr>
<tr>
<td>Both</td>
<td>41 (7)</td>
<td>93 (15)</td>
<td>7 (1)</td>
<td>27 (4)</td>
</tr>
<tr>
<td>Total</td>
<td>614</td>
<td>614</td>
<td>653</td>
<td>653</td>
</tr>
</tbody>
</table>
sample reported initiation of a tobacco product for the first time during the year between seventh and eighth grade. Change in tobacco use status is shown in Table 2.

Next, we examined the impact of gender on the association between the psychosocial/alcohol use variables as measured in the seventh grade and initiation of tobacco use. Gender was found to moderate the association between the predictor variables and initiation of tobacco use in only two cases. For both risk taking and susceptibility to social influence to use tobacco the association with initiation of tobacco use was found to be moderated by gender. Therefore, an additional model was analyzed for each of these variables in which the association between the predictor variable and initiation of tobacco use was examined by gender. The results from these analyses are shown in Table 3. For males and females, initiation of use of both cigarettes and smokeless tobacco was found to be associated with higher scores on risk taking. Females who initiated use of both tobacco products reported scores on risk taking that were significantly higher than those reported by females who initiated use of cigarettes only. For males who initiated use of cigarettes only, scores on risk taking fell in between those of abstainers and of users of both tobacco products. Susceptibil-

<table>
<thead>
<tr>
<th>Variable</th>
<th>Females</th>
<th>Males</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk taking</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td>.17</td>
<td>.02</td>
</tr>
<tr>
<td>Cigarettes</td>
<td>-.07</td>
<td>.03</td>
</tr>
<tr>
<td>Both products</td>
<td>.21</td>
<td>.31</td>
</tr>
<tr>
<td>F-value</td>
<td>13.84**</td>
<td>4.52*</td>
</tr>
<tr>
<td>Susceptibility</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td>.07</td>
<td>.25</td>
</tr>
<tr>
<td>Cigarettes</td>
<td>.71</td>
<td>.75</td>
</tr>
<tr>
<td>Both products</td>
<td>1.25</td>
<td>.71</td>
</tr>
<tr>
<td>F-value</td>
<td>1.36</td>
<td>5.31**</td>
</tr>
</tbody>
</table>

*p < .05.

**p < .01.
Table 4. Results of the discriminant analysis of the variables that did not interact with gender

<table>
<thead>
<tr>
<th>Variable</th>
<th>Neither</th>
<th>Cigarettes</th>
<th>Both products</th>
<th>F-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-esteem</td>
<td>.06 A</td>
<td>-.24 B</td>
<td>-.18 A, B</td>
<td>5.71**</td>
</tr>
<tr>
<td>Stress</td>
<td>-.02 A</td>
<td>.08 A</td>
<td>.28 A</td>
<td>1.17 NS</td>
</tr>
<tr>
<td>Trial alcohol</td>
<td>-.08 B</td>
<td>.35 A</td>
<td>.62 A</td>
<td>12.95***</td>
</tr>
<tr>
<td>Current alcohol</td>
<td>-.05 B</td>
<td>.22 A</td>
<td>.40 A</td>
<td>4.97**</td>
</tr>
</tbody>
</table>

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

ity to social influence to use tobacco was found to be associated with initiation of tobacco use for males only. Among the males, subjects who initiated use of both cigarettes and smokeless tobacco were found to score the highest in susceptibility to social influence to use tobacco. Susceptibility scores of initiators of cigarettes-only fell in between the scores of abstainers and users of both tobacco products.

Significant interactions between gender and the other four variables were not obtained. Therefore, the means comparisons tests for these variables were calculated for the entire sample. The results from these analyses are shown in Table 4. Perceived stress was not found to be associated with initiation of tobacco use. Scores on self-esteem were found to be the highest among the subjects who continued to abstain from tobacco use. Abstainers scored significantly higher on self-esteem than subjects who initiated cigarette smoking. The self-esteem scores of subjects who initiated use of both cigarettes and smokeless tobacco did not differ from the scores of subjects who continued to abstain from tobacco use or initiated use of cigarettes only. Regarding alcohol use, the same pattern of results was found for trial and current use of alcohol. Subjects who reported high scores on either alcohol use item were more likely to report having initiated tobacco use. The alcohol use scores of subjects who initiated use of both tobacco products did not differ from the scores of subjects who initiated use of cigarettes only.

DISCUSSION

The year between the seventh and eighth grades marks a high-risk period for initiation of tobacco use. Twenty-four percent of nonusers initiated tobacco use for the first time during this one-year period. Apparently, the seventh-to-eighth-grade transition period remains an appropriate one in which to examine predictors of tobacco use onset. This finding is consistent with previous research (e.g., Flay, D'Avernas, Best, Kersell, & Ryan, 1983).

The results pertaining to the ability of the four psychosocial and two alcohol use variables to predict trial use of cigarettes only are very similar to the results obtained in our cross-sectional study. The majority of the variables examined were found to be predictive of initiation of use of cigarettes only. These results are encouraging because they suggest that the correlations found in previous studies between the psychosocial variables and tobacco use were not simply due to the inclusion of scores from subjects who use both tobacco products.

Regarding initiation of use of both tobacco products, some unexpected findings were obtained. In the cross-sectional study, subjects who reported trial of both cigarettes and smokeless tobacco were significantly more problem prone than sub-
Prospective correlates of tobacco use

Prospective correlates of tobacco use 523

jects who had tried neither tobacco product. Therefore, it was hypothesized that scores on these psychosocial/alcohol use variables would be higher in a problem direction among those who began use of both tobacco products or cigarettes only versus continued abstention within the next year. Scores on 4 of the 6 variables in the seventh grade were associated with increased risk of use of both tobacco products in the eighth grade. Scores on risk taking, susceptibility to social influence to use tobacco (males only), trial of alcohol, and current use of alcohol in the seventh grade differed across the two groups. However, regarding the comparison between trial of cigarettes only and trial of both tobacco products, only risk taking was significantly higher among those who began using both tobacco products, and this finding held only for females. On the other hand, mean scores on risk taking, susceptibility to peer social influence to use tobacco (males only), and the alcohol measures, were consistent with the findings from the cross-sectional study.

For most of the variables examined, the association with initiation of tobacco use did not differ across gender. This finding suggests that at least some common underlying causal factors may exist for onset of tobacco use for males and females. However, gender was found to moderate the association between scores on two of the predictor variables and initiation of tobacco use. Scores on risk taking were found to have a stronger association with initiation of tobacco use for females than for males. Susceptibility to social influence to use tobacco was found to be associated with initiation of tobacco use for males only. These results indicate that not all correlates of initiation of tobacco use have the same pattern of associations for males and females. Therefore, future research should examine the potential moderating effect of gender on predictors of tobacco use onset.

There are at least two possible implications of these data. First, although the pattern of results appears to indicate a trend toward more problematic scores among those who use both tobacco products, these findings may suggest that regarding prospective prediction of initiation of tobacco use, predictors of use of tobacco do not differentiate type of product used (controlling for gender, ethnicity, and region). Variables that are associated with increased risk for use of one tobacco product may be associated with increased risk for use of the other product. One may speculate that use of either tobacco product simply reflects a single "tobacco use" factor. Second, the moderating effect of gender on the association between some of the variables and initiation of tobacco use suggests that certain tobacco use prevention strategies may be relatively more successful for one gender. For example, the current results suggest that refusal assertion training may have a greater preventive impact for males, since onset of tobacco use was found to be associated with susceptibility to social influence to use tobacco for males only.

At least two factors limit the conclusions that can be drawn from these findings. First, subjects who reported use of smokeless tobacco only in the seventh grade were not examined in the current analyses due to the small sample size. Although the findings from the Simon et al. (1993) study would suggest that subjects who initiate use of smokeless tobacco only will report scores that are similar to those reported by students who reported trial of cigarettes only, the predictive utility of these correlates on initiation of smokeless tobacco only has not been examined prospectively. It seems plausible that students who choose to initiate use of smokeless tobacco and not of cigarettes may differ from smokers on some of these variables. The second limitation is that regular tobacco use (e.g., weekly use) was not examined. The prevalence of regular tobacco use was too low in this sample to permit analyses
across the tobacco use categories. Regular tobacco use may differ from initiation of tobacco use in terms of the association it has with scores on these psychosocial and alcohol use variables. However, as discussed above, the seventh- to eighth-grade transition represents a period of increased risk of tobacco use initiation. Therefore, it is desirable to examine prospective correlates of tobacco use initiation among students of these ages.

Overall, these findings do suggest that a variety of problem-prone attributes are predictive of initiation of tobacco use. Students who transition to use of cigarettes or both cigarettes and smokeless tobacco report more problematic scores than nonusers on several of these variables. Although risk taking was the only variable that differentiated initiation of use of cigarettes only from use of both tobacco products, the pattern of mean scores on the other variables suggests that users of both tobacco products may be the most problem prone. Future prospective studies with larger samples are needed.

REFERENCES


