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FACTORS RELATED TO CIGARETTE SMOKING AND ALCOHOL USE AMONG ADOLESCENTS

Thorolfur Thorlindsson and Runar Vilhjalmsón

ABSTRACT

Based on a national survey of Icelandic adolescents, this study examined the various predictors of cigarette smoking and alcohol use. It was found that the use of tobacco and alcohol was related to a number of different factors: sex, residence, hours of paid work, physical activities, social network, educational performance and beliefs, and psychological distress. Further, smoking and drinking had most predictors in common. It was concluded that existing theoretical perspectives on juvenile deviance do not provide an adequate account of adolescent smoking and drinking. The need to integrate existing theories into a wider explanatory framework is discussed.

INTRODUCTION

Studies of adolescents have shown that cigarette smoking and alcohol use are related to a number of psychosocial and demographic factors. In addition, substantial positive associations have been reported between smoking, drinking, and the use of illegal drugs. Several theoretical perspectives have been used to account for these relationships. Some researchers have suggested that adolescents who smoke or drink are more likely than nonsmokers and nondrinkers to engage in various other deviant activities. According to these researchers, adolescent smoking and alcohol use coexist with other deviant behaviors as part of a *problem behavior syndrome* (Barnes, 1984; Donovan & Jessor, 1985; Jessor & Jessor, 1977).

The *subculture perspective* (Cohen, 1955; Coleman, 1961; Johnson, 1973; Sutherland & Cressey, 1978; Akers, 1985) maintains that deviant behavior is learned through interaction with others, and involves communication, sanctioning, and modeling. Adolescents are more

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likely to engage in deviant behavior when they associate with others who: (1) engage in deviant behavior (e.g., substance abuse); (2) share views and definitions favoring such behavior; and (3) apply sanctions when their views pertaining to the behavior are ignored or disrespected (Sutherland & Cressey, 1978; Akers, 1985).

According to the *social control view*, deviant behavior results from insufficient social control of deviant acts which individuals are motivated to perform (Hewitt, 1970; Hirschi, 1969). Hirschi's social bonding theory states that four elements of social integration act as a constraining influence on juvenile deviance: (1) attachment to parents and peers (which enhances sensitivity to others' conventional opinions); (2) commitment to conventional lines of action (in the form of ambitions and aspirations); (3) involvement in conventional activities (which limits the opportunity to think about or engage in deviant acts); and (4) belief that one is morally obligated to respect conventional values and norms (regardless of personal advantage).

Although it is frequently assumed that adolescent smoking and drinking occur in deviant contexts, empirical findings suggest that this is not always the case. Therefore, an alternative view might define adolescent smoking and drinking as part of a life-style encompassing behaviors, attitudes, and outlooks relevant to health. According to the *life-style perspective* presented by Bruhn (1988), an "illness-lifestyle" is characterized by a number of factors, including external beliefs (e.g., external locus of control, fatalism), shyness and social withdrawal, psychological distress (e.g., depression, anger), low skills, and "risk-seeking health behaviors" (e.g., smoking and alcohol use) that are learned through parent and peer modeling, information acquired through the mass media, and life changes, and which increase the risk of developing illness. The life-style perspective makes three assumptions that are relevant for our discussion: (1) different forms of substance abuse are intercorrelated as part of a person's "risk-seeking"; (2) different forms of substance abuse have many (if not most) of their predictors in common; and (3) these predictors include affective, cognitive, and behavioral factors of various kinds.

Although attempts have been made to elaborate and refine these theoretical perspectives through empirical testing (Akers, Krohn, Lanza-Kaduce, & Radosevich, 1979; Krohn, Massey, Skinner, & Lauer, 1983; Krohn, Skinner, Massey, & Akers, 1985; Skinner, Massey, Krohn, & Lauer, 1985), most empirical research on the use of tobacco and alcohol among adolescents has only indirect bearing on existing theory. In fact, there is a gap between the wealth of empirical findings and the theoretical formulations pertaining to the use of these substances.

According to the empirical literature, adolescent tobacco and alcohol use is associated with a number of different factors. First, it appears that smoking and drinking often coincide with and provide a gateway to the use of other drugs. For example, Mills and Noyes (1984) showed that drug use is both sequential and cumulative. When young people become dependent on a new drug, they do not abandon the old one; instead, they add the new drug to their repertoire. It seems that alcohol often paves the way for the use of other drugs, such as marijuana, cocaine, and heroin (Kandel, 1975; Kandel, Kessler, & Margulies, 1978; Welte & Barnes, 1985; Yamaguchi & Kandel, 1984). Studies also indicate that cigarette smoking serves as an opening into a culture of hard drugs (Welte & Barnes, 1987; Yamaguchi & Kandel, 1984). These findings support the notion of a problem behavior syndrome. From the subculture perspective, these findings can be interpreted as demonstrating that membership in a subcultural group increases the likelihood of numerous forms of deviance. It might also be argued, based on the life-style framework, that correlations between different forms of substance abuse signify the presence of an illness-lifestyle comprising various health-risk elements.

Second, a number of studies support the proposition of subculture theorists that membership and participation in deviant subcultures increases the likelihood of deviance. For example, parents' attitudes toward drug use and parental smoking and drinking habits correlate with the use of tobacco and alcohol among adolescents (Barnes, 1984; Barnes & Welte, 1986; Charlton & Blair, 1989; Kandel et al., 1978; Lanse, Banks, & Keller, 1972; McDermott, 1984; O'Connell, Alexander, Dobson, Lloyd, Hards, Springthorpe, & Leeder, 1981). Peer attitudes and their substance use also correlate with adolescent smoking and drinking (Barnes & Welte, 1986; Biddle, Bank, & Marlin, 1980; Charlton & Blair, 1989; Jessor & Jessor, 1975; Lanse et al., 1972; O'Connell et al., 1981; Ureberg & Robbins, 1981).

Third, in line with Hirschi's social control theory, the empirical literature suggests that the use of alcohol and tobacco is related to aspects of social bonding. Thus, research shows that adolescent problem drinkers tend not to engage in school work and sports (involvement), get low grades and express negative attitudes toward school (commitment), and interact poorly with parents (attachment) (Bachman, Johnston, & O'Malley, 1981; Barnes, 1984; Buhrmann, 1977; Gerber & Newman, 1989; Hastad, Segrave, Pangrazi, & Petersen, 1984; Snyder & Spreitzer, 1983; Thorlindsson, 1989; Welte & Barnes, 1985). Similar results have been obtained for adolescent cigarette smoking. For exam-

ple, Salber, MacMahon, and Welsh (1962), Lanse et al. (1972), Krohn et al. (1983), Brunswick and Messeri (1984), and Young and Rogers (1986) found a negative relationship between smoking and school performance. In addition, Lanse et al. (1972) reported that students who do not participate in extracurricular activities smoke cigarettes more than twice as frequently as do others. Research also shows a negative correlation between adolescents' sport participation and cigarette smoking (Buhrmann, 1977; Hastad et al. 1984; Thorlindsson, 1989). However, there are indications that social bonding variables relate to adolescent substance abuse in different ways. For example, in a study by Krohn et al. (1983), it was found that attachment to friends resulted in more smoking, whereas attachment to parents was either unrelated or negatively related to smoking. In the same study, as well as in a study by Bachman et al. (1981), involvement in paid work appeared to increase smoking.

Fourth, a number of studies have shown that adolescents' use of tobacco and alcohol is related to various factors that can be seen as elements of an illness-lifestyle (see Bruhn, 1988). Thus, a positive correlation frequently is reported between depression and anxiety on one hand and the use of alcohol on the other (Deykin, Levy, & Wells, 1987; Mayer, 1988). In a study by Thorlindsson, Vilhjalmsson, and Valgeirsson (1990), it was found that anxiety, depression, and psychophysiological symptoms were all significantly associated with cigarette smoking and alcohol use. Additionally, studies have found an inverse relationship between self-esteem and alcohol use (Kaplan & Pokorny, 1976). It has also been demonstrated that external locus of control predicts cigarette smoking (Brunswick & Messeri, 1984; Clarke, MacPherson, & Holmes, 1982).

Finally, several sociodemographic factors have been found to correlate with cigarette smoking and alcohol use among adolescents. Research shows that the use of alcohol is related to gender (Bachman et al., 1981; Gibbons, Wylie, Echterling, & French, 1986; Kandel, Single, & Kessler, 1976; McLaughlin, Baer, Burnside, & Pokorny, 1985; Napier, Carter, & Pratt, 1981), socioeconomic status (Kandel et al., 1976), and residence (Gibbons et al., 1986; Napier et al., 1981). These studies show fairly consistently that males, residents of urban areas, and groups of lower socioeconomic status tend to use more alcohol than do others. Also, relationships are frequently reported between smoking and sociodemographic variables (Lanse et al., 1972; O'Connell et al., 1981; Welte & Barnes, 1987), although results vary somewhat from study to study. Lanse et al. (1972) and O'Connell et al. (1981) reported that males tend to smoke more than do females. Other research (Bachman et al., 1981; Welte & Barnes, 1987) has documented more smoking among females. While such discrepancies may be due to differences in

survey methodology or population characteristics, a closer analysis suggests that large-scale changes in smoking habits have occurred among the sexes. Not only have females caught up with males, but in some instances have surpassed them (Welte & Barnes, 1987).

Although most of the above correlates can be conceptualized as antecedents to cigarette smoking and alcohol use, it should be noted that the vast majority of adolescent studies are cross-sectional and do not specifically address issues of causality. The available longitudinal data have not provided clear evidence of causal patterns (Downs, 1985). In view of this fact, predictor variables are at this stage best treated as correlates of smoking and drinking.

The above literature review is by no means exhaustive. Nevertheless, it enables us to draw several important conclusions. First, correlations with smoking and alcohol use reveal a similar pattern both within and across categories of predictor variables, although relationships vary in strength from study to study, as might be expected given the variations in sampling and definitions of variables. Thus, both smoking and alcohol use are associated with elements of social bonding, as well as various subcultural and life-style elements. Second, the vast majority of studies look either at alcohol use or cigarette smoking but not simultaneously at both. Few attempts have been made to compare the correlates of smoking and drinking in the same population in a systematic way. To do that would, however, further our understanding of the use of these substances. Third, smoking and alcohol use appears not to be restricted to deviant contexts. In order to evaluate the significance of deviant and nondeviant factors, it is useful to compare correlations across different categories of predictors within the same population.

The present study contributes to the research on adolescent use of tobacco and alcohol in three ways. First, we included both smoking and alcohol use in our analyses. Second, we compared patterns of correlation and regression coefficients within and across several different categories of predictors. Third, since our analysis was based on a representative national sample of Icelandic adolescents, whereas most of the studies reported in the literature were conducted in the U.S., this study also extends the research on this topic cross-culturally.

METHOD

Sample

The analysis was based on a nationwide random sample of 1,200 subjects drawn from a complete list of Icelandic adolescents. The subjects were 15- and 16-year-old male and female students attending the

9th grade at the time of data collection in February and March of 1989 (schooling is obligatory for all children in Iceland through the 9th grade). Questionnaires were administered to respondents in their classrooms. Valid questionnaires were obtained from 1,131 subjects, resulting in a response rate of 94.3%. Forty-nine percent of the respondents were female. Thirty-nine percent came from lower class families, 27% from middle class, and 34% from upper class families. Forty-four percent were living in the Reykjavik area, which includes the capital city of Reykjavik and the surrounding towns of Hafnarfjörður, Kópavogur, Gardabaer, Seltjarnarnes, and Mosfellsbaer (55% of a total population of 244,000 live in the Reykjavik area, which is by far the largest urban area in Iceland).

Measures

The questionnaire was derived in part from an international project on the health behavior of schoolchildren (Aar, Wold, & Kannas, 1986; Aar & Wold, 1987). Several items based on previous research on youth, leisure, and drugs in the Reykjavik area were then added to the questionnaire (Thorlindsson, 1981, 1983, 1989). (See Table 1.)

Dependent variables. Smoking was measured by asking subjects how often they smoked, with scores ranging from 0 (no smoking) to 5 (once or more every day). The use of alcohol was measured as the number of times alcoholic beverages were consumed, ranging from 0 (no use of alcohol) to 5 (once a week or more).

Sociodemographic background. Three sociodemographic variables were included in the analyses. Sex was dummy coded with 1 = female and 0 = male. Residence was a dichotomous variable indicating whether or not the respondent lived in the urban Reykjavik area (1 = yes, 0 = no). Social class, a trichotomous measure based on occupational titles, was determined by the parent who had the higher class status (1 = lower class, 2 = middle class, and 3 = upper class). The lower class included skilled and unskilled manual workers, fishermen, and farmers. The middle class included service occupations, such as nonprofessional health service workers, elementary school teachers, office clerks, and salespeople. The upper class included business owners, executives, and university-educated specialists and professionals.

Physical activities. Sport participation (excluding athletics in school) was measured by means of a two-item summary scale (range = 0-11). The subjects were asked how often they participated in sports each week, and how many hours per week they spent participating. The first item ranged from 0 (no participation in sports) to 6 (six times per week or more); the second item ranged from 0 (zero hours) to 5 (10 hours or more per week). The correlation between the two items was

TABLE 1. Descriptive Statistics for Study Variables (N=1131)

Category and Variable	Range	Mean	Standard Deviation
<i>Socio-demographic variables</i>			
Social class	1-3	1.948	.812
Sex (1=Female)	0-1	.488	.499
Residence (1=Reykjavik area)	0-1	.444	.494
<i>Physical activities</i>			
Sport participation	0-11	4.536	3.249
Outdoor activities	0-4	1.541	1.080
<i>Social network</i>			
Having a good friend	0-1	.990	.098
Interaction with friends	0-6	4.498	1.413
Support from friends	0-3	2.393	.744
Support from parents	0-6	3.893	1.507
<i>Paid work</i>			
Hours of paid work	0-5	.819	1.253
<i>Educational performance and beliefs</i>			
Academic standing	2-9	5.809	1.574
Homework never done	0-1	.057	.229
Importance of studies	0-3	2.702	.562
Importance of grades	0-3	2.513	.645
Disliking of school	0-3	1.146	.704
<i>Internal control beliefs</i>			
Health locus of control	0-4	3.437	.825
<i>Mental health</i>			
Life satisfaction	0-3	2.252	.620
Anxiety	0-8	3.074	1.627
Depression	0-13	3.192	2.268
Psychophysiological symptoms	0-16	3.124	2.788
<i>Cigarette smoking and use of alcohol</i>			
Smoking	0-5	.698	1.543
Alcohol use	0-5	2.252	1.429

.73. Outdoor activities during the winter (e.g., skiing, skating) were measured by a single variable, ranging from 0 (no outdoor activities) to 4 (outdoor activities almost every day).

Educational performance and beliefs. Educational performance was assessed by two separate measures. Academic standing was measured using a two-item summary scale (range = 2-9). One item asked about respondents' assessment of their own study performance (range: 1 = very poor performance to 5 = very good performance), and the other item asked respondents how the teacher assesses their school performance (1 = below average performance, 2 = average, 3 = good, and 4 = very good). The correlation between the two items was .59. The

second measure of educational performance was a dummy variable indicating whether or not respondents do their homework (0 = at least some homework done, 1 = homework never done). Three separate measures of educational beliefs were also included in the analyses. The first measure asked respondents about the importance of studies for their future (range: 0 = not important at all to 3 = very important); the second measure asked about the importance of high grades (range: 0 = not important at all to 3 = very important); and the third measure asked whether or not respondents like school (0 = likes school a lot, 1 = likes school, 2 = dislikes school, and 3 = dislikes school a lot).

Social network. Four social network measures were included in the analyses. Interaction with friends was assessed using a two-item summary scale (range = 0–6). One item asked respondents about the frequency of interaction with friends after school during the daytime (range: 0 = never to 3 = four or more days each week) and the other asked about the frequency of interaction with friends in the evening (range: 0 = never to 3 = four or more evenings each week). The correlation between the two items was .54. Also, respondents were asked whether or not they had a good friend (1 = yes, 0 = no). Emotional support from friends was assessed by asking respondents whether they found it easy or difficult to talk to friends about personal problems (range: 0 = very difficult to 3 = very easy). Emotional support from parents was assessed using a two-item summary scale (range = 0–6). The items asked respondents whether they found it easy or difficult to talk about personal problems with each parent (range of both items: 0 = very difficult to 3 = very easy). The correlation between the two items was .55.

Paid work. The amount of paid work during the school year was assessed by a single measure. Respondents were asked about the number of hours of paid work they engaged in each week (range: 0 = zero hours to 5 = 20 hours or more).

Internal control beliefs. Internal locus of control was measured by a five-point health locus of control scale. Each point of the scale corresponded to a statement about a person's level of control over his or her health. Respondents were asked to indicate which statement best described their level of health control (range: 0 = "good health is just a matter of luck" to 4 = "good health only depends on what I do for myself and how I behave").

Mental health. Four dimensions of mental health were assessed. Life satisfaction was assessed using a single four-point measure (0 = unsatisfied, 1 = not too satisfied, 2 = satisfied, 3 = very satisfied). The psychophysiological symptoms variable used a four-item summary scale to measure how often subjects have headaches, stomach pains, back pains, and feel dizzy. Subjects rated each item on a five-point

scale, ranging from 0 (never) to 4 (almost every day). The scores were then added to obtain a summary score for each subject (Chronbach's $\alpha = .63$). Anxiety was measured by three items asking subjects how often they felt anxious (range: 0 = never to 4 = almost every day), tense and restless (0 = never, 1 = sometimes, and 2 = often), and had problems concentrating (0 = never, 1 = sometimes, and 2 = often). A summary score was created based on the three items (Chronbach's $\alpha = .56$). Finally, depression was measured by four items asking respondents how often they felt sad or blue (range: 0 = never to 4 = almost every day), lonely (range: 0 = never to 3 = very often), tired, even if they did not exert themselves (0 = never, 1 = sometimes, and 2 = often), and had sleeping problems (range: 0 = never to 4 = almost every day). The items were then added to obtain a summary score (Chronbach's $\alpha = .57$).

RESULTS

Bivariate Analysis

Table 2 shows the correlations of cigarette smoking and alcohol use with predictor variables. Relationships were generally in the direction predicted by earlier research. Further, comparison of correlation patterns between smoking and alcohol use revealed great similarities. Although the strength of correlation coefficients varied somewhat between smoking and alcohol use, only one discrepancy was found across the twenty-one pairs of coefficients: residence was significantly related to alcohol use but not to smoking.

All correlations with sociodemographic variables were low. Contrary to prior research, social class was not significantly related to smoking or alcohol use. There was only a weak association between residence and alcohol use. The association between gender and smoking was significant but weak, confirming recent findings showing that females smoke cigarettes more frequently than do males. There was also a significant relationship between gender and alcohol use, but in a direction opposite to previous research. In our study, females tended to use alcohol somewhat more frequently than did males.

Table 2 shows that correlations with school-related variables were consistent, ranging from low negative correlations with the perceived importance of high grades ($r = -.115$ for smoking and $-.131$ for alcohol use) to moderate negative correlations with academic standing ($r = -.253$ for smoking and $-.272$ for alcohol use). The same can be said about relationships with the two predictor variables measuring physical activities. The table reveals a consistent pattern, ranging from a low negative correlation between outdoor activities and alcohol

TABLE 2. Correlations of Cigarette Smoking and Alcohol Use with Predictor Variables (N=1131)

Category and Variable	Smoking	Alcohol Use
<i>Socio-demographic variables</i>		
Social class	-.039	.002
Sex (1=Female)	.100***	.056*
Residence (1=Reykjavik area)	.011	.056*
<i>Physical activities</i>		
Sport participation	-.250***	-.194***
Outdoor activities	-.144***	-.063*
<i>Social network</i>		
Having a good friend	-.002	.031
Interaction with friends	.227***	.347***
Support from friends	.152***	.148***
Support from parents	-.071**	-.114***
<i>Paid work</i>		
Hours of paid work	.120***	.103***
<i>Educational performance and beliefs</i>		
Academic standing	-.253***	-.272***
Homework never done	.204***	.200***
Importance of studies	-.160***	-.173***
Importance of grades	-.115***	-.131***
Disliking of school	.183***	.195***
<i>Internal control beliefs</i>		
Health locus of control	-.014	-.019
<i>Mental health</i>		
Life satisfaction	-.056*	-.069*
Anxiety	.100***	.165***
Depression	.135***	.117***
Psychophysiological symptoms	.217***	.203***

* $p < .05$, one tailed

** $p < .01$, one tailed

*** $p < .001$, one tailed

use ($r = -.063$) to a moderate negative correlation between sport participation and cigarette smoking ($r = -.250$). Thus, adolescents who were more educationally committed and more involved in schoolwork, sports, and outdoor activities were clearly less likely to use tobacco or alcohol.

Table 2 shows that all variables measuring mental health were significantly and consistently associated with both smoking and alcohol use, although correlations with life satisfaction were weak. The table shows that adolescents who were more psychologically distressed tended to be more frequent users of tobacco and alcohol.

Correlations with social network variables showed considerable

variability. Interaction with friends was moderately and positively correlated with smoking and alcohol use ($r = .227$ and $.347$, respectively). Also, emotional support from friends was positively associated with smoking and alcohol use, although the correlations were rather low ($r = .152$ and $.148$, respectively). However, having a good friend (a dichotomous variable) was not significantly related to cigarette smoking or alcohol use. These findings suggest that integration into a network of friends tends to increase smoking and alcohol use. On the other hand, emotional support from parents was negatively related to smoking and alcohol use, although the correlations were low ($r = -.071$ and $-.114$, respectively). Thus, adolescents who feel emotionally supported by their parents appear to be less inclined to smoke and drink.

Working for pay during the school year was significantly associated with the use of tobacco ($r = .120$) and alcohol ($r = .103$). In contrast, the relationship between health locus of control and the use of these substances was nonsignificant.

Finally, we conducted a separate analysis of the relationships between cigarette smoking, alcohol consumption, and the use of illegal drugs (e.g., hashish, cocaine, and LSD). In line with previous research, there was a relatively strong correlation between alcohol use and cigarette smoking ($r = .48$). It was also found that adolescent users of illegal drugs almost always had used alcohol and smoked cigarettes. Virtually all adolescent users of illegal drugs (5% of the total) had used alcohol and 92% had smoked cigarettes.

Regression Analysis

Tables 3 and 4 show the results of the regression analyses of smoking and alcohol use. When the explanatory power of the predictor variables was compared within categories of predictors with smoking as the dependent variable (see Table 3), the importance of educational performance and beliefs (Adj. $R^2 = .090$), social network (Adj. $R^2 = .075$), and physical activities (Adj. $R^2 = .070$) was noteworthy. Mental health (primarily psychophysiological symptoms) was also of some importance (Adj. $R^2 = .045$). The sociodemographic variables taken together explained only about 1% of the variance in cigarette smoking.

Comparison within categories of predictors with alcohol as the dependent variable (see Table 4) revealed similar results with a few exceptions. Residence and anxiety were significantly related to alcohol use but not to smoking. Also noteworthy was that the social network variables explained about 15% of the variance in alcohol use, but only about 8% of the variance in smoking. The difference in explained variance was primarily due to the fact that peer interaction and parental

TABLE 3. Regression Analyses of Cigarette Smoking Within and Across Categories of Predictor Variables (N=1131)

Category and Variable	Within Categories		Across Categories	
	b	Beta	b	Beta
<i>Socio-demographic variables</i>				
Social class	-.080	-.042	.034	.018
Sex (1=Female)	.309***	.100	.282**	.091
Residence (1=Reykjavik area)	.065	.021	.042	.013
Constant	.674***			
Adjusted R ² (R ²)	.009 (.012)			
<i>Physical activities</i>				
Sport participation	-.109***	-.230	-.076***	-.159
Outdoor activities	-.142***	-.100	-.131***	-.092
Constant	1.414***			
Adjusted R ² (R ²)	.070 (.072)			
<i>Social network</i>				
Having a good friend	-1.162**	-.074	-.610	-.039
Interaction with friends	.239***	.219	.205***	.187
Support from friends	.287***	.138	.213***	.103
Support from parents	-.114***	-.111	-.015	-.015
Constant	.530			
Adjusted R ² (R ²)	.075 (.079)			
<i>Paid work</i>				
Hours of paid work	.147***	.120***	.067*	.054
Constant	.578***			
Adjusted R ² (R ²)	.013 (.014)			
<i>Educational performance and beliefs</i>				
Academic standing	-.180***	-.183	-.139***	-.142
Homework never done	.903***	.134	.803***	.119
Importance of studies	-.139	-.051	-.138	-.050
Importance of grades	-.006	-.002	.004	.002
Disliking of school	.138*	.063	.071	.032
Constant	1.922***			
Adjusted R ² (R ²)	.090 (.094)			
<i>Internal control beliefs</i>				
Health locus of control	-.026	-.014	.034	.018
Constant	.789***			
Adjusted R ² (R ²)	.000 (.000)			
<i>Mental health</i>				
Life satisfaction	.007	.003	.038	.015
Anxiety	-.017	-.018	-.051	-.053
Depression	.032	.047	.041*	.061
Psychophysiological symptoms	.112***	.203	.071***	.129
Constant	.281		.842	
Adjusted R ² (R ²)	.045 (.048)		.217 (.231)	

* p < .05, ** p < .01, *** p < .001, one tailed

TABLE 4. Regression Analyses of Alcohol Use Within and Across Categories of Predictor Variables (N=1131)

Category and Variable	Within Categories		Across Categories	
	b	Beta	b	Beta
<i>Socio-demographic variables</i>				
Social class	-.017	-.010	.048	.027
Sex (1=Female)	.163*	.057	.122	.043
Residence (1=Reykjavik area)	.168*	.058	.149*	.051
Constant	2.132***			
Adjusted R ² (R ²)	.004 (.006)			
<i>Physical activities</i>				
Sport participation	-.083***	-.189	-.050***	-.113
Outdoor activities	-.035	-.027	-.017	-.013
Constant	2.683***			
Adjusted R ² (R ²)	.036 (.038)			
<i>Social network</i>				
Having a good friend	-1.103**	-.076	-.600	-.041
Interaction with friends	.348***	.344	.311***	.308
Support from friends	.225***	.117	.197***	.102
Support from parents	-.142***	-.149	-.068**	-.071
Constant	1.792***			
Adjusted R ² (R ²)	.148 (.151)			
<i>Paid work</i>				
Hours of paid work	.117***	.103	.033***	.029
Constant	2.156***			
Adjusted R ² (R ²)	.010 (.011)			
<i>Educational performance and beliefs</i>				
Academic standing	-.180***	-.199	-.117***	-.128
Homework never done	.767***	.123	.658***	.106
Importance of studies	-.136	-.054	-.148*	-.058
Importance of grades	-.030	-.014	-.036	-.016
Disliking of school	.139*	.069	.092	.045
Constant	3.542***			
Adjusted R ² (R ²)	.099 (.103)			
<i>Internal control beliefs</i>				
Health locus of control	-.033	-.019	.031	.018
Constant	2.365**			
Adjusted R ² (R ²)	.000 (.000)			
<i>Mental health</i>				
Life satisfaction	-.030	-.013	-.026	-.011
Anxiety	.090**	.102	.066*	.075
Depression	-.018	-.028	-.008	-.013
Psychophysiological symptoms	.086***	.168	.051***	.099
Constant	1.831***		1.887***	
Adjusted R ² (R ²)	.045 (.049)		.255 (.268)	

* p < .05, ** p < .01, *** p < .001, one tailed

support were more strongly related to alcohol use than to cigarette smoking. Finally, it should be noted that physical activities explained smoking somewhat better than it did alcohol use ($\text{Adj. } R^2 = .070$ and $.036$, respectively).

The regression equations which included all predictor variables (across categories) revealed similar patterns (Tables 3 and 4). Seven out of ten significant predictors of smoking were also significant predictors of alcohol use. The major difference between the two equations was that residence, parental support, importance of studies, and anxiety were significant only when predicting alcohol use, while sex, outdoor activities, and depression were significant only when predicting smoking. However, these individual effects contributed little to the explained variance of the models, which was 22% for cigarette smoking and 26% for alcohol use. It should also be noted that when variables were entered stepwise into the regression equations, seven variables included in the final equation for smoking were also included in the final equation for alcohol use. Ten variables were included in each of the final stepwise equations, explaining 22% of the variance in cigarette smoking and 25% of the variance in alcohol use.

DISCUSSION

The results obtained in this study lend support to previous studies showing that both smoking and alcohol use are related to a number of individual and social factors. The direction of significant relationships generally agrees with results from previous studies. Thus, it was found that educational performance and beliefs, physical activities, and parental support were negatively related to the use of tobacco and alcohol. On the other hand, peer interaction and support, and psychological distress (i.e., depression, anxiety, and psychophysiological symptoms) were positively related to alcohol use and cigarette smoking. In addition, smoking and alcohol use correlated substantially with each other and with the use of illegal drugs.

The effects of gender on cigarette smoking, and residence on alcohol use, were in line with previous studies. The third sociodemographic variable—social class—was not related to either smoking or alcohol use. Keeping in mind that previous research has not reported consistent findings regarding the relationship between socioeconomic status and the use of the two substances, these results are hardly surprising (see Pulkkinen, 1983).

In short, our findings generally agree with previous research and provide fairly strong cross-cultural support for results from studies of

American adolescents. It may be noted that the pattern of alcohol use and cigarette smoking among Icelandic youth revealed in this study does not permit a completely balanced comparison with empirical results obtained in the U.S. Important predictor variables were not included, such as parental and peer smoking and drinking, which limits to some extent the explanatory and comparative value of the study.

Great similarities were found in bivariate correlation patterns in that most predictors were associated with smoking and alcohol use in much the same way. Further, when alcohol use and cigarette smoking were analyzed using regression analysis within categories of predictor variables, the patterns that emerged were again quite similar. These results support findings in the empirical literature suggesting that smoking and alcohol use are related to similar or identical individual and social factors. This is important since most of the research cited earlier studied either alcohol use or smoking. The limited focus of these studies has resulted in problems of interpretation, since it is hard to determine to what extent variations in results are due to differences in sampling, measurement, or data analysis.

When regression results were compared across categories of predictor variables, similar patterns again emerged for cigarette smoking and alcohol use. The major difference was that physical activities seemed to have a greater deterrent effect on cigarette smoking than on alcohol use, whereas friends and parents influenced alcohol use more than they did cigarette smoking.

Several conclusions can be drawn based on these findings. As has been pointed out by Barnes (1984) and Welte and Barnes (1987), adolescent cigarette smoking and alcohol use are complex behaviors that are related to other problem behaviors as well as to a number of other factors. Since alcohol use and cigarette smoking follow similar patterns, these behaviors should be considered simultaneously, both at a theoretical and practical level. In addition, the interrelationship between alcohol use, cigarette smoking, and the use of illegal substances has serious implications for intervention and prevention of adolescent drug use. Some of these implications have already been pointed out (Welte & Barnes, 1985, 1987), and others will ultimately depend on further theoretical and methodological developments.

This study supports the notion of a problem behavior syndrome in that relatively strong correlations were found between different forms of substance use. However, this tells us little about the role of predictors that do not imply problem behavior.

Support was also found for subculture theory, which states that the probability of deviance increases as adolescents become more integrated with their peers (Cohen, 1955; Coleman, 1961). Likewise, we

found less smoking and drinking among adolescents who had closer ties to their parents.

The negative impact of integration into the peer network is consistent with other empirical findings (Krohn et al., 1983), but contradicts the proposition of social bonding theory that attachment discourages juvenile deviance. Also contradicting social bonding theory is the finding that job participation (a measure of involvement) was associated with more smoking and alcohol use (see also Krohn et al., 1983). In other respects, however, we found support for social bonding theory. Emotional support from parents (attachment) was negatively related to smoking and alcohol use. Likewise, physical activities and doing homework (involvement) were associated with less use of tobacco and alcohol. Also, academic standing and liking school (commitment) were associated with less use of these substances. These findings suggest that although social bonding theory generally predicts adolescent smoking and drinking, important revisions of the theory are necessary. Specifically, the theory has to take into account the consequences of integration into the peer and job worlds. These consequences may be explained in different ways. Adolescents may work for pay during the school year in order to get extra money to sustain their smoking and drinking habits. Alternatively, they may view smoking, drinking, and working for pay as indications of their maturity or adult status (Hirschi, 1969; Krohn et al., 1983). These views may be further reinforced within the peer group.

The positive relationships between psychological distress and smoking and alcohol use are in line with the life-style perspective. Associations between poor school performance and the use of tobacco and alcohol also support life-style arguments about the relationship between low skills and health-risk behavior. However, contrary to the life-style perspective, significant associations between health locus of control and the use of these substances were not found. Perhaps this can be explained by the fact that the single measure of health locus of control employed in this study was rather crude. In fact, other empirical research indicates that locus of control predicts smoking (Brunswick & Messeri, 1984; Clarke et al., 1982).

None of the above theoretical perspectives account for the total picture of cigarette smoking and alcohol use among adolescents. Therefore, more elaborate theoretical work on this topic is clearly needed. The present study was cross-sectional, like most previous research on this topic, and therefore does not provide conclusive causal evidence. Longitudinal studies including variables in diverse areas of attitudes, behaviors, and contexts are needed for a fuller understanding of the causal processes involved.

In the final analysis, we are confronted with the fact that both cigarette smoking and alcohol use are related to a number of different factors that have not yet been incorporated into a single theoretical perspective. This study supports the current literature suggesting that cigarette smoking and alcohol use can be accounted for only by wide-ranging theory. The research suggests that such a theory might be based on arguments found in subculture theory (Barnes, 1984; Donovan & Jessor, 1985; Jessor & Jessor, 1977; Akers, 1985), theories of social control, bonding, and social network (Hirschi, 1969; Johnson, 1986; Skinner et al., 1985), the life-style perspective (Bruhn, 1988), personality theory (Mayer, 1988), and theories of socialization in general (Barnes, 1984). In the absence of such a comprehensive theory, we are left with a rather incomplete picture which indicates that adolescents use tobacco and alcohol for numerous reasons within a complex psychosocial context.

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