EVIDENCE FOR TWO PATHS OF ALCOHOL USE ONSET IN ADOLESCENTS

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Abstract — Research is needed to identify risk factors specifically associated with the development of substance abuse. The current study explored the possibility that adolescents classified as having a problem behavior prone orientation (Type II) are predisposed to more rapid alcohol use onset compared to more normally socialized (Type I) adolescents. It was hypothesized that both types of adolescents would increase their alcohol use over time, but that problem behavior prone adolescents would increase their rates of alcohol consumption more rapidly than would normally socialized adolescents. Using ANCOVA (with baseline alcohol use as a covariate) and t tests (examining only nondrinkers at baseline), the hypotheses were strongly supported. Both Type I and Type II adolescents significantly increased their alcohol use over a one-year period. Type II adolescents, in comparison to Type I adolescents, had significantly higher alcohol use. The greater alcohol use among Type II adolescents was attributed to their problem behavior prone orientation. The findings suggest the existence of two different developmental pathways of alcohol use onset, one initiated by normally socialized adolescents and the other by adolescents with a problem behavior prone orientation. Future alcohol abuse prevention programs may benefit from tailored intervention strategies which take into account population specific risk factors.

INTRODUCTION

Distinguishing between adolescent substance users and potential substance abusers has recently received increased research attention (e.g., Baumrind, 1985; Donovan & Jessor, 1983; Hawkins, Lishner, & Catalano, 1985; Robins & Przybeck, 1985). This emphasis is well placed. Hundreds of studies (see reviews by Barnes, 1977; Braucht, 1982; Braucht, Brakarsh, Follingstad, & Berry, 1973; Flay, d’Avernas, Best, Kersell, & Ryan, 1983; Gorsuch & Butler, 1976; Jessor, 1979; Rachal, Maisto, Guess, & Hubbard, 1982; Stacey & Davies, 1970) have identified the antecedents and correlates of substance use initiation. However, comparatively little is known about the etiology of substance abuse. This distinction is critical. Recent epidemiological studies clearly indicate that for most adolescents substance use is a transitory phenomenon (Johnston, O’Malley, & Bachman, 1984; Kandel & Yamaguchi, 1985). Although the lifetime prevalence of adolescent alcohol use is greater than 90% (Johnston, Bachman, & O’Malley, 1982; Miller et al., 1983), only a relatively small, but obviously significant proportion of adolescents develop chronic problems with alcohol (Braucht, 1982; Rachal et al., 1982). Evidence of the transitory nature of adolescent substance use is further supported by demographic trends of high use periods indicating sharp declines in alcohol and marijuana use as adolescents reach their early 20s (Kandel & Yamaguchi, 1985).

The finding that adolescent substance use is transitory has important implications for etiologic research. Although most adolescents will not progress beyond casual or occasional use, approximately 10–30% will develop problem drug use (Braucht, 1982; Donovan & Jessor, 1978, 1983; Rachal et al., 1982). It follows that there should be identifiable risk factors for distinguishing between those who maintain use at levels which are not clearly...
problematic, versus those who progress to substance abuse. Previously reported findings suggest that the etiologic factors that have been identified for initial trying and experimenting with drugs, although certainly important, may not be directly applicable to understanding potential substance abusers. Thus, research is needed to delineate the risk factors specifically associated with the development of substance abuse.

One possible starting point in the search for risk factors that discriminate between those adolescents who become substance abusers versus tryers, or experimenters, may be found in the seemingly contradictory theories of Jessor and Jessor (1977), and Huba, Wingard, and Bentler (1980a; 1982).

The Jessors’ Problem Behavior Theory (1977, 1980) conceptualizes substance use within a general context of problem behavior proneness. Adolescent substance use is considered one type of an overall pattern of “deviant” behavior such as early sexual experience, rebelliousness, stealing, and so on. Other research has also implicated general deviance or antisocial tendencies as precursors of substance use (Loeber & Dishion, 1983; Kandel, Kessler, & Marguiles, 1978; Smith & Fogg, 1977, 1978).

In contrast, Huba, Wingard, and Bentler (1979, 1980b) argue that a general deviance dimension is not causally linked to substance use. They contend that knowledge of previous substance use, social support systems, and drug availability is sufficient to explain substance use transitions. Other research also supports a peer socialization orientation to substance use (Baumrind, 1985; Johnson, 1973, 1980).

One possible explanation for the apparently conflicting findings, and the recurrence in the research literature of both the “problem behavior” and “socialization” theories of onset is that there are actually two types of substance users. One group may consist of those who are normally socialized; the other, those with a primarily problem behavior prone orientation. It may also be the case that these two typologies place adolescents at differential risk for the development of substance abuse. Specifically, the problem behavior prone orientation may predispose adolescents to future substance abuse.

Identification of Type I and Type II adolescents

In a recent study (Weber, Graham, Hansen, Flay, & Johnson, 1985), a K-means iterative partitioning cluster program (SAS FASTCLUS, 1985) was used in a cross-sectional sample to identify different groups of alcohol users. Classification was based on the responses of adolescents to questionnaire items measuring alcohol consumption patterns and psychosocial constructs proximally related to alcohol use (e.g., parental and peer reactions to hypothetical use, use among parents and peers, and beliefs about consequences of use). Several cluster solutions were obtained and the “best-fitting” solution was selected based on both internal and external evaluation criteria (Aldenderfer & Blashfield, 1984; Anderberg, 1973; Everitt, 1980; Huizinga, 1978; Lorr, 1983).

Cluster evaluation criteria included (a) Discriminant plots of the clusters to determine that they occupied distinct areas of cluster space; (b) establishing the replicability of the cluster solutions by randomly splitting the sample and demonstrating that the same clusters were identified in each sample; (c) establishing the stability of the solution by replication on different samples of students; and (d) testing the external validity of the solution by demonstrating that cluster membership is predictive of variable scores on theoretically relevant constructs that were not included in the cluster analyses. Based on these criteria, a six-cluster solution was selected for further examination.

In addition to providing a description of alcohol users at various levels of use, it appeared that the results could have important implications. An examination of the alcohol use scores associated with the six clusters obtained suggested that the clusters were representative of six stages of alcohol use onset from lowest (Cluster 1) to highest (Cluster 6).
An examination of the clusters suggested that progress through the stages represented was not linear. Specifically, the initial two clusters did not appear to represent successive alcohol stages. While the subjects in these two clusters did not differ substantially on alcohol use, the mean differences on several psychosocial constructs were markedly different for members of these two groups. Of the psychosocial differences between these two clusters, the most notable was the relationship with parents. The members of one cluster (Cluster 2) seemed to have extremely poor relationships with their parents. Members of the other cluster (Cluster 1) had relatively good relationships with their parents.

Given the magnitude of the differences between Clusters 1 and 2 on these psychosocial dimensions, it seemed unlikely that these groups could be thought of as representing successive stages. If progress from one cluster to the other was successive, students with good parental relationships would have to develop extremely poor relationships over a relatively short time interval (i.e., between Stages 1 and 2). Moreover, parental relationships for Cluster 3 members were nearly as good as those for Cluster 1. For this reason, the Stage 2 to Stage 3 transition appeared equally doubtful in that it seems unlikely that students would improve dramatically in the relationships with their parents within such a short time interval (i.e., between Stages 2 and 3). Since it seemed unlikely that all Stage 3 members would have made such precipitous changes, that is, would follow a 1-2-3 stage sequence, it appeared that a single pathway was not sufficient to explain the onset of alcohol use, at least in these data.

Weber et al. (1985) suggested an alternative alcohol use onset model. In this model, two distinct stage sequences of alcohol use development were proposed. Of interest to the present study is the possibility that adolescents who were placed in Clusters 1 and 2 follow distinct alcohol onset pathways and develop distinguishable alcohol consumption behaviors.

The members of Cluster 1 and Cluster 2 have psychosocial profiles characterized, respectively, by either normal socialization (hereafter referred to as Type I) or problem behavior orientation (hereafter referred to as Type II). The concurrence between the psychosocial profiles of Type I and Type II and past research (e.g., Huba et al., 1979, 1980b; Jessor & Jessor, 1975, 1977) provided an opportunity to explore the possibility that these two types may be at differential risk to alcohol/substance abuse. Specifically, people who use at a higher rate when they are young are more likely to become heavily involved and less likely to be successful in self-cessation later in life (Brill & Christie, 1974; Davidson, Mellinger, & Manheimer, 1977; Kandel & Faust, 1975; Robins & Przybeck, 1985). Thus, the finding of onset rate differences between Types I and II could be an important step towards identifying risk factors specifically associated with the development of alcohol/drug abuse.

It was hypothesized in the present study (a) that both Type I and Type II adolescents would increase their alcohol use over time, and (b) that Type II adolescents would exhibit an accelerated rate of alcohol use onset. The expectation that both Types I and II would increase their alcohol use is based on research findings indicating a general upward trend in adolescent alcohol use as a function of increasing age (Jessor & Jessor, 1975, 1977; Johnston et al., 1984; Kandel & Logan, 1984). Presumably this trend reflects the fact that, for almost all adolescents, experimentation with alcohol is one aspect of a general developmental pattern (Baumrind, 1985; Jessor & Jessor, 1975, 1977). Onset rate differences were expected because Type II, compared to Type I, lack parental and peer-related constraining influences, and lack the belief that alcohol use leads to negative consequences. Confirmation of the hypothesized alcohol use pattern between Type I and Type II adolescents would provide preliminary evidence for the two-sequence alcohol onset model.

**METHOD**

**Subjects**

Subjects in this study were drawn from two successive measurement waves (measured in
Table 1. Distribution of Type I and Type II adolescents by sex, grade, and ethnicity

<table>
<thead>
<tr>
<th>Psychosocial orientation</th>
<th>Sex</th>
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<tbody>
<tr>
<td></td>
<td>Female</td>
<td>Male</td>
<td>Total</td>
<td></td>
</tr>
<tr>
<td>Type I (normal soc.)</td>
<td>656</td>
<td>558</td>
<td>1214</td>
<td></td>
</tr>
<tr>
<td>Type II (problem prone)</td>
<td>125</td>
<td>164</td>
<td>299</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>781</td>
<td>722</td>
<td>1503</td>
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<table>
<thead>
<tr>
<th>Psychosocial orientation</th>
<th>Grade</th>
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<tbody>
<tr>
<td></td>
<td>Seventh</td>
<td>Eighth</td>
<td>Total</td>
<td></td>
</tr>
<tr>
<td>Type I (normal soc.)</td>
<td>885</td>
<td>329</td>
<td>1214</td>
<td></td>
</tr>
<tr>
<td>Type II (problem prone)</td>
<td>217</td>
<td>72</td>
<td>289</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1102</td>
<td>401</td>
<td>1503</td>
<td></td>
</tr>
</tbody>
</table>

| Psychosocial orientation | Ethnicity        |          |          |          |          |          |
|--------------------------|------------------|----------|----------|----------|----------|
|                          | Other            | Asian    | Black    | Hispanic | White    | Total    |
| Type I (normal soc.)     | 47               | 98       | 372      | 449      | 248      | 1214     |
| Type II (problem prone)  | 8                | 10       | 103      | 119      | 49       | 289      |
| Total                    | 55               | 108      | 475      | 568      | 297      | 1503     |

Fall 1983; and Fall 1984) of the same panel from Project SMART (Hansen, Johnson, Flay, Graham, & Sobel, 1988). All seventh and eighth grade students (N = 3571) from the Fall 1983 panel were entered into the cluster analysis.

The demographic characteristics of Type I and Type II adolescents are presented in Table 1. Slightly more males (23%) than females (16%) were Type II (problem behavior prone) members, $\chi^2(1) = 10.45, p = .001$. Approximately 20% of each grade were Type II members. Proportionally fewer Asians were classified as Type II, $\chi^2(4) = 12.04, p = .02$. An examination of the ethnic distribution of the two groups does not reveal a clear pattern of differences between them and was considered trivial.

Variable selection

All data are based on students’ self-reported answers to the Project SMART Questionnaire administered in the classrooms in the Fall of 1983 (Time 1) and the Fall of 1984 (Time 2). The same alcohol use items were selected at both waves and represent Recent Alcohol Use (How many days in the last month have you had alcohol to drink?) and Drunkenness (How many times have you been drunk?). The internal consistency of scales involving these items was excellent (alphas for Recent Alcohol Use and Drunkenness were .92 and .91, respectively).

Social-psychological and behavioral (self-reported) constructs that have been consistently identified in the drug use literature as being proximally related to alcohol use (e.g., Huba et al., 1979, 1980b; Huba & Bentler, 1982; Jessor & Jessor, 1975, 1977; Kandel, 1978; Smart & Gray, 1979) were used to classify Type I and Type II adolescents. Reported here are only those constructs that best discriminated between Types I and II. The constructs used and specific item(s) associated with each are as follows:
Two paths of alcohol use onset

(a) Adolescent Caring About Parents' Reaction to Drug/Alcohol Use, “How much do you care how your parents would act if you used drugs or alcohol?”; (b) Parents' Anger About Adolescents' Alcohol, Cigarette, or Marijuana Use, “How angry would your parents be if you drank alcohol, or smoked cigarettes or smoked marijuana?”; (c) Negative Consequences of Alcohol Use, “If you were to drink alcohol regularly, do you think you would make a fool of yourself in front of your friends?” and “If you were to drink alcohol regularly, do you think you would get into trouble at school?”; (d) Best Friends' Reactions to Alcohol Use, “How would your best friends act toward you if you drank alcohol?” and “How would your best friends act toward you if you got drunk?”; (e) Alcohol Availability, “If you wanted to have an alcoholic drink, how hard would it be for you to get one?”; (f) Best Friends' Alcohol Use, “How many of your close friends drink alcohol?”

The internal consistency and validity of constructs involving these items evaluated using coefficient alpha and common factors analysis was judged to be good (Graham et al., 1985).

Classification of Type I and Type II adolescents

Of the 3571 students initially studied, 1796 (50%) were classified as Type I adolescents and 492 (14%) were classified as Type II adolescents. Subjects were classified into Type I and Type II on the basis of their similarity on 16 constructs related to alcohol use. Of these constructs, several discriminated highly between Type I and Type II adolescents. In contrast to Type I, Type II members (a) were less concerned about their parents’ reaction to alcohol use, (b) believed less that alcohol use leads to negative consequences, (c) perceived their parents as being uncaring about their possible alcohol use, (d) were less concerned about their best friends’ reactions to their possible alcohol use, (e) had greater access to alcohol, and (f) had more friends who used alcohol. These results confirmed the label of problem behavior prone that was applied to the Type II group.

Data analysis

The data analyses were designed (a) to test the hypothesis that both Types I and II increase their alcohol use at Time 2, and (b) to determine if classification by alcohol type is differentially predictive of future alcohol use. All analyses involved testing for a sex interaction to determine the appropriateness of combining boys and girls in the same analyses.

Gain scores were utilized to demonstrate that in addition to any significant between-group differences, the within-group differences across time are significant. The gain scores were created by subtracting students’ Time 1 from Time 2 scores on Recent Alcohol Use and Drunkenness for Type I and Type II. Thus, a positive gain score implics increasing use over time. T tests were used to test the significance of Recent Alcohol Use and Drunkenness gain scores for both Types I and II. Significantly higher means on these gain scores would indicate that both types are increasing in alcohol use, and would support the first hypothesis.

Analysis of Covariance (ANCOVA) was used to adjust for initial alcohol differences between Types I and II. The ANCOVA procedure, using Time 1 alcohol use as the covariate, tested for differences between Type I and Type II means at Time 2 on measures of Recent Alcohol Use and Drunkenness. It was predicted that in comparison to Type I, Type II would have significantly higher levels of alcohol use at Time 2 (one year later).

Because ANCOVA can either overadjust or underadjust for baseline differences, its use may result in a biased estimate of between-group differences and possible artifactual findings (Cook & Campbell, 1979). To avoid this potential limitation, another data analytic approach was also used. If both approaches lead to the same conclusions, more confidence may be placed in the results.
The second approach involved deleting all alcohol users at Time 1 from Types I and II. Using this approach resulted in deleting 53.9% of Type I’s and 64.2% of Type II’s for Recent Alcohol Use, and 57.6% of Type I’s and 64.7% of Type II’s for Drunkenness. In effect, this approach does manually what the ANCOVA model does statistically, but without the potential methodological limitations. Analysis of variance (ANOVA) was used to test the significance of the mean differences on Recent Alcohol Use and Drunkenness. Significantly higher means on these alcohol use constructs at Time 2 for Type II members were taken as supporting the hypothesis.

Attrition analyses

Attrition is an important concern in the current study because 33% of the students who were measured at pretest were not present at the following measurement, and because certain attrition patterns could account for any observed differences between Types I and II. Following the lead of Hansen, Collins, Malotte, Johnson, and Fielding (1985), the analyses conducted attempted to answer three questions: (a) Do differences exist on pretest alcohol use between Stayers and Leavers (dropouts)? (b) Are there differences in the rates of attrition among students classified as Type I or Type II? (c) Do the pretest scores on alcohol use for Leavers differ among students classified as Type I or Type II?

RESULTS

Analysis of variance, using gender and Type as the independent variables, and gain scores as the dependent measures, were used to test for gender differences. Mean differences among boys and girls on both Recent Alcohol Use and Drunkenness gain scores were found to be nonsignificant. Therefore, the gain score analyses were performed on the boys and girls combined.

As hypothesized both Type I and Type II adolescents were shown to increase their alcohol use over time. The mean differences were significant for Type I and Type II, respectively, on Recent Alcohol Use gain scores, \( t(1194) = 9.15, p = .0001 \), and \( t(282) = 5.96, p = .0001 \); and in Drunkenness gain scores; \( t(687) = 8.49, p = .0001 \), and \( t(175) = 6.14, p = .0001 \).

The results of the ANCOVA provided strong support of the hypothesis that Type II adolescents have a more rapid alcohol use onset rate than do Type I adolescents. After adjusting for pretest levels of alcohol use, Type II adolescents had greater alcohol use for both Recent Alcohol Use, \( F(2, 1475) = 20.94, p = .0001 \) and Drunkenness measures, \( F(2, 861) = 17.48, p = .0001 \). The sex by Type interactions were not significant, suggesting that boys and girls within each of the two types had similar rates of alcohol use onset.

The ANOVA involving only nondrinkers at Time 1 yielded the same results as ANCOVA. Type II adolescents had greater alcohol use for both Recent Alcohol Use, \( F(3, 647) = 6.96, p = .009 \) and Drunkenness measures, \( F(3, 419) = 7.50, p = .007 \). The sex by Type interactions for both dependent measures were also found to be nonsignificant.

Attrition results

Analysis of variance was used to test if Stayers differed from Leavers on Recent Alcohol Use and Drunkenness at pretest. The results indicated that Leavers in comparison to Stayers had a significantly higher mean on Recent Alcohol Use, \( F(3, 1884) = 13.49, p = .0002 \). Leavers also had a higher mean score on Drunkenness compared with Stayers, but the difference was not significant, \( F(3, 1497) = 1.86, p = .173 \).

The second attrition analysis determined if the rate of attrition was the same for Type I and Type II students. A chi-square test indicated that significantly more Type II students (40%) in comparison to Type I students (32%) dropped out, \( \chi^2(1) = 9.42, p = 002 \).
The last set of attrition analyses assessed if pretest alcohol use differed among Type I and Type II dropouts. ANOVA was used to test if the mean pretest scores on Recent Alcohol Use and Drunkenness differed significantly for Type I and Type II adolescents. The results indicated that Type II dropouts had greater alcohol use for both Recent Alcohol Use, $F(3, 750) = 15.23, p = .0001$ and Drunkenness measures, $F(3, 495) = 8.99, p = .003$.

**DISCUSSION**

The hypotheses of the current study were strongly supported. First, it was found that all subgroups of adolescents increase alcohol use over the one-year measurement period. More important, however, was the finding that adolescents described by previous research (Weber et al., 1985) as problem behavior prone showed significantly higher alcohol use and drunkenness at a second wave of measurement in comparison to normally socialized adolescents. The fact that the results were consistent across two different approaches for controlling baseline alcohol use adds confidence to the findings. Because the main difference between those two types was on a dimension that could be called problem behavior proneness, we conclude that the more rapid increase in alcohol use among Type II adolescents can be attributed to their problem behavior proneness.

A moderate attrition rate was observed in the present study sample. That Leavers had higher alcohol use than Stayers is consistent with attrition findings reported from other studies (e.g., Hansen et al., 1985; Josephson & Rosen, 1978). Although this finding suggests that higher level alcohol users are somewhat underrepresented in this study, the effects on the conclusions drawn are minimal. The present findings would be spurious due to a threat to internal validity only if (a) there were proportionally more Type I than Type II dropouts (assuming higher alcohol use among dropouts) or (b) the pretest alcohol use of the dropouts were higher for Type I students than for Type II students. However, there were significantly more Type II dropouts, and Type II dropouts had significantly higher pretest scores on alcohol use. Therefore, the observed attrition differences probably suppressed the Type I-Type II differences on alcohol use observed at Wave 2. Thus, the reported findings may be considered conservative estimates of alcohol onset rate differences between Type I and Type II adolescents.

Based on the pattern of results in the present study, it may be useful to think of the alcohol use onset process as being a multiple pathway process having at least two paths; one followed by normally socialized adolescents and the other followed by problem behavior prone adolescents. Such a process fits nicely with Jessor and Jessor's (1977) problem behavior theory. Consistent with that theory, the group of adolescents with more or less normal-looking behaviors and relationships showed relatively slow alcohol use onset. This slow onset rate would appear to place these students at low risk for later alcohol abuse. For the second group of adolescents, those with behaviors and relationships that make them appear more similar to Jessor and Jessor's problem behavior prone adolescents, the onset rate was substantially more rapid, placing them at considerably higher risk for alcohol abuse.

The present study has shown that there may be multiple alcohol use pathways, at least with respect to increases from essentially nonuse to low levels of alcohol use. However, it remains to be seen whether or not the members of the two types have equal probabilities for increasing their use to the level of alcohol abuse. One hypothesis for future research is that the more rapid onset rate demonstrated in the present study by the Type II group will translate into relatively higher rates of alcohol abuse among Type II members.

The possibility that there are two (or more) developmental paths of alcohol use onset has implications for how the alcohol use onset process is studied, as well as for the way prevention programs are designed. Most past studies exploring alcohol use onset have
assumed implicitly that there was a single path connecting onset stages (see Braucht, 1982, Gorsuch & Butler, 1976, for reviews), and that there was a single set of risk factors explaining the progression from one level of use to another. That is, past studies have generally assumed that substance use is an unitary process. While most of these studies have recognized differences in transition risk factors across successive stages of alcohol/drug use (e.g., the risk factors are different for the abstainer-experimenter and the experimenter-regular user transitions), they have assumed that the risk factors at each level of use are the same for all adolescents. The present research suggests that there may be at least two sets of risk factors for adolescents at each level of alcohol use.

The possibility that there are two paths of alcohol use onset has implications for prevention programs. Past prevention efforts have typically focused on adolescents who have never tried drugs, or who have tried only once or twice. However, most programs have provided these nonusers and initiates with a single program aimed at a single set of risk factors, primarily peer influences. The present research suggests that there may be a clear benefit in tailored intervention strategies in which different prevention programs are targeted at population specific risk factors. One addition to existing programs suggested by this research and the Weber et al. (1985) study would be a component in which an attempt was made to redirect Type II students towards socialization patterns more consistent with those exhibited by the normally socialized adolescents.

REFERENCES

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