

# The Effect of Early Cognitions on Cigarette and Alcohol Use During Adolescence

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The present study predicts cigarette and alcohol use in adolescence from the development of children's cognitions in the elementary years. Using latent growth modeling, the authors examined a model using data from 712 participants in the Oregon Youth Substance Use Project, who were in the 2nd through 5th grade at the 1st assessment and followed for 6 annual or semiannual assessments over 7 years. Growth in children's prototypes and subjective norms in the elementary years (Times 1 through 4) were related to their substance use in adolescence (Time 6) through their willingness and intentions (Time 5) to smoke and drink. Across the sample, for both substances, the intercept and slope of prototypes were either indirectly related to use through willingness or directly related to use. Both the intercept and slope of subjective norms were indirectly related to use of both substances through both willingness and intentions and directly related to cigarette use. Results suggest that elementary children have measurable cognitions regarding substance use that develop during the elementary years and predict use later in adolescence. These findings emphasize the need for prevention programs targeted at changing children's social images of substance users and encouraging more accurate perceptions of peers' use.

*Keywords:* alcohol, smoking, children, adolescence, cognitions

As Steinberg and Morris (2001, p. 87) noted, "development during adolescence cannot be considered without understanding development prior to adolescence." Although researchers have long recognized the temporal relationship between early risk factors in childhood and subsequent adolescent behaviors, with few exceptions (e.g., Kellam, Ling, Merisca, Brown, & Jalongo, 1998; Kellam, Simon, & Ensminger, 1983), studies have not systematically linked risk factors identified in childhood to use of substances in adolescence. Potential early predictors of adolescent substance use are the cognitions young children have about substance use and substance users. The present study is the first longitudinal study to assess children's cognitions across the elementary years and to predict cigarette and alcohol use in adolescence from the development of these cognitions.

The prediction of adolescent alcohol and cigarette use is of public health concern for two reasons. First, there are negative

health effects associated with use of cigarettes and alcohol in adolescence (Burr et al., 1999), which may not occur until adulthood (Brick, 2004; Brook, Brook, Zhang, & Cohen, 2004). Second, early use of a substance in adolescence is related to substance abuse or dependence in adulthood (Chassin, Presson, Sherman, & Edwards, 1990; Gruber, DiClemente, Anderson, & Lodico, 1996). Hence, the identification of early risk factors associated with adolescent substance use is essential to prevent or postpone use in adolescence and to improve the health of youth.

Two theories of health behavior that examine cognitive factors are prominent in the field. Within the theory of reasoned action (TRA; Fishbein & Ajzen, 1975) and its extension, the theory of planned behavior (TPB; Ajzen, 1988, 1991), attitudes and normative beliefs influence behavioral intentions to engage in a behavior, and intentions, in turn, predict subsequent behavior (Armitage & Conner, 2001). In both the TRA and the TPB, intentions are the result of reasoning and planning and are the only proximal antecedent of action (Ajzen & Fishbein, 1980). Attitudes are affective and instrumental evaluations of performing the behavior. As defined by Ajzen and Fishbein (1973), normative beliefs (prescriptive norms) are beliefs about the likelihood that members of a given reference group expect the person to perform the behavior in question. To examine the influence of subjective norms on substance use among children and adolescents, researchers have often used descriptive rather than prescriptive norms. Descriptive norms are defined as the extent to which children and adolescents believe their peers have tried the behavior.

More recently, behavior has been conceptualized as the result of dual processes: one reasoned and planned (i.e., intentions) and the

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other less deliberate and more reactive. These processes have been brought together in the prototype/willingness (prototype) model of adolescent health behavior (Gibbons & Gerrard, 1995; Gibbons, Gerrard, Blanton, & Russell, 1998; Gibbons, Gerrard, & Lane, 2003). This model includes a reasoned and planned path to behavior through intentions, as outlined in the TRA and TPB, as well as a second less planful path to behavior through behavioral willingness. Willingness is reactive, rather than planful, and is defined as an openness to a risk opportunity. Although intentions and willingness are correlated, they uniquely predict behavior (Gerrard, Gibbons, Brody, Murry, & Wills, 2006; Gibbons et al., 1998; Gibbons et al., 2004).

Another key concept in the model described by Gibbons, Gerrard, and colleagues is that of prototypes, that is, social images of the typical individual who engages in a behavior. They are more narrow than the attitudes as defined in the TRA and TPB theories but are similar to the affective, evaluative component of attitudes. However, in contrast to the TRA and TBP, the prototype model suggests that prototypes associated with risky behaviors are not goal states, and hence they do not influence behavior through planful intentions (Gerrard et al., 2002; Gibbons et al., 2003) but rather through willingness to engage in risky behavior in risk-conducive circumstances. Thus, one of the tenets of the prototype model is that children and adolescents have images of what smokers and drinkers are like (Andrews & Peterson, 2006; Snortum, Kremer, & Berger, 1987), and these images influence their subsequent willingness to engage in the behavior (Gerrard et al., 2002, 2006; Gibbons et al., 2003). For example, if individuals perceive the type of person who smokes as exciting or cool, then they are more willing to smoke themselves. Although the prototype model includes subjective norms as antecedents to behavior (as do the TRA and TPB), it suggests that the influence of subjective norms is mediated by willingness rather than by intentions.

There is extensive empirical support for the roles of prototypes and subjective norms in the direct and indirect prediction of adolescent substance use. Gibbons, Gerrard, and others have shown that adolescents with more favorable images of smokers report more willingness to smoke (Blanton, Gibbons, Gerrard, Conger, & Smith, 1997; Gerrard, Gibbons, Stock, Vande Lune, & Cleveland, 2005), and favorable images of nondrinkers are associated with abstinence from alcohol (Gerrard et al., 2002). A number of studies examining the influence of prototypes that have not included willingness in the model have shown that social images influence intentions. For example, adolescents with more favorable images of smokers were more likely than those with less favorable images to intend to smoke (Andrews & Peterson, 2006; Chassin et al., 1981; Spijkerman, van den Eijnden, Vitale, & Engels, 2002). Perceived norms have been related to smoking (e.g., Gritz et al., 2003; Norman & Tedeschi, 1989; Simons-Morton, 2002) and to intention to use alcohol and cigarettes (Hampson, Andrews, & Barckley, 2007; Hampson, Andrews, Barckley, & Severson, 2006), and peer influence has been a consistent predictor of adolescent substance use (e.g., Chuang, Ennett, Bauman, & Foshee, 2005; Urberg, Degirmencioglu, & Pilgrim, 1997; Urberg, Luo, Pilgrim, & Degirmencioglu, 2003).

The purpose of the present study is to draw from these theoretical frameworks and to examine a model relating the development of children's prototypes and subjective norms in the elementary years to their subsequent substance use in adolescence. Our pre-

vious work and that of others suggests that young children's cognitions are reliable and valid predictors of intentions and behavior. Studies indicate that children in as early as first grade recognize alcohol and cigarettes (Andrews, Tildesley, Hops, Duncan, & Severson, 2003) and by second grade have reliable prototypes (i.e., social images) of smokers and alcohol users (Andrews & Peterson, 2006). Second- to eighth-grade children's prototypes and their subjective norms (i.e., beliefs about the prevalence of peers' cigarette and alcohol use) are concurrently associated with intentions to use that substance when they are older (Hampson, Andrews, & Barckley, 2007; Hampson et al., 2006), and children's social images of smokers in fifth grade predicted their cigarette use in seventh grade (Dinh, Sarason, Peterson, & Onstad, 1995).

Although cigarette and alcohol use are both considered problem behaviors (Jessor & Jessor, 1977) and hence are often combined into a single construct for the purpose of analyses, each also has unique etiological factors (e.g., Andrews, Hops, Ary, Tildesley, & Harris, 1993; Andrews, Hops, & Duncan, 1997) and differs as to its prevalence and acceptability by society. Alcohol use is more normative than is cigarette use, and young children are more likely to try alcohol than to try cigarettes (Andrews et al., 2003). Therefore, we tested separate models for cigarette and alcohol use.

On the basis of the prototype model, we hypothesized a dual process: that both intentions and willingness would independently predict behavior and that prototypes would be related to use through willingness, for both substances. On the basis of the TRA, the TPB, and the prototype model, we hypothesized that subjective norms would be related to use through both intentions and willingness to use alcohol. The lower prevalence of cigarette use among youth suggests restricted variability in subjective norms, particularly for the younger sample. Therefore, we hypothesized that only prototypes would be directly and indirectly related to cigarette use, particularly for the younger samples.

We tested these models on a community sample of young children participating in an ongoing longitudinal study, the Oregon Youth Substance Use Project (OYSUP).<sup>1</sup> Model testing included an assessment of gender and grade differences. Popularity is particularly important for adolescent girls (Rutter, 1979), and this need for popularity may guide their ultimate behavior, suggesting that social images may be a stronger predictor of willingness for girls than for boys. Although subjective norms are perceptions of peers' use, they are considered a form of peer influence. Even though results of studies investigating gender differences on the effects of peer influence have been mixed, when gender differences were found, the effect was stronger for girls than for boys (Berndt & Keefe, 1995; Billy & Udry, 1985; Duncan, Duncan, & Hops, 1994; Kandel, 1978). Therefore, we hypothesized a stronger relationship between prototypes and subjective norms and subsequent willingness, intentions, and use, for girls than for boys.

<sup>1</sup> Previous articles using the OYSUP data set (Andrews et al., 2003; Hampson, Andrews, & Barckley, 2007; Hampson et al., 2006; Severson, Andrews, & Walker, 2003) were based on data collected in earlier assessments. Because children were younger and the prevalence of use was low, previous articles predicted intention. The focus of additional articles based on the data from this sample was on the evaluation of the psychometric properties of variables (Andrews & Peterson, 2006; Hampson, Andrews, Barckley, & Peterson, 2007).

We also examined each model as a function of grade (age) by splitting the sample into younger and older groups: those who were in the second and third grade at the first assessment and those who were in fourth and fifth grade at the first assessment. In addition to differences in the prevalence of substance use as a function of the grade of the child (Andrews et al., 2003), children are more likely to intend to use substances, are more willing to use, and have more positive prototypes of substance users as they get older (Andrews & Peterson, 2006). According to Elkind (1967), as youths age they become more egocentric and are more likely to believe that they are central to others' thoughts. Thus, we predicted that the influence of prototypes of substance users on willingness would be stronger for the older group. In addition, because peer influence increases as the child ages (Steinberg & Silverburg, 1986), the influence of subjective norms on both willingness and intentions was expected to be stronger for the older group.

## Method

### Overview of Design

OYSUP is an ongoing cohort-sequential longitudinal project (Schaie, 1965, 1970) wherein 5 grade cohorts, defined by grade at Time 1 (T1), have been or will be assessed annually or semiannually across 9 years, beginning when they are in the 1st through the 5th grade. This article is based on data from the first six assessments, which spanned 7 years, and from 4 grade cohorts, who were in the 2nd through 5th grade at the first assessment. At the sixth assessment, the sample was in the 8th through the 11th grade.

### Participants

Of the 1,075 T1 students for whom we obtained parental consent, 1,070 children completed the first assessment. The remaining 5 students were absent on the assessment day. An average of 215 students per grade (first through fifth) participated in the study at T1 with an even distribution by gender (50.3% girls,  $n = 538$ ; 49.7% boys,  $n = 532$ ). With minor exceptions, the children in the T1 sample were representative of elementary students in the district, specifically, and in Oregon, in general. (Refer to Andrews et al., 2003, for more details regarding the design of the study and the characteristics of the sample.)

Because the measure of a key variable, prototypes, was not reliable for the first grade cohort, this cohort was eliminated from the analyses. We included data from those participants for whom we had data from both the T5 and T6 assessments and from at least one of the T1 through T4 assessments. Missing data for the T1 through T4 assessment was estimated using maximum likelihood procedures. The resulting sample size was 703 for the prediction of alcohol use and 712 for smoking.

**Demographics.** At the time of the first assessment (T1), participants in this study were an average of 9.47 years old ( $SD = 1.15$ ), 74.2% of mothers and 68.0% of fathers had more than a high school education, and 5.8% of mothers and 10.0% of fathers had not graduated from high school and did not have a general education diploma. The sample was primarily Caucasian (86.7%), 6.2% Hispanic, 0.8% African American, 2.2% Asian, 2.3% American Indian or Alaskan Native, and 1.6% other or of mixed race/

ethnicity. Thirty-nine percent of the sample was eligible for a free or reduced lunch under Title I, an indicator of low family income. This is comparable to the proportion of students eligible for free or reduced lunch in Oregon (40.8%) and across the United States (36%).

**Attrition.** Of the 848 second through fifth grade children who participated in the T1 assessment, 127 did not participate in both the T5 and T6 assessments (15% of the T1 participants). Children who participated in the study at T5 and T6 were similar to those in the T1 sample who did not participate on most demographic variables, including grade, gender, race/ethnicity, father's education, and income (as measured by eligibility for free lunch). However, the mothers of those who left the study were less likely to have graduated from high school than were the mothers of those who stayed in the study (16.3% vs. 5.8%),  $\chi^2(2, N = 745) = 15.09, p < .001$ . Those who left the study were similar to those who stayed in the study on all hypothesized risk factors assessed at T1, including prototypes, subjective norms, and intentions.

### Assessment Procedures

At T1, all consenting students were assessed at school during their class time on 1 of 2 assessment days. At T2 through T6, if children attended school in the study school district, they were assessed at school. If they lived outside of the district but within driving range of the Oregon Research Institute, they were assessed at the institute. If they did not live within driving range, 2nd and 3rd graders were not assessed, 4th through 8th graders were assessed via the telephone, and 9th through 11th graders completed mailed questionnaires.

The second and third grade assessment was an individual interactive structured interview. Therefore, those who could not be assessed in person did not complete the interview. This interview used a procedure similar to that used by Blinn-Pike et al. (1993) and by Jahoda and Cramond (1972), wherein children put pictures of each substance in one of three labeled boxes representing their answers. For in-school assessments, 4th through 11th grade children answered questions in group sessions using written questionnaires. In a separate study, we showed that responses did not vary as a function of the assessment method (interview vs. questionnaire; Andrews et al., 2003).

For 4th and 5th graders, a trained monitor read the questions aloud to the group, and another monitor answered questions on an individual basis; for 6th through 11th graders, children read the questions to themselves, and trained monitors were available to answer questions. If children in the 6th through 11th grade could not read the questionnaire to themselves, a monitor read it to them. At the institute, assessments were done either in groups or individually, depending on the circumstances of the participants. Items asked were similar across grades.

### Measures

Second and third graders were shown a series of pictures depicting cigarettes and alcohol (wine, beer, and hard liquor) and asked if they could identify the item in each picture using the question "Do you know what this is?" Children were scored as identifying the substance if they could name it or describe its effects. If the children indicated that they could not identify a

specific drug, prototypes and subjective norms were not assessed and were recorded as missing. At T1 3% of second and third graders could not identify cigarettes, and 8% could not identify alcohol; at T2, 3% could not identify cigarettes, and 6% could not identify alcohol.

*Prototypes (social images).* Characteristics of substance users for the assessment of prototypes were selected from a list of attributes of smokers examined by Dinh et al. (1995) in a prospective study of fifth and seventh graders. Attributes selected for the present study were “exciting,” “cool” or “neat,” and “popular” (see Andrews & Peterson, 2006, for more details regarding attribute selection). To assess prototypes, we asked all children if they thought that “kids who smoke cigarettes (drink alcohol)” were each of these attributes. A 3-point response format was used for each question, with “yes” coded as 2, “no” as 0, and “maybe” as 1. The measure was created by averaging the three items. As shown in Andrews and Peterson (2006), the Guttman properties of these items were excellent for all but first graders’ prototypes of alcohol users, implying a unidimensional scale, with children initially endorsing “popular,” followed by “popular” and “exciting,” and finally “popular,” “exciting,” and “cool” or “neat.”<sup>2</sup> The three items were summed to measure prototypes for each substance. In earlier studies (Andrews & Peterson, 2006; Andrews et al., 2003) the intraclass correlation of these variables within school were examined and found to be small, ranging from .001 to .018, allowing us to collapse across school for these analyses.

*Subjective norms.* To assess peer-based descriptive norms, we showed second and third graders a picture of alcoholic beverages and a picture of cigarettes and asked “Do any kids in your neighborhood or at school (smoke/drink) this?” and “Do your friends ever (smoke/drink) this?” (“no” or “don’t know” = 0, “yes” = 1). Fourth through eighth graders were asked “How many of the kids at school or in the neighborhood have tried (a drink of alcohol [beer, wine, or hard liquor]/a cigarette)?” (“none” = 0; “some,” “most,” or “all” = 1) and “Do you have any friends who (drink alcohol/smoke cigarettes)?” (“yes” = 1, “no” = 0). Responses were summed across the two items (second and third graders,  $r_s = .09$  and  $.47$ , for cigarettes and alcohol, respectively;<sup>3</sup> fourth through eighth graders,  $r_s = .44$  and  $.57$ , for cigarettes and alcohol, respectively). Hampson et al. (2006) examined the convergent and discriminate correlations among the two items assessing norms and the three items assessing prototypes and found that the correlations between items assessing the same construct were consistently higher (mean convergent  $r$  for prototype items =  $.40$ , mean convergent  $r$  for norm items =  $.34$ ) than the correlations between items assessing divergent constructs (mean divergent  $r = .14$ ).

*Behavioral intentions.* To assess intentions, we asked all children the following two items: “Do you think you would (smoke/drink alcohol, etc.) when you are an adult?” and “when you are (in high school, for middle school participants; out of high school, for high school participants)?”<sup>4</sup> Responses to each item were “no” (coded as 0), “maybe” (coded as 1), and “yes” (coded as 2). At T5, the correlation between the two items was  $.84$  for cigarettes and  $.74$  for alcohol.

*Behavioral willingness.* To assess willingness, we gave children in the 6th through 10th grade at T5 the following scenario: “Suppose you were with one of your friends and one of them offered you a (cigarette/drink of alcohol). How willing would you be to . . .”. Four items assessing willingness followed this state-

ment. Items ranged from experimenting with the substance (e.g., “try a few puffs”) to more extensive use (e.g., “smoke more than one cigarette” and “take one to smoke later”). Children indicated their willingness to engage in each behavior on a 5-point Likert-type scale, ranging from *very unwilling* (1) to *very willing* (5). At T5, internal consistency across the four items for willingness, as measured by Cronbach’s alpha, was  $.84$  for cigarettes and  $.86$  for alcohol.

*Use in the last 12 months.* Use in the last 12 months was assessed with the following question: “During the last 12 months, how many times did you (drink alcohol/smoke cigarettes or cigars)?” The six response options ranged from *never* (0) to *some each day* (5). The stability of responses to this item between T5 and T6 was  $.69$  for cigarettes and  $.67$  for alcohol.

### Overview of Analyses

We used the MPlus program, Version 3.0 (Muthén & Muthén, 2004), to test the fit of the model to the data. We modeled development in both prototypes and subjective norms across the first four assessments using latent growth models. Within latent growth models, measures of variables across time (assessments) were used to estimate the intercept (initial level at T1) and the slope (rate of change over time). Within this program, missing data within the first four assessments were estimated using maximum likelihood. We first examined the fit of an associative growth model of the concurrent growth of prototypes and subjective norms over time. We then fit a model wherein the intercept and slope of prototypes and subjective norms were both directly related to substance use at T6 and indirectly related to substance use through intentions at T5 and through willingness at T5. Nonsignificant paths were eliminated from the final model. Within the final model, the significance of the indirect paths was tested using the Sobel (1982) test.

To test for gender differences in the cigarette and alcohol models, we used multiple sample analysis to evaluate the significance of the difference in fit of each parameter between the two models, one with the respective parameter fixed between genders and the other with the parameter freed. To test for grade differences in the cigarette and alcohol models, we used multiple sample

<sup>2</sup> The coefficient of reproducibility (CR), which has a minimum acceptable value of  $.90$ , ranged from  $.92$  to  $1.00$ , across the second through eighth grade and substances. The minimum marginal reproducibility was lower than the CR in all cases meeting criteria for acceptability, and the coefficient of scalability, which interprets the difference between the CR and the minimum marginal reproducibility, ranged from  $.60$  to  $.96$ , meeting or exceeding the minimum of  $.60$ .

<sup>3</sup> The relatively low coefficient for cigarettes in the sample of second and third graders was due to the low variability in these two items.

<sup>4</sup> In the majority of studies, behavioral intentions and behavioral expectations are used interchangeably (Armitage & Conner, 2001). However, these two variables differ as to the time frame. Behavioral intentions typically refer to a more recent time frame than expectations do (Warshaw & Davis, 1985). Because the measure in this study refers to several years in the future, behavioral expectations is a more accurate name for this variable, although it is not as widely used. Behavioral expectations generally have higher means, are more stable, are more internally consistent, and are more predictive of behavior than are behavioral intentions (Gibbons et al., 2004; Parker, Manstead, Stradling, Reason, & Baxter, 1992).

analysis to compare the second and third graders at T1 with the fourth and fifth graders at T1.

## Results

### Descriptive Analyses

*Intentions, willingness, and use.* Intentions, willingness, and use were less prevalent for cigarette use than for alcohol use. At T5, 20.1% expressed some intention to smoke cigarettes in the future (a score on the intention scale greater than or equal to 1.0), and 47.1% expressed some willingness to smoke cigarettes in the future (a score on the willingness scale greater than or equal to 1.0). At T5, 71% expressed some intention to drink alcohol in the future, and 58.9% expressed some willingness. At T6, 24.1% reported smoking in the last year, with 13.5% reporting smoking at least some each month (5.3% reported smoking daily). At T6, more than half (53.4%) reported drinking in the last year, and 38.8% reported drinking at least some each month.

*Prototypes and subjective norms.* The means and standard deviations of prototypes and subjective norms are shown in Table 1. For both substances, the means were consistently less than 1.0, for both measures, across assessments. Both prototypes and subjective norms increased over time. Across the entire sample, prototypes of alcohol users did not differ from prototypes of cigarette users across the first three assessments but were significantly more favorable than those of cigarette users at the fourth assessment ( $p < .05$ ). Subjective norms regarding cigarette use exceeded those of alcohol use in the first assessment ( $p < .05$ ) but were less than those of alcohol use for the third and fourth assessment ( $p < .05$ ).

*Gender differences.* Using multiple sample analysis, we examined the intercepts and slopes of prototypes and subjective norms for each substance as a function of gender and found no differences. There were also no gender differences in willingness or intention to use any substance at T5. However, girls smoked more cigarettes in the last 12 months than boys did at T6,  $t(710) = 2.53, p < .05$ , but use of alcohol did not vary by gender.

Table 1  
Means and Standard Deviations of Prototypes and Subjective Norms Across Assessments

Time point (T)	Cigarettes		Alcohol	
	Mean	SD	Mean	SD
Prototypes (favorability)				
T1	0.39	0.78	0.41	0.82
T2	0.38	0.74	0.40	0.85
T3	0.47	0.88	0.45	0.89
T4	0.52	0.95	0.61	1.14
Subjective norms				
T1	0.36	0.57	0.28	0.53
T2	0.41	0.61	0.44	0.68
T3	0.61	0.69	0.69	0.80
T4	0.68	0.71	0.92	0.85

### Prediction of Cigarette Use

*Associative model of prototypes and subjective norms.* An associative growth model of both prototypes and subjective norms fit the data well,  $\chi^2(21, N = 712) = 35.36, p = .03$ ; comparative fit index [CFI] = .981; root-mean-square error of approximation [RMSEA] = .031; 90% confidence interval [CI] = .011, .018. The intercept and slope of both prototypes (intercept,  $M = .37, p < .001$ ; slope,  $M = .045, p < .01$ ) and subjective norms (intercept,  $M = .34, p < .001$ ; slope,  $M = .115, p < .001$ ) differed significantly from zero. Variances of these parameter estimates were all significant (all  $ps < .001$ ). As expected, the intercepts of prototypes and subjective norms were negatively correlated with their respective slopes ( $r = -.41, p < .01$ , and  $r = -.22, p < .05$ , respectively). Thus, less favorable initial prototypes and lower subjective norms were related to a faster increase in prototypes and norms, respectively, across assessments. The slope of prototypes was significantly correlated with the slope of subjective norms ( $r = .33, p < .01$ ), suggesting an association between the rate of change in these two cognitions over time. Although the intercept of subjective norms was correlated with the slope of prototypes ( $r = .25, p < .05$ ), the intercept of prototypes was not significantly correlated with either the intercept ( $r = .02$ ) or the slope of subjective norms ( $r = -.12$ ).

*Full model.* The model predicting cigarette use in the last 12 months at T6 from the development of prototypes and subjective norms through willingness and intentions fit the data well,  $\chi^2(36, n = 712) = 46.09, p = .12$ ; CFI = .993; RMSEA = .020; 90% CI = .000, .035. As shown in Figure 1, the effect of the intercept and slope of prototypes on cigarette use at T6 was indirect, through willingness (intercept, Sobel test = 2.83,  $p < .01$ ; slope, Sobel test = 2.63,  $p < .01$ ). However, the intercept and slope of subjective norms were indirectly related to cigarette use through both willingness (intercept, Sobel test = 3.14,  $p < .01$ ; slope, Sobel test = 2.19,  $p < .05$ ) and intentions (intercept, Sobel test = 3.44,  $p < .001$ ; slope, Sobel test = 2.48,  $p < .05$ ). These variables were also directly related to use.

*Gender differences.* Multiple sample analysis by gender showed differences on four parameter estimates, with stronger effects for girls than for boys. These are summarized in Table 2 and illustrated in Figure 1. The paths from the slope of subjective norms to willingness at T5 and to cigarette use at T6 and from the slope of prototypes to intentions at T5 were significant for girls but not for boys. In addition, the path from intentions at T5 to cigarette smoking at T6 was significant for both genders, but stronger for girls.

*Grade differences.* Multiple sample analysis by grade showed differences on two parameter estimates with stronger effects for older youth than for younger youth. First, the path from the intercept of prototypes to willingness at T5 was significant only for older participants, those who were in the fourth and fifth grades at T1. Second, the path from willingness at T5 and cigarette use at T6 was stronger for older than for younger students, but significant for both.

### Prediction of Alcohol Use

*Associative model.* An associative growth model of prototypes and subjective norms fit the data well,  $\chi^2(21, n = 703) = 54.38, p < .001$ ; CFI = .967; RMSEA = .048; 90% CI = .032, .063. The

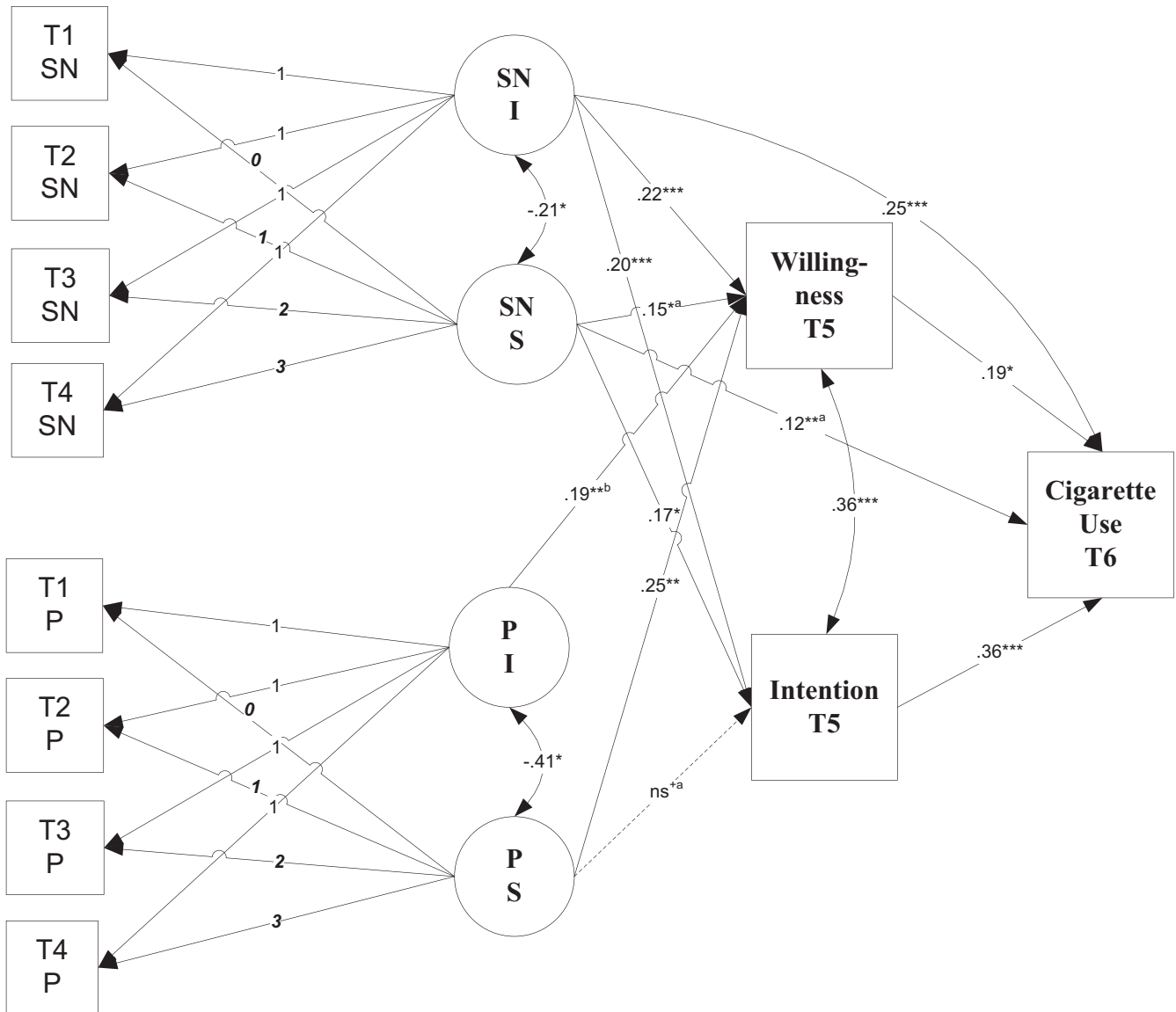


Figure 1. The indirect and direct effects of initial level and growth of subjective norms and prototypes on smoking at T6. Estimates are for the entire sample. T = time point; SN = subjective norms; P = prototypes; I = intercept; S = slope. <sup>a</sup>Multiple sample analysis by gender showed that these paths were significant only for girls. The path from the slope of prototypes to intention was not significant for the entire sample. <sup>b</sup>Multiple sample analysis by grade group showed the path was significant only for older children (fourth and fifth grade at T1). \* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ .

intercept and slope of both prototypes (intercept,  $M = .80$ ,  $p < .001$ ; slope,  $M = .22$ ,  $p < .001$ ) and subjective norms (intercept,  $M = .79$ ,  $p < .001$ ; slope,  $M = 1.19$ ,  $p < .001$ ) differed significantly from zero. Variances of these parameter estimates were all significant (all  $ps < .001$ ). As expected, the intercept of prototypes was negatively correlated with the slope ( $r = -.36$ ,  $p < .05$ ), suggesting that those who have the less favorable initial prototypes tend to increase the favorability of prototypes faster. However, the intercept of subjective norms was not significantly correlated with the slope ( $r = .20$ ). The slope of prototypes was significantly correlated with the slope ( $r = .69$ ,  $p < .011$ ) of subjective norms,

suggesting that these two cognitions are associated across time. However, the intercept of prototypes was not significantly correlated with the intercept of subjective norms ( $r = .03$ ), but was significantly and negatively correlated with the slope of subjective norms ( $r = -.20$ ,  $p < .01$ ). The intercept of subjective norms was significantly correlated with the slope of prototypes ( $r = .31$ ,  $p < .01$ ).

*Full model.* The model predicting alcohol use in the last 12 months at T6 from the development of prototypes and subjective norms through willingness and intentions fit the data well,  $\chi^2$  (39,  $n = 703$ ) = 64.14,  $p < .01$ ; CFI = .987; RMSEA = .030; 90%

Table 2  
Gender and Grade Group Differences in Standardized Path Coefficients

Path	$\chi^2$ difference test	$\beta$	
		Boys	Girls
Cigarette use			
Slope of subjective norms to willingness	7.112*	-.019	.30***
Slope of subjective norms to cigarette use	3.916*	-.12	.17**
Slope of prototypes to intentions	6.452**	-.05	.36**
Intentions to cigarette use	25.181**	.27***	.47***
		Younger	Older
Intercept of prototypes to willingness	4.77***	.06	.32***
Willingness to cigarette use	7.47***	.14**	.26***
Alcohol use			
		Boys	Girls
Intercept of subjective norms to intentions	8.25***	.37***	.10

Note.  $N = 712$  for cigarette use;  $N = 703$  for alcohol use.  
\*  $p < .05$ . \*\*  $p < .01$ . \*\*\*  $p < .001$ .

CI = .016, .043. As shown in Figure 2, similar to cigarettes, the intercept of prototypes was indirectly related to alcohol use through willingness (Sobel test = 1.97,  $p < .05$ ); however, in contrast to cigarettes, the slope of prototypes was directly, rather than indirectly, related to alcohol use. Similar to cigarettes, the intercept and slope of subjective norms were indirectly related to alcohol use, through both willingness (intercept, Sobel test = 2.88,  $p < .01$ ; slope, Sobel test = 4.18,  $p < .001$ ) and intentions (intercept, Sobel test = 3.41,  $p < .001$ ; slope, Sobel test = 4.97,  $p < .001$ ). However, in contrast to cigarettes, there was not a direct effect of either the intercept or the slope of subjective norms on alcohol use at T6.

*Gender and grade differences.* Multiple sample analysis by gender showed only one difference. The path between the intercept of subjective norms and intention to use alcohol at T5 was significant only for boys, not for girls. Multiple sample analysis did not suggest grade differences in parameter estimates.

## Discussion

The findings from this study support a dual process model, wherein risky behavior is influenced by two pathways: one that is reasoned and another that is reactive (Reyna & Farley, 2006). Both cigarette and alcohol use in adolescence were influenced by both intention to engage in the behavior and by willingness to do so. In support of the prototype/willingness model (Gibbons & Gerrard, 1995; Gibbons et al., 1998, 2003), both the intercept and slope of prototypes (social images of substance users) predicted cigarette use through willingness to smoke, and the intercept of prototypes

predicted alcohol use through willingness to drink alcohol. In support of the TRA and TPB cognitive theories and of the prototype/willingness model, both the intercept and slope of subjective norms, or perceptions of friends' and classmates' use, predicted use of both alcohol and cigarettes through both intentions and willingness.

Reflective of the acceptability of alcohol use versus cigarette use among adults in today's society, a large proportion of adolescents intended to use alcohol when they were older, and relatively few intended to smoke cigarettes. In addition, more adolescents used alcohol than smoked cigarettes. More adolescents intended to use alcohol when older than were willing to do so. In contrast, fewer adolescents intended to smoke cigarettes than were willing to do so. These inconsistent results for alcohol versus cigarettes are most likely due to the time frame of willingness (now) versus intentions (later) and the perceived risk associated with using the substance. Smoking is considered a risky behavior by most adolescents, and adolescents are willing to do riskier things than they intend to do (Gibbons et al., 2003).

The results emphasize the importance of children's cognitions about substance use throughout the elementary years in the prediction of substance use 3 years later, in adolescence. In general, both initial level, when they were in the second through the fifth grade, and growth, until the fifth through eighth grade, of these cognitions either indirectly or directly predicted frequency of use of that substance. Children who initially had more favorable prototypes of kids their age who use cigarettes or alcohol and believed that more of their peers used the substance, were more willing to use these substances, and subsequently used that substance more in adolescence. Children who initially believed that more of their peers smoked had greater intention to smoke in the future and subsequently used cigarettes more frequently in adolescence. This effect was replicated for boys in the prediction of alcohol use. Moreover, those children whose prototypes of cigarette users became increasingly more favorable across the early years were more willing to smoke and subsequently used cigarettes more frequently in adolescence; those children whose perceptions of the number of peers who use alcohol and cigarettes increased over the elementary years were more willing to use, more likely to intend to use in the future, and subsequently used the respective substance more frequently in adolescence.

For all children, for both cigarettes and alcohol, the intercept and slope of prototypes were directly related to the use of that substance or were indirectly related through willingness. The indirect effect of the initial level of prototypes on alcohol and cigarette use and the slope of prototypes on cigarette use through willingness supports the prototype/willingness model. Prototypes, or social images of other kids who use a substance, are evaluative and affect-laden (i.e., associated with good or bad qualities). According to the prototype/willingness model, willingness is more reactive than is intention, which is conceptualized by Ajzen and Fishbein (1973) as more planful. Similarly, according to Slovic (2001), the decision to engage in risky behavior such as substance use is based on two distinct cognitive systems: an experiential system, which is intuitive and automatic, and another that is deliberative and reason based. The experiential system is based on imagery and affect. Our findings are consistent with these theoretical orientations. They suggest that more affect-laden cognitions (i.e., prototypes) are more highly related to teens' knowledge-

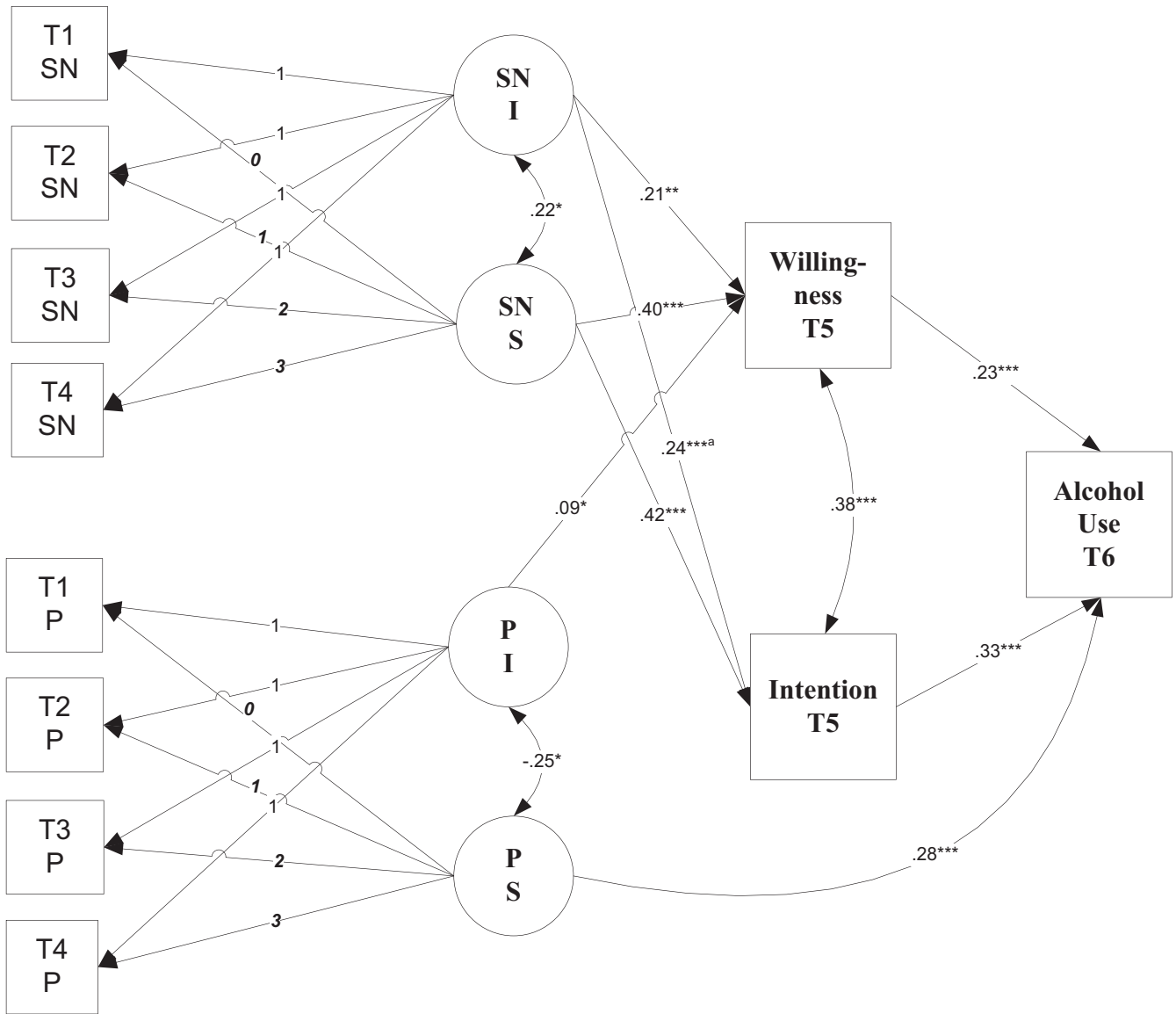


Figure 2. The indirect and direct effects of initial level and growth of subjective norms and prototypes on alcohol at T6. T = time point; SN = subjective norms; P = prototypes; I = intercept; S = slope. <sup>a</sup>Multiple sample analysis by gender showed the path was significant only for boys. \* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ .

ments of their willingness to engage in an activity than to their more reasoned intentions to do so.

Subjective norms influenced both alcohol use and cigarette use through both a reasoned pathway, intentions, and a social reaction pathway, willingness. As noted earlier, subjective norms are teens' perceptions of their peers' use of a substance and most likely consist of a veridical report of actual peer use and an overestimate of actual peer use, but both social influence variables uniquely affect adolescent substance use (Graham, Marks, & Hansen, 1991). Perhaps actual use impacts the more deliberative aspects of use (i.e., intentions), and overestimations are more affect laden, affecting willingness. Additional research is necessary from within the framework proposed by Graham et al. (1991), which separates these two facets of subjective norms to investigate their unique relationship to willingness and intentions.

The direct path from the slope of prototypes to alcohol use in a sample of this age who are in general inexperienced was surprising and is not easily explained. Although others have found a direct path from prototypes to the behavior (Rivis & Sheeran, 2003), they did not include willingness in the model, or the studies were based on an older, more experienced sample. There is no clear reason why children's social images of kids who use alcohol should influence alcohol use in adolescence directly, rather than indirectly through willingness.

#### Gender Differences

The paths of influence of both prototypes and subjective norms on cigarette use and of subjective norms on alcohol use varied by gender. However, for both genders, both prototypes and subjective



norms ultimately predicted both alcohol and cigarette use. On the basis of previous research on gender differences in peer influence (e.g., Berndt & Keefe, 1995; Duncan et al., 1994), we expected stronger relationships between the initial level and growth of subjective norms and intentions and willingness for girls than for boys. As expected, in contrast to boys, girls' increase in perception across the elementary years of the number of peers who smoked was related to a higher intention to smoke in the future and to more willingness to smoke. For girls, the effect of the slope of prototypes on cigarette use was through both willingness and intentions, whereas for boys the effect was only through willingness. Girls have a greater concern about rejection from friends (Berndt, 1982) and have a greater need to be popular (Rutter, 1979). These concerns may guide girls to be playful as a result of their social images of smokers, leading to intention as well as to willingness.

Because the frequency of girls' cigarette use at T6 was greater than that of boys, the finding of more significant pathways to use is meaningful. All paths must be targeted in smoking prevention programs, with a particular emphasis on both the affective and reasoned pathways for girls.

Only one gender difference was found in the model predicting alcohol use, and this effect was in the opposite direction to that hypothesized. The initial level of perception of peer alcohol use was significantly related to intentions only for boys. There is really no obvious explanation for this finding, which is not supported by previous research. The stronger effects for girls than for boys found only for cigarette use could be due to the relative acceptability and prevalence of alcohol use as compared to cigarette use.

### *Grade Differences*

Effects of grade were tested in both the cigarette and alcohol models. In contrast to predictions, for the most part, the final model was generalizable across all grade groups for both substances. This finding is particularly important, suggesting that prototypes and subjective norms, with one exception, are as important for second and third graders as for older children. Analyses suggested only one grade difference in a parameter estimate; the effect of the initial favorability of prototypes at T1 on cigarette use was only significant for the older cohorts. This finding suggests implementing prevention programs for cigarette use in the fourth and fifth grade.

### *Strengths and Limitations*

This study has both strengths and limitations. The strengths of this study include the large longitudinal data set, including measures of cognitions in the early elementary years, and the method of analysis, allowing for the prediction of substance use in adolescence from the initial level and growth of these early cognitions. However, although the sample is representative of students in the geographical region, findings are generalizable to a limited proportion of adolescents: those who live in working-class communities in the western United States who are primarily Caucasian. Moreover, the analysis limits the potential for examining the interaction of gender and grade in the prediction of use. Although it is possible to test for interaction effects using latent growth modeling (Li, Duncan, & Acock, 2000), the models are exceedingly complex, requiring many additional parameter estimates.

Hence, we limited our analyses to that of main effects. Further, data on peer use were collected only from the participants, limiting our ability to separate the unique variance of both perceived and actual use in the prediction of subsequent substance use.

### *Implications for Prevention*

The findings in this article have important implications for the design of prevention programs and for the timing of these programs. They suggest that both prototypes and subjective norms are important targets for elementary school prevention programs designed to prevent or postpone cigarette and alcohol use. Thus, these programs need to focus on reinforcing unfavorable prototypes among children to prevent prototypes from becoming more favorable as they develop and on encouraging more accurate perceptions of peer use, because perception of peers' use is often overestimated (Agostinelli & Grube, 2005; Graham et al., 1991). Other foci for programs are the reinforcement of low intentions, the targeting of elementary school children prior to the increase in intentions, which occur in middle school, and an emphasis on parental monitoring, targeting parents of middle school children. Parental monitoring can remove opportunities for substance use, if children are willing to engage in that behavior.

The finding that initial levels of both prototypes and subjective norms are related to subsequent cigarette and alcohol use suggests designing programs for elementary students, beginning as early as second grade for alcohol use and fourth grade for cigarette use. Moreover, the finding that the slope or rate of growth of both prototypes and norms is related to subsequent cigarette and alcohol use suggests that annual booster sessions are needed to prevent the normative developmental increase of these cognitions.

Most prevention programs for children are school based, are designed for students in the seventh and eighth grade, and target social influence factors (c.f. Sussman, Dent, Burton, Stacy, & Flay, 1995). For example, Gerrard, Gibbons, and colleagues have developed and tested an alcohol prevention program for early adolescents targeting prototypes (Gerrard et al., 2006), and Sussman's program (Sussman et al., 1995) targets subjective norms, as well as other social influence factors. More recently, Andrews et al. (2007) have developed a computer-based tobacco prevention program for fifth graders, with targeted components reinforcing children's unfavorable prototypes of tobacco users and correcting perceptions of peer use. This program is engaging for elementary students and suggests the feasibility of using the computer as an instructional modality to deliver similar substance use prevention programs. Educational software is a common instructional tool for children as young as preschool age. Therefore, a computer-based substance use prevention program would be appropriate for children in early elementary school, as well as for children in the later grades.

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