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## The Contextual and Subjective Experience of Alcohol Use Incaucasian Adolescents' Daily Lives

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LOYOLA UNIVERSITY CHICAGO

THE CONTEXTUAL AND SUBJECTIVE EXPERIENCE OF ALCOHOL USE  
IN CAUCASIAN ADOLESCENTS' DAILY LIVES

A DISSERTATION SUBMITTED TO  
THE FACULTY OF THE GRADUATE SCHOOL  
IN CANDIDACY FOR THE DEGREE OF  
DOCTOR OF PHILOSOPHY

DEPARTMENT OF PSYCHOLOGY

BY

PAUL CROWE

CHICAGO, ILLINOIS

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CHAPTER I  
INTRODUCTION

In the past 30 years, a considerable amount of research has focused on the topic of adolescent alcohol use. Early studies tended to focus solely on prevalence rates in relation to demographic characteristics (e.g., Bacon & Jones, 1968; Johnston & Bachman, 1975; NIAAA, 1974). Because of the importance of monitoring population trends, studies of this nature continue. After discovering high rates of alcohol use among adolescents, researchers turned their attention to investigating the correlates and predictors of use. As McDonald and Towberman (1993) have noted, most factors (aside from demographic variables) which have been studied in relation to adolescent alcohol use fall into two major categories: 1) environmental influences such as peer and familial socialization, and 2) internal states and characteristics such as sensation seeking, alcohol expectancies, and depression. This wide range of investigation has led to a call for and the eventual development of multivariate models and integrative

psychosocial theories of adolescent alcohol use (e.g., Problem Behavior Theory; Jessor & Jessor, 1975). In a recent review, Petraitis, Flay, and Miller (1995) organized 14 theories of adolescent experimental substance use into three types of influence (viz., social, intrapersonal, and attitudinal) and three levels of influence (viz., ultimate, distal, and proximate).

However, despite this broad range of inquiry and the development of theories to explain adolescent alcohol use, surprisingly few studies have focused on the actual behavior of adolescent drinking. This fact is surprising for a number of reasons. First, research on contextual/situational factors related to alcohol consumption indicates that the environment in which drinking takes place impacts not only on the amount and intensity of alcohol consumed (Harford, 1984; Harford & Grant, 1987; Harford & Spiegler, 1983; Harford, Wechsler, & Rohman, 1981; Storm & Cutler, 1981) and the expected effects of alcohol (Brown, 1985) but is also related to the occurrence of risk-taking behaviors associated with drinking, such as driving under the influence (Beck & Summons, 1987a). Furthermore, the study of drinking contexts can identify adolescent problem drinkers by the lack of situational specificity in their drinking; in

other words, adolescents who drink across a wide range of contexts are more likely to be problem drinkers (Kouzis & Labouvie, 1992). Second, research suggests that early experiences with alcohol may confirm or disconfirm adolescents' expectancies about the experience of alcohol (Christiansen, Goldman, & Inn, 1982). Early drinking experiences can increase or decrease the likelihood of future drinking based on whether the expectations were positive or negative and whether they were met (Christiansen, Goldman, & Brown, 1985). Thus, early drinking experiences may impact upon future use because decisions to drink in the future will be based upon the experience of the past. A final reason why the study of the subjective experience of alcohol use is important to the field becomes evident when one considers adolescent behavior as adaptive, purposeful and goal-directed. Alcohol use is not just an outcome variable, it is a choice that adolescents make to experience the effects of alcohol and, ultimately, most adolescents engage in alcohol use because they view its effects (whether social or pharmacological) as desirable. Thus, the more distal predictors of adolescent alcohol use (e.g., parenting style or personality characteristics) should be understood in terms of the more proximal

predictors: the immediate meaning and experience that alcohol use provides for adolescents. Therefore it would benefit the field to collect data on adolescents' experience of alcohol use in terms of ascertaining why factors such as authoritative parenting and sensation seeking predict alcohol use. Moreover, by identifying what alcohol use provides for adolescents, prevention techniques which employ alternatives to alcohol use can be better designed.

Thus, the field is still missing crucial data on where, when, with whom, and (most importantly) how adolescents experience the use of alcohol. The few studies that have investigated these areas via survey methods often suffer from a reliance on adolescents' memory for these events and poor ecological validity. While adolescents' ability to recall and aggregate their experience of drinking may already be limited, the task is made even more difficult by asking them to do so in an environment far removed from where and when the behavior took place. Moreover, much of what is thought to comprise the subjective experience of alcohol use is based upon inference from alcohol expectancy research. This author suggests that employing ecologically valid measures, such as time sampling, to examine the contexts and experience of alcohol use is essential to



understanding the most immediate causes of why adolescents consume alcohol and describing the parameters that surround the consumption of alcohol.

This introduction is divided into five sections. First, the prevalence of adolescent alcohol use and the negative effects it may have will be examined in order to establish the scope and impact of adolescent drinking. Second, a review of factors associated with and psychosocial theories about adolescent alcohol use will be provided. The third section will review the important role of alcohol expectancies in adolescent drinking and their relationship to the experience of alcohol use. Fourth, the utility of and methods for studying the contexts and experience of alcohol use among adolescents will be discussed. Finally, the current study will be described and hypotheses based upon the reviewed literature will be presented.

#### Prevalence and Impact of Use

In contrast to the slight decline in drug use reported by adolescents during the 1980's, recent surveys indicate that alcohol use during adolescence has remained high and even increased from earlier levels. In a recent national survey of adolescents, 69 percent of the sampled eighth graders indicated having ever used alcohol, with 26 percent

of them indicating use in the past month. Even higher rates of alcohol use were found for older adolescents. Among adolescents in 12th grade, almost 88 percent of the adolescents indicated having used alcohol, with more than half reporting use in the past month. Daily use of alcohol, indicative of severe dependence, was reported by 3.4% percent of the twelfth graders (Johnston, O'Malley, & Bachman, 1993). Another annual national survey of high school seniors indicated that almost a third of the graduating class of 1990 reported drinking five or more drinks in a sitting within two weeks prior to the study (University of Michigan, 1991). Other studies indicate comparable and even higher rates of use as well as a consistent relationship between alcohol use and age (e.g., Martin and Pritchard, 1991; Newcomb and McGee, 1989; Oetting & Beauvais, 1990). Although the reported prevalence and quantity of alcohol use by adolescents may vary slightly by sample and measurement tool (e.g., quantity-frequency vs diary measures; O'Hare, 1991; Webb et al., 1990), alcohol consumption is clearly a part of life for many American adolescents and it increases with age. A review of studies indicates that the onset of use occurs by age 13 for over fifty-percent of adolescents, the greatest increases in use

are seen between 14 and 15 years of age and that maximum exposure rates occur before adolescents are 18 years old (Pandina, 1986). By the end of high school, about two-thirds of adolescents drink on at least a monthly basis. Research suggests this developmental trend is likely due to a number of factors including increased unsupervised peer contact and increased access to transportation and alcohol (Harford & Spiegler, 1983; Milgram, 1982) as well as developmental claims of adult status (Jessor & Jessor, 1977). Because the greatest increase in adolescent drinking occurs during high-school years, the current study focused on adolescents of this age.

Gender is also associated with the prevalence and incidence of adolescent alcohol use. Research indicates that boys start drinking at an earlier age, consume more, drink more frequently, and experience more problems related to alcohol use than girls (Beck & Summons, 1987b; Martin & Pritchard, 1991; O'Hare, 1990). Numerous studies also indicate a gender difference in beverage choice: boys prefer to drink beer and liquor, and girls prefer wine more than boys (Beck & Summons, 1987; Becker & Kronus, 1977). Research suggests that these differences may be due to gender differences in norms and role expectations related to

alcohol use (Carman & Holmgren, 1986), cultural differences (Oetting & Beauvais, 1990), as well as differences in alcohol expectations and beliefs (Brown, 1990). However recent research, which shows an increase in the frequency and intensity of drinking by young women, suggests that the gender gap in alcohol consumption is narrowing (Jenson, Howard, & Jaffe, 1995; Midanik & Clark, 1994).

In addition to gender, ethnicity has been found to be related to the prevalence of adolescent alcohol consumption. In general, European-American teens drink more than African-American, Hispanic, and Asian-American adolescents (Brannock, Schandler, & Oncley, 1990; Johnston, O'Malley, & Bachman, 1991; Oetting & Beauvais, 1990), while Native-American teens have a disproportionate number of heavy drinkers (May, 1982; Moncher, Holden, & Trimble, 1990; Oetting & Beauvais, 1990). Brinson (1992) suggests these differences may be due to cultural differences within ethnic groups that serve to protect and/or expose adolescents to risk factors associated with use. For example, a recent study by Peterson and colleagues (Peterson, Hawkins, Abbot, & Catalano, 1994) found that parents of African-American youths drank less frequently, held stronger norms against alcohol use, perceived alcohol use as more harmful, and

involved their children less frequently in family alcohol use than did parents of Caucasian youths.

One issue that persists in assessing the impact of ethnicity on alcohol use is disentangling it from the effects of socioeconomic status and/or discrimination. Overall, alcohol use is more common in higher SES households. For example in 1989, 75% of families with incomes of \$50,000 and over reported drinking, while only 46% of households with incomes under \$20,000 drank (Colasanto & Zeglarski, 1989). Yet, alcohol abuse is very high among African-American, Hispanic and Native-American youth living in impoverished environments (Moncher, et al., 1990; Morales, 1984; Oetting & Beauvais, 1990). The high rates of alcohol abuse by youths in impoverished environments may be seen as a response to racism, lack of opportunity, and/or poor community resources. More recent research suggests that, among males, ethnicity may interact with SES in predicting drinking problems (Jones-Webb, Hsiao, & Hannan, 1995). In this large survey study, less affluent African-American males reported greater numbers of drinking consequences and problems than less affluent Caucasian males, while the opposite was true for affluent African-American and Caucasian men.

Compared to levels of alcohol use in adult populations, adolescents drink somewhat less frequently than young adults but more frequently and with greater intensity than older adults (30+ years old). Results of a 1990 national alcohol use survey indicate that alcohol use peaks during young adulthood and starts to drop substantially after age 40 (Midanik & Clark, 1994). Still, given that the legal age of drinking is 21 years, the high proportion of adolescents who regularly use alcohol is surprising.

However, the high rate of use among adolescents would not be considered that serious if not for the impact that alcohol may have on adolescent life. In a 1987 nationwide survey of high school seniors, 27% indicated driving after drinking and 15% reported driving after having 5 or more drinks (NCDD, 1988). Roughly 40-50% of all adolescent deaths result from injuries sustained in traffic crashes (Karpf and Williams, 1983; Perrine, Peck, & Fell, 1989) and it is estimated that over half of the fatal crashes involving adolescents are alcohol related (Perrine et al., 1989). Adolescent alcohol use has also been linked to a wide range of other behavioral problems including: disorderly conduct; vandalism; serious crime; other assaults; rapes; sex offenses; and suicide (Lex, 1985; Newcomb and McGee, 1989;

Sigurdson, Staley, Matas, & Hidahl, 1994). A number of studies also indicate that even recreational alcohol use may put adolescents at greater risk for pregnancy and HIV infection (Cooper, 1992; Gordon & Carey, 1996; Plant, 1993).

Additionally, alcohol use by adolescents may be indicative of, or put them at risk for, the potential development of later problems such as increased alcohol use, illicit drug use, and undesirable life trajectories. In a study by Anderson and Magnusson (1988), high frequency of reported drunkenness at 14-16 years was significantly related to registered alcohol abuse at 18-24 years; Alcohol's role as a "gateway drug" to illicit substance use has been well documented (Ellickson, Hays, & Bell, 1992; Kandel & Yamaguchi, 1993) as well as its association with poor school performance, truancy, and dropping out of school (Ellickson & Hays, 1991; Zucker & Fitzgerald, 1991). Furthermore, among adolescents who use alcohol extensively as coping behavior, alcohol may interfere with the successful completion of important developmental tasks of adolescence such as developing appropriate coping skills, forming close personal relationships, and successfully completing some type of education or training (Elman & Offer, 1993). Finally, repeated heavy use alcohol may have

an adverse effect on adolescents' health. Compared to their non-abusing peers, alcohol-abusing adolescents report more frequent appetite changes, eczema, headaches, and loss of consciousness (Arria, Dohey, Mezzich, & Buckstein, 1995). Moreover, alcohol has the ability to damage most major organs of the body (Goldstein, 1983) and may adversely affect the brain and nervous system (Levin, 1990).

#### Factors Associated with Adolescent Alcohol Use

Although a great number of factors have been found to be associated with adolescent alcohol use, the directionality of some of these associations may be in question because of the lack of longitudinal studies in this field. The clarity of these relationships is further muddied by the fact that moderate alcohol use during adolescence and even occasional intoxication is usually considered a normative, transition-marking behavior while alcohol abuse is usually considered as a symptom and not a cause of maladjustment (although it can certainly exacerbate preexisting problems). Thus, alcohol use during adolescence may be indicative of either normal or problematic development, depending on the extent of use, the developmental stage at which it occurs, and its impact upon a child's life.



Environmental factors. Perhaps the most distal environmental factor which influences adolescent alcohol use is the culture in which the adolescent develops. Numerous cross-cultural studies have demonstrated differences between adolescents of different cultures in the age of onset, prevalence, frequency, contexts, perceived appropriateness, expected outcomes of alcohol use, and behaviors related to use (Arnett & Balle-Jensen, 1993; Christiansen & Teahan, 1987; Marcos & Johnson, 1988; Wilks & Callan, 1984; Wilks, Callan, & Forsyth, 1985). For example, a study comparing Irish and American adolescents found that Irish teenagers (aged 15-18 years) drank less frequently but those who did drink reported more problems related to their use (Christiansen & Teahan, 1987). In addition to differences in behavior, this study also found cultural differences in adolescents' reports of the expected effects of alcohol. Irish adolescents reported expecting significantly fewer social benefits, less sexual enhancement, less cognitive and motor improvement, and greater aggression as a result of alcohol use (Christiansen & Teahan, 1987).

As mentioned previously, impoverished and/or oppressive environments may also increase the risk of adolescent alcohol use. Social control theory (Hirschi, 1969) suggests

that the high rates of abuse by youths in these environments is due to the lack of opportunity perceived by these youths and inability of these types of environments to promote bonding to conventional society.

As part of the larger sociocultural environment, the media may impact in a distal fashion upon adolescent drinking by providing models of behavior, suggesting goals that are achieved by drinking, and influencing the formation of attitudes and expectations about alcohol (Arnett, 1992a; 1992b; Lieberman & Orlandi, 1987; Orlandi, Lieberman, & Schinke, 1988). However, a causal relationship between media influences and alcohol consumption has yet to be established (White, Bates, & Johnson, 1991).

The majority of the research done on the relationship between environmental factors and alcohol use has involved the more proximal impact of peer and/or familial socialization. Family and peers may influence adolescent alcohol use by providing an immediate model of drinking behavior (Burnside, Baer, McLaughlin, & Pokorny, 1986; Dielman, et al., 1991; Dielman, Butchart, & Shope, 1993; Gfroerer, 1987; Kandel, 1985; McDermott, 1984; Needle, et al., 1986; Peterson, Hawkins, Abbott, & Catalano, 1994; Weinberg, Dielman, Mandell, & Shope, 1994) and as a source

of norms and attitudes regarding alcohol use (Andrews, Hops, Ary, Tildesley, & Harris, 1993; Iannotti & Bush, 1991, Peterson et al., 1994). However, one cannot state unequivocally that peer pressure leads to adolescent drinking. Research indicates that the established relationship between peer use and adolescent drinking may be due more to friendship selection than coercion by friends (Fisher & Bauman, 1988). According to Bauman and Ennett (1994), individual friendship patterns may evolve in part because of a congruence of attitudes about drinking and past drinking behavior. In other words, this research suggests that alcohol-using adolescents are more likely to form friendships with other alcohol-using adolescents and that this relationship may cause researchers to overestimate the influence of peer groups on drinking patterns.

Importantly, the quality of interaction with family and peers may influence adolescent alcohol use (Barnea, Teichman, & Rahav, 1992; Martin & Pritchard, 1991). Indeed, research based on a family systems perspective suggests that heavy alcohol use by adolescents is related to a lack of attachment/commitment to the family (Protinsky & Shilts, 1990), low parental support and control (Foxcroft & Lowe, 1991), as well authoritarian and permissive parenting styles

(Barnes, Farrell, & Cairns, 1986; Foxcroft & Lowe, 1991; McDermott, 1984; Vicary & Lerner, 1986). Once alcohol use is initiated, adolescent intoxication may exacerbate existing familial conditions by promoting parent-child conflict. Mayer (1980) has suggested that adolescents who use alcohol heavily desire to distance themselves from their families. This desire may result in inappropriate peer involvement. Indeed, research has indicated that adolescents who engage in heavy alcohol use have been found to seek support from peers, rather than their parents (Wills & Vaughan, 1989) and spend more time with friends than family (Shilts, 1991).

In contrast to heavy use, experimental or moderate adolescent alcohol use has been viewed in a developmental context as a normative, transition-marking behavior (Jessor & Jessor, 1975). Thus, moderate alcohol use may reflect the important developmental tasks of individuation from the family and immersion into peer relations. Regardless of whether adolescent alcohol involvement is in response to poor/weak family orientation or a part of normative development, it appears to be consistently related to increased time with peers and decreased time with family. A recent study by the present author investigated this question and found that adolescents who were highly involved

with alcohol (as defined by scoring in the upper quartile on a questionnaire measure of frequency, intensity, and problems related to drinking) spent nearly twice as much time with their peers (33 hours per week) and less than half as much time with their family (10 hours per week) than adolescents in the lower quartile of the alcohol involvement scale (Crowe, Philbin, Richards, and Crawford, 1996). Moreover, this same study found that adolescents who were highly involved in alcohol use experienced greater social isolation when with their family.

Personality characteristics. Many studies have investigated the relationships between personality characteristics and alcohol involvement in adolescents. The relationship between sensation-seeking (Zuckerman, 1979) and alcohol use in adolescence has been well documented (e.g., Galizio, Rosenthal, & Stein, 1983; Segal, Huba, & Singer, 1980; Teichman, Barnea, & Rahav, 1989). Mayer (1988) found that the personality characteristics of adolescent alcohol abusers include impulsiveness, anxiety, low self-esteem, unstableness, extroversion, low achievement orientation, and immaturity. Gomberg (1982) investigated psychological characteristics of adolescent problem drinkers and found that they reported unhappiness, boredom, aggressiveness,

frustration, and dissatisfaction. Depression (Brooks, Walfish, Stenmark, & Canger, 1981; Robson, 1989) and external locus of control (Gold & Coghlan, 1976) have also been linked to adolescent drinking, but the association has not been consistent (Barnea, Teichman, & Rahav, 1992; Brook, Whitman, & Gordon, 1983).

Importantly, the developmental stage of adolescence is associated with a number of factors and characteristics that impact upon alcohol use. Sensation seeking is highest during adolescence (Zuckerman, Eysenck, & Eysenck, 1978). Because adolescents are nearing adult status, transition-marking behaviors such as alcohol use are often employed to claim that status (Jessor & Jessor, 1977). Adolescent egocentrism (Elkind, 1967; Elkind, 1985) may contribute to adolescent alcohol use by increasing the salience and influence of peer pressure and/or social reinforcement to drink. Finally, adolescents' level of cognitive development and perceived invulnerability may impair their ability to weigh the numerous risk factors and outcomes related to their decision to drink, leading to increased risk behaviors (such as driving under the influence) and binge drinking. However, recent research suggests that adolescents' sense of personal vulnerability is similar to that of adults (Quadrel,

Fishchhoff, & Davis, 1993) and is influenced largely by environment (Rucker & Greene, 1995) and experience (Greening & Dollinger, 1992).

In summary, heavy alcohol use appears to be consistently related to the following personality traits in adolescents: sensation seeking orientation, high variability in affective states, and, in general, depressed affect. Because of the lack of longitudinal studies, determining whether these traits are precursors to, or resultant of, alcohol use is often difficult. However, ample evidence suggests that some behavioral traits related to alcohol use (such as the experience of alcohol as reinforcing, hyperactivity, emotionality, and sociability) have a genetic basis which predates alcohol use and may be exacerbated by environmental conditions (Goodwin, 1990; Tarter, 1988; Uhl, Blum, Noble, & Smith, 1993).

Although the above findings suggest that adolescents who abuse alcohol possess a cluster of maladaptive personality and psychological characteristics, the same may not be true for adolescents who experimentally or moderately use alcohol. Although somewhat dated, a set of studies on psychological health and alcohol use (Jones, 1968, 1971) suggests that experimentation with alcohol might be

associated with better adjustment. Adolescents in these studies who had engaged in experimental alcohol use were better adjusted than both heavy-drinking peers (who were alienated and manifested emotional distress) and abstainers (who were emotionally constricted and lacking in social skills). A more recent longitudinal study on marijuana use reported findings consistent with this notion (Shedler & Block, 1990).

In addition to time spent in different social contexts, the aforementioned study of the current data also investigated adolescents' daily subjective experience in relation to their degree of alcohol involvement. The results indicated that while average mood states did not vary as a function of alcohol involvement, variability of mood across different context was significantly related to alcohol involvement (Crowe, et al., 1996).

Psychosocial theories. Psychosocial theories have refocused attention on the relative contributions of external and internal factors to alcohol involvement. Behaviors such as heavy alcohol use, drug involvement and other risk-taking behaviors are often considered a cluster of deviant or delinquent behaviors. One of the first and most influential of these theories is problem behavior



theory (Jessor, 1987; Jessor, Chase, & Donovan, 1980; Jessor & Jessor, 1977). According to this theory, the likelihood of alcohol use and other problem behaviors during adolescence is jointly determined by personality (e.g., sensation seeking, nonconformity), perceived environment (e.g., parental/peer approval/ disapproval), and behavior. Variables within each system reflect either proneness towards alcohol use or controls against it. Arnett (1992a, 1992b) has proposed that the expression of personality factors common during adolescence (e.g., sensation seeking) which predispose adolescents to engage in risk behaviors, such as alcohol use, is determined by the restrictiveness of the socialization environment. This socialization environment is said to be composed of not only the adolescent's friends, family, and immediate surroundings but also the larger sociocultural environment.

Other broad theories of adolescent alcohol use include: peer cluster theory (Oetting & Beauvie, 1986, 1987) which organizes alcohol use-related factors into four broader sets of variables (viz., social structure, psychological characteristics, attitudes and beliefs, and socialization links) and focuses on the role of substance-using peers as the direct cause of alcohol use; Sher's model of

vulnerability (Sher, 1991) which emphasizes the biological foundations of the multitude factors which contribute to adolescent alcohol use; and domain model (Huba & Bentler, 1982) which discusses over 50 potential causes grouped into four domains (viz., biological, intrapersonal, interpersonal, and sociocultural influences) and, like Arnett's model of risk-taking behavior (1992a, 1992b), emphasizes the role of personality characteristics common to adolescents (e.g., rebelliousness and sensation seeking) which may contribute to alcohol use.

As is evident, the consensus of modern theory regarding adolescent alcohol use is that many factors, both internal and external, impact upon an adolescent's decision to consume alcohol. The theories differ in the factors they choose to focus on and the perceived relative contribution of these factors. Additionally, exposure to and the presence of different factors that promote or inhibit alcohol use will vary from adolescent to adolescent. For example, some adolescents may come from a household which models heavy drinking as a coping behavior for stress while other adolescents might drink alcohol out of a desire for the social acceptance of their peers. However, only one set of

factors are common to all types of adolescent alcohol users: positive alcohol expectancies.

### The Role of Alcohol Expectancies

The investigation of alcohol expectancies developed in response to laboratory studies which, using a balanced placebo design, manipulated participants' belief that they had consumed alcohol. These studies demonstrated that the effects of alcohol are to a great extent determined by expectation of those effects and not solely the pharmacological action of alcohol (for a review, see Lang & Michalec, 1990). This may be especially true for the subjective effects of low to moderate amounts of alcohol, when the pharmacological effects of alcohol as a CNS depressant are less evident (Brown, 1990).

The concept of alcohol expectancies is rooted in cognitive-affective theories such as Ajzen and Fishbein's (1980) theory of reasoned action. The main premise of expectancy theories is that, regardless of other factors, the final pathway in a decision to drink lies in the conscious or unconscious evaluation of: 1) the perceived benefits and liabilities of drinking; 2) the affective value held for those effects; and 3) the likelihood of their occurrence. As Cox and Klinger (1988, 1990) as well as

others (Lang & Michalec, 1990) have noted, the nature of the expected costs and benefits of alcohol may be direct (i.e., adverse or positive reactions to the pharmacological action of alcohol) or indirect (e.g., peer disapproval or approval).

As will be discussed, the importance of alcohol expectancies in relation to both alcohol consumption and the experience of alcohol consumption has been well established in the literature (Christiansen, Goldman, & Inn, 1982; Brown, Creamer, & Stetson, 1987; Brown, 1985; Lang & Michalec, 1990). Moreover, even theorists who focus on different factors give deference to the role of the perceived effects of alcohol. For example, both the psychosocial model of Jessor (1987) and the motivational model of Cox and Klinger (1988, 1990) describe drinking behavior as purposive and instrumental towards goal attainment. Presumably then, adolescents will vary (based upon risk factors in the models) in their expectation that alcohol use achieves certain goals and that these goals are worth pursuing. Social learning theorists (e.g., Akers, Krohn, Lanza-Kaduce, & Radosevich, 1979) also concur that substance-specific effects are the immediate cause of adolescent drinking, but argue that alcohol-using peers, and

other significant role models, are the immediate cause of those cognitions. In their review, Petraitis, Flay, and Miller (1995) suggest not only that expectancies are the most consistently accurate predictor of alcohol use but also that other factors related to adolescent alcohol use exert their influence via alcohol expectancies. Thus, a focus on the expected effects of alcohol does not deny the influence of other important, more distal factors, but suggests that expectancies play a moderating role.

Typically, studies developing a scale to measure the expected effects of alcohol will first collect interviewer or open-ended response data on the effects of alcohol from different samples. These data are then content and/or factor analyzed to determine the scales. One of the most widely used surveys is the Alcohol Expectancy Questionnaire (AEQ; Brown, Goldman, Inn, & Anderson, 1980; Brown, Christiansen, & Goldman, 1987). The AEQ designed for adolescents aged 12-19 years (AEQ-A; Christiansen, Goldman, & Inn, 1982) identifies the following expectancy factors: 1) Global positive changes; 2) positive changes in social behavior; 3) improved cognitive and motor abilities; 4) sexual enhancement; 5) cognitive and behavioral impairment; 6) increased arousal; and 7) relaxation/tension reduction.

Participants are asked to endorse the effects they would expect from drinking a moderate amount of alcohol.

However, research indicates that the expected effects of alcohol will vary according to the amount of alcohol consumed (Southwick, Steele, Marlatt, & Lindell, 1981). This suggests that asking respondents only about the expected effects of a moderate dose, such as the AEQ-A does, may result in an incomplete picture. More recent questionnaires have taken these findings into consideration. For example, the Comprehensive Effects of Alcohol Questionnaire (CEOA; Fromme, Stoop, & Kaplan, 1993) not only inquires whether an effect is likely, but also asks how many drinks would be needed in order to experience a given effect and the valence of each effect. Expectancy scores derived from this scale include: the positive effects of 1) increased sociability; 2) tension-reduction; 3) liquid courage; and 4) enhanced sexuality; as well as the negative effects of 5) cognitive/ behavioral impairment; 6) increased risk-taking/aggression; and 7) poor self-perception.

In sum, it appears that alcohol is expected to act as a positive reinforcer (enhancing mood sociability, sexuality, and arousal), a negative reinforcer (via tension reduction), and is also associated with a number of negative effects.

Research indicates that most young adults drink to experience the positive reinforcement effects of alcohol and not to alleviate negative mood states (Johnson & Fromme, 1994).

Adolescents hold expectancies about the effects of alcohol well before they ever consume alcohol and these are assumed to be jointly derived via acculturation during childhood (Christiansen, Goldman, & Inn, 1982) and personality characteristics (e.g., sensation seeking; Stacy, Newcomb, & Bentler, 1993). One cross-sectional study indicated that children as young as age six years hold specific beliefs about the effects of alcohol (Miller, Smith, & Goldman, 1990). Moreover this study indicated that these beliefs develop as children mature. In young children, the effects of alcohol were perceived as more global and less positive, whereas third and fourth grade children reported substantially greater expectations of positive effects from drinking alcohol. As suggested by Miller et al. (1990), this change may reflect an increased receptivity and ability to understand societal information regarding alcohol during that age. Lang and Michalec (1990) and Lang, Murrakm & Pellham (1984) suggest this shift may also reflect a change in perspective regarding how alcohol is viewed by

children: from one that primarily focuses on how adults' behavior towards them changes as a function of drinking alcohol to one of being a potential consumer of alcohol.

Expectancies about the effects of alcohol continue to develop during adolescence. Using cross-sectional data, Christiansen et al. (1980) found that while 12-14 year-olds reported somewhat similar expectancies to older adolescents (aged 17-19), the older adolescents differentiated the effects to a greater degree. This shift to more crystallized expectancies was found to be related to direct experience with alcohol and not other age-related factors. A similar study by Christiansen, Goldman, and Brown (1985) found that young adolescents increasingly believed that alcohol actually improved cognitive and motor performance and that reports endorsing this expectancy then decreased in older, non-problem drinking adolescents. Thus, early experiences with alcohol serve to confirm or dismantle the preexisting alcohol expectancies that younger adolescents possess. Moreover, the modified expectancies will impact upon the experience of future alcohol use. Therefore the relationship between alcohol use and expectancies should be viewed as reciprocal (Bauman, Fisher, Bryan, & Chenoweth, 1985).



The existence of a relationship between alcohol expectancies and drinking behavior in adolescents and young adults has been well-established in recent studies. Brown, Creamer, and Stetson (1987) investigated adolescent (12-19 years old) alcohol abusers and nonabusers and found that alcohol expectancies discriminated the two groups. In this study, adolescents who abused alcohol held significantly greater positive expectancies about the effects of alcohol than their nonabusing peers. Moreover, research suggests that adolescent drinkers may anticipate positive effects as more likely (and negative effects as less likely) for themselves than for others (Leigh, 1987). Research has also investigated gender differences in alcohol expectancies. According to a study conducted by Brown (1990), male adolescents are most likely to expect that a moderate dose of alcohol will make them less anxious, enhance their sexual arousal, and make them more aggressive. Female adolescents are more likely to anticipate more pleasurable changes from moderate drinking.

In studies which compare the impact of alcohol expectancies to that of demographic/background variables (such as race, religion, and parental drinking) on drinking styles, alcohol expectancies appear to provide additional

predictive power beyond the effects of background variables (Brown, 1985; Christiansen & Goldman, 1983). In Brown's (1985) study, demographic and background characteristics served as successful predictors of whether or not college students drank, but only alcohol expectancies were able to successfully differentiate between social, heavy, and problem drinkers. Christiansen and Goldman (1983) found that adolescents who expected effects of increased sociability from alcohol tended to drink in a frequent, social manner and that older adolescents who still perceived alcohol as an agent for improved cognitive and motor functioning reported greater problematic drinking. A subsequent study that investigated the expectancy profiles of adult alcoholics found that, like adolescent problem drinkers, alcoholics also perceived alcohol as providing cognitive and motor improvement (Christiansen, Goldman, & Brown, 1985). This suggests that adolescents who expect cognitive/motor improvement from alcohol consumption may be at high risk for developing alcoholism. Among college students, problem drinking was associated with greater expectations for the tension-reducing effects of alcohol (Brown, 1985). This research suggests that adolescents who experience greater tension-reduction effects from alcohol

may be at risk for the development of drinking problems. Indeed, many studies have indicated that drinking for tension-reduction or to alleviate negative mood states (i.e., as a negative reinforcement) is associated with problematic drinking (for a review see West & Sutker, 1991).

In summary, research indicates that expectancies about the effects of alcohol: 1) influence decisions to drink; 2) determines, in part, the experience of alcohol use; 3) are composed of a number of positive and negative perceived outcomes; 4) develop over time from childhood (via social learning) and are modified by drinking experience; and 5) may predict drinking patterns in adolescents and adults even when important background variables are also considered. However, while this considerable body of research has demonstrated the importance and utility of studying the alcohol expectancies of adolescents, a great gap in research in this area still exists. Specifically, this area lacks important information on the subjective experience of use. Thus, while a considerable number of studies may provide evidence on what adolescents expect to experience from drinking alcohol, few studies have examined if those expectations are met in actual or contrived drinking situations.

## The Subjective Experience of Alcohol Use

Before reviewing how past research has addressed the measurement of the subjective experience of alcohol use, a brief description of the usefulness of this area of research is in order. The utility of examining the subjective experience of alcohol use becomes evident when the following questions, to be addressed in the current study, are posed. First, if the experience of alcohol use varies by context (as suggested by Sher, 1985), what are the environmental and social contexts of adolescent alcohol use? Second, if alcohol use is a goal-directed behavior (as Cox and Klinger 1988, 1990 propose), then does the experience of alcohol reflect the attainment of those goals? In other words, do adolescent expectancies about the experience of alcohol (as indicated by prior questionnaire research) match the actual experience of use? Third, if early experiences of alcohol consumption serve to crystallize or dismantle preexisting expectancies (as Christiansen et al., 1980, 1985 propose) and act in a reciprocal fashion with other predictors of use (as Flay & Petraitis, 1994 suggest), then what are the characteristics of those early experiences? Fourth, do gender differences in alcohol expectancies translate into gender differences in the experience of alcohol use? Fifth,

what is the immediate motivational and affective impact of drinking on adolescents? Finally, how do adolescents experience the short-term consequences of drinking (e.g., hangovers) and how do these consequences impact upon their daily life?

While the utility of investigating the subjective experience of alcohol in adolescence may be obvious, the appropriate measurement of it may be less clear. One of the most common ways the experience of alcohol use has been investigated is via laboratory studies.

Laboratory investigations. One type of design used in laboratory investigations of the experience of alcohol use involves a choice procedure (DeWitt, Pierri, & Johanson, 1989; DeWitt, Uhlenhuth, Pierri, & Johanson, 1987). In these designs, participants first try both placebo beverages and drinks containing a drug (i.e., alcohol) after which their subjective responses to the drug and placebo are measured. Thereafter, participants are allowed to drink whatever beverage they choose. The participants' preferences are noted and measurements of the subjects' experience are taken at fixed intervals. Experimental designs employing choice procedures are well-suited to measure individual differences

in preference for alcohol, alcohol dose preference, as well as subjective response to alcohol.

Using a choice procedure to study preference for alcohol via a cumulative dosing method, DeWitt, et al. (1989) found that, compared to infrequent choosers, young adults who choose to consume the most alcohol report experiencing more stimulant-like effects (e.g., increased arousal and affect). Those participants in the study who chose to consume less alcohol reported experiencing primarily depressant effects (e.g., decreased arousal and fatigue) from alcohol. These results were consistent with an earlier study (DeWitt, et al., 1987) which also found that consistent choosers of alcohol reported experiencing more stimulant effects, while consistent choosers of nonalcoholic beverages reported experiencing primarily depressant effects from alcohol (from the same dose of alcohol) during the initial beverage sampling. Importantly, both of these studies suggest and provide evidence for a wide range of individual differences in the experience of alcohol use, even when dose and setting are held constant across consumers.

Perhaps the most widely used designs in laboratory studies of alcohol use is the balanced placebo design

(Marlatt, 1980). This design systematically manipulates participants' beliefs regarding whether they have consumed alcohol along with the dose of alcohol received, the result of which are four distinct conditions: 1) expect alcohol/receive alcohol, 2) expect alcohol/receive placebo, 3) expect no alcohol/receive alcohol, and 4) expect no alcohol/receive no alcohol. Thus, this design allows an investigator to isolate the pharmacological and expectancy effects of alcohol.

As noted earlier, a review of studies employing this design has established that the effects of alcohol are to a great extent determined by expectation of those effects and not solely the pharmacological action of alcohol (Lang & Michalec, 1990). Moreover, some of the experienced effects of alcohol appear to be more related to expectancies than others. In their review, Lang and Michalec (1990) observe that the pharmacological action of alcohol is primarily responsible for the experience of the more impersonal aspects of the alcohol experience (e.g., CNS depressant effects), while the expectancy that one has consumed alcohol is more important in influencing psychologically relevant social behavior (e.g., sexual behavior and aggression). In another study employing the balanced placebo design, Sher

(1985) demonstrated the importance of the environment in influencing the subjective experience of alcohol use in adult men by systematically manipulating the social context of consumption (i.e., alone vs. in group). In this study, placebo drinkers in the social setting exhibited some physical effects usually attributed to alcohol.

A number of laboratory studies have investigated predictors of alcohol use by systematically manipulating anxiety from physical stressors (e.g., electric shock, Higgins & Marlatt, 1975) and social stressors such as social evaluation (Higgins & Marlatt, 1975; Holroyd, 1978; Strickler et al., 1979), assertiveness (Miller et al., 1974) and confrontation (Marlatt, Kosturn, & Lang, 1975). In their summary of these studies, Lang and Michalec (1990) note that "levels of beverage consumption may be determined more by psychosocial/contextual factors than by the biological state of the organism" (p. 209).

Through their ability to experimentally isolate variables, the previous laboratory studies have convincingly demonstrated that the subjective experience of alcohol use is influenced by several important factors in addition to the dose of alcohol consumed: 1) individual differences in responses to alcohol; 2) expectancy of effects; 3) the



environmental context or situation; and 4) motivational, situational and affective precursors to drinking. However, the level of experimental control that allows these studies to demonstrate the individual influence of the aforementioned factors is both the advantage and disadvantage. For example, a laboratory study that manipulates what dose of alcohol is consumed by subjects and then asks them to rate their subjective experience may be able to assert a dose-response relationship between alcohol and experience, but the relationships found may not apply outside the context of the experiment; the experience of alcohol use is also dependent upon the location and social composition of the situation in which the alcohol is consumed. Thus, the findings from laboratory studies on the experience of alcohol use may be of limited generalizability (Sher, 1985).

Indeed, laboratory studies in general suffer from a lack of ecological validity. As stated by Hormuth (1986, 1992), "ecological validity (Brunswick, 1949) refers to the occurrence and distribution of stimulus variables in the natural or customary habitat of an individual." Thus, a method is ecologically valid to the degree to which the observational situation represents the subject's natural

environment. For some laboratory studies, ecological validity is not an issue; the study may be concerned with how subjects can respond and not how they respond in their natural environment. However, because alcohol use, especially the decision to use and the experience of that use, is bound in context, it is surprising that more research in this area has not embraced more ecologically valid methods.

When trying to determine the subjective experience of alcohol use in adolescents, an additional problem in using laboratory designs that manipulate actual alcohol consumption is apparent when the age of the participants is considered. No laboratory studies using the aforementioned methods have investigated high school-age adolescents. Because of ethical considerations, as well as legal and practical constraints, studies of this nature cannot be carried out with adolescent participants (at least in countries where the legal drinking age excludes adolescents). Perhaps then, survey methods can circumvent these problems.

Questionnaire methods. Questionnaires, whether self-report or interview, have been the data collection method of choice for most research investigating substance use, and

for a large proportion of research in the social sciences. Much alcohol research, especially expectancy research, has relied on student surveys (Lang & Michalec, 1990). This choice is not without reason; questionnaires are a practical, cost-efficient means to estimate population characteristics in a reliable and valid way. They can also be easily administered to groups of subjects (Shaugnessy & Zechmeister, 1994). As such, they are particularly well suited for estimating rates (e.g., Johnston, O'Malley, & Bachman, 1993), patterns (e.g., Kandel & Yamaguchi, 1993), and personality correlates (e.g., Teichman, Barnea, & Rahav, 1989) of alcohol use in the populations they sample.

A number of questionnaire studies have investigated the social and environmental contexts of adolescent drinking. In a series of studies, Harford and his colleagues (Harford, et al., 1983; Harford & Grant, 1987; Harford & Spiegler, 1983) have underscored the changing contexts of adolescent drinking. They found that during early adolescence (age 12-13 years) the majority of youth who drink do so only in the context of their home, fewer adolescent drinkers of this age drink both at home and with peers, and a small percentage of them drink solely in the context of their peers. In contrast, few older adolescent drinkers (age 16-20 years)

drink solely at home -- most drink both at home and with peers, and an increasing number of them drink solely in a peer context. In a study on college students, drinking contexts were found to change from a mixed-gender group context to opposite-sex dyads. This change corresponded with a decrease in the intensity of use. Kouzis and Labouvie (1992) asked adolescent drinkers to endorse different times, situations, and companions as appropriate for drinking. They found that most adolescent drinkers thought it was appropriate to drink on weekend evenings and during special occasions but not before or during school. While most younger drinkers (age 12 years) thought it was appropriate to drink with family members, more older drinkers (ages 15 and 18 years) endorsed friends as appropriate drinking companions. Similarly, most younger adolescents reported drinking at home while older adolescents were more likely to endorse drinking at their friend's home and at parties. In a study investigating alcoholics, Brown (1985) found that the expectations of the effects of alcohol varied as a function of social and environmental contexts. For example, global positive changes were considered most likely when drinking with barmates while tension reduction was considered most likely when drinking in the context of family.

However, retrospective questionnaires possess a number of serious limitations which restrict their utility in the measurement of the contexts and subjective experience of alcohol. The most important shortcoming of most self-report questionnaires is that respondents may not be able to answer the questions accurately (Delespaul, 1995). This problem can have a number of causes. Subjects may have difficulty remembering the details needed to answer the questions correctly (i.e., retrospective bias/inability to recall). Memory of an event may be different from the actual event. For example, asking alcoholics their affective experience when they first tasted alcohol may be of clinical relevance but it may not be accurate; their experience after that event may have altered their memory of it. When assessing the experience of alcohol use, problems of context-dependent memory and aggregation bias are encountered in addition to the aforementioned causes of inaccurate reports (Delespaul, 1995). Additionally, demand characteristics of situation may be problematic especially if the questionnaire is administered in a one on one interview (Shaugnessy & Zechmeister, 1994). For example, the small percentage of adolescents who endorsed drinking during the day or at school in the Kouzis and Labouvie (1992) study may not

reflect the true extent of this type of drinking and may be an artifact of social desirability in their reporting. In conclusion, asking adolescents to accurately summarize an experience that is associated with a number of positive and negative outcomes and varies according to a number of different factors may be asking too much. Results of such a questionnaire would likely reflect a generalized memory of the experience of alcohol and not the actual experience.

Experience sampling method (ESM). ESM is a time-sampling method designed to collect repeated structured self-observations in which participants carry an electronic signaling device (e.g., pager, wristwatch, palmtop computer) and complete self-report forms in response to signals received from the signaling device (Csikszentmihalyi & Larson, 1987). Sampling schedules may be either fixed or random, depending upon research goals (Delespaul, 1992). The self-report form that respondents complete should also be customized to fit research goals. However, most ESM report forms request information about both the objective circumstances (e.g., companionship, activity) and subjective experience (e.g., moods, thoughts, motivation; Csikszentmihalyi & Larson, 1987).

There are numerous advantages of using time sampling methods like ESM, especially in the study of the experience of alcohol use. One of the primary strengths of ESM is its ability to sample behavior in the context that it occurs. Thus, ESM possesses a high degree of ecological validity (Hormuth, 1986, 1992). Because of the small interval of time between stimulus signals and what is asked of the respondent (ESM typically asks the subject to describe the moment immediately before being signaled) ESM avoids retrospective bias in responses and is therefore well-suited for measuring internal, subjective states (Hormuth 1986, 1992; Larson, 1989). Combining these two advantages illuminates what the author considers to be the primary advantage of ESM: By repeatedly measuring internal states within an ecologically valid context, one is able to examine the interaction between person and situation. Because the assessments are independent of the occurrence of specific behaviors and situations (events), time sampling provides unbiased data of the antecedents of target events as well as useful comparison information from nontarget events (Delespaul, 1995). Thus, ESM allows one to investigate how the experience of alcohol use fits in the daily life of adolescents. By its nature, ESM has great utility in the

investigation of time budgets, the flow of experience, and in the classification of mental disorders (deVries, 1992). Given these advantages, methods such as ESM are an excellent tool for studying the social/environmental contexts of alcohol use, antecedents of alcohol use (both situational and affective, e.g. craving, motivation), and the subjective experience of alcohol use.

Several studies have already utilized ESM to investigate alcohol use in adolescents. Most notably, Larson, Csikszentmihalyi, and Freeman (1984) studied the contexts and subjective experience of alcohol use by examining the self-reports of 17 high-school age adolescents (11 boys and 6 girls) who provided 29 samples of alcohol use during the week they were sampled. In this study, alcohol use was found to occur primarily at friends' houses and public places on the weekend and was usually in the context of a social gathering (7+ companions). Compared to their baseline rates, the adolescents' subjective experience of alcohol use was associated with significantly greater affect, social disinhibition and gregariousness, as well as decreased concentration (Larson, et al., 1984).

While this study provides evidence for the utility of using ESM to study adolescent alcohol use and a basis for



further investigation, it is also characterized by a few limitations which are the result of the relatively small sample of drinking episodes. First, this study did not investigate whether the subjective experience of alcohol use varied by situation (either physical or social) as the study by Sher (1985) and others (Higgins & Marlatt, 1975; Holroyd, 1978; Strickler et. al, 1979) suggest would be the case. Second, while comparing the subjective experience to the adolescents' baseline experience provided important information on how the experience of alcohol use differs from their average state, the study might also have compared the experience of alcohol use to that of baseline rates for similar, but alcohol-free, situations in an attempt to isolate effects of situation and alcohol. For example, because alcohol use primarily occurs in large social groups, a comparison could be made between the experience of being in a large social group when alcohol was being used and when it was not. Third, because the self-report form did not contain alcohol use specific items, the amount of alcohol consumed was not reported by the adolescents and underreporting of alcohol use may have occurred. Finally, gender and age differences in the experience of alcohol were not examined.

Preliminary analysis of a more recent ESM study sample of adolescent alcohol users (52 adolescents providing 102 instances of alcohol use) found that, consistent with the results of Larson et al. (1984), adolescents reported significantly higher affect and excitement while drinking (Crowe & Richards, 1994). However, this study also indicated that alcohol use was related to decreased arousal (i.e., feeling less strong and alert) in boys, but increased arousal in girls. It was suggested that this finding may reflect the CNS depressant effects of alcohol. In support of this interpretation, boys reported consuming significantly more alcohol than girls when they reported drinking.

Conclusions. While I have proposed that ESM is an excellent method for the study of the subjective experience of alcohol use in adolescents, a major limitation of the method must be noted. Like most other context-oriented research, ESM does not exert a great deal of control over the observational situation; respondents self-select their environments and conditions are not systematically manipulated. Thus, while providing rich descriptive data, ESM is poor in establishing cause-effect relationships.

Therefore, because no single type of measurement is without bias or limitation, a multimethod approach is most desirable when trying to understand complex biopsychosocial behavior such as substance use. No method, including time-sampling (ESM), is without limitations for describing and understanding complex phenomena such as the experience of alcohol use. More often than not, the different types of data provided by different measurements are complementary. Triangulation, both within individual studies and within a field of study, is an essential technique for understanding complex biopsychosocial phenomena such as substance use. Thus, the relationship between ESM and other methods of inquiry into the experience of alcohol use should be viewed as complementary and not competitive. For example, relationships established in experimental studies may be investigated with ESM to establish external and ecological validity. In turn, information provided by ESM can be an excellent source of hypotheses for laboratory studies.

### The Current Study

The current study was designed to provide an ecologically valid examination of the phenomenological experience of alcohol use and how alcohol use fits into the

daily life of adolescents by using data collected by ESM on a sample of middle-income, Caucasian high-school students. The line of investigation followed four general purposes.

The first purpose of the study was to provide validation research by comparing adolescents' reports of alcohol use derived via ESM to those gathered via retrospective questionnaire. As noted by Hormuth (1986), previous research indicates the relationship between questionnaire and ESM data is consistently moderate-to-strong. Thus, although the ESM focused on one week's behavior and the questionnaire asked adolescents about their alcohol use in general, it was expected that a general agreement between indices derived from the two measures would be found.

The second purpose of this study was to examine grade and gender differences in the incidence, frequency, and intensity of adolescents' alcohol use. Based upon previous research, it was expected that boys and older adolescents would 1) show a higher incidence of alcohol use, 2) report drinking more frequently, and 3) report drinking greater quantities of alcohol than girls and younger adolescents.

The third purpose of the study was to provide detailed information on the objective contexts and circumstances

surrounding adolescent alcohol use. Thus, the analysis focused on gender and age differences in 1) temporal patterns of use (i.e., day and times that adolescents reported drinking); 2) the environmental contexts in which drinking occurred (e.g., home vs. at friend's home); and 3) the social contexts in which drinking occurred (e.g., at home, in mixed-gender groups, and opposite-sex dyads). Additionally, the relationships between these four areas were investigated (e.g., which social contexts of drinking are associated with the greatest levels of consumption?).

Based upon the aforementioned literature, the following hypotheses regarding the contexts of adolescent drinking were tested. As noted, few adolescents endorse drinking during weekdays and during daytime. Therefore, it was expected 1) that most adolescents would report drinking during weekends during evening hours. Because solitary drinking is relatively rare among adolescents it was hypothesized 2) that alcohol consumption would occur most often in the company of others. It was also expected that 3) younger adolescents would be more likely to report drinking in a family context. Because of age-related differences in peer companionship (Richards, Crowe, Larson, and Swarr, 1996), it was hypothesized 4) that older adolescents would

report drinking more often with the opposite sex alone. Regarding the environmental contexts of drinking, it was expected that 5) few adolescents would report drinking in a public setting or during school; perhaps because of the legal status of teenage drinking, previous research suggests that alcohol use is more likely at home and at a friend's home.

The fourth and final purpose of the current study was to investigate the impact that alcohol use had on the subjective experience of these adolescents. To do this, several lines of inquiry were followed in order to assess: 1) the differences between moods and motivations while drinking and overall non-drinking moods; 2) changes in adolescents subjective state from a non-drinking to a drinking situation; and 3) the impact alcohol use had on adolescents' subjective state on the morning following consumption. As with the analysis of the contextual aspects of drinking, grade and gender differences were also be assessed.

Six mood constructs were chosen based upon the aforementioned research (viz., Christiansen, Goldman, & Inn, 1982; DeWitt et al., 1987, 1989; Fromme, Stoop, & Kaplan, 1993; Johnson & Fromme, 1994; Leigh, 1987) on the effects

and expected effects of alcohol: Sociability; romantic feelings; tension-reduction; hedonic tone (i.e., the experience of personal pleasure); arousal; and motivation. It was hypothesized that adolescents' would report an increase in sociability, romantic feelings, tension-reduction, and hedonic tone. Based upon Brown's (1990) work on gender differences in alcohol expectancies, it was predicted that girls would report greater increases in hedonic tone than boys. Although it was predicted that arousal will change as a function of drinking, previous research presents conflicting evidence on the direction of this change. Although alcohol is clearly a CNS depressant, both laboratory (DeWitt et al., 1987, 1989) and questionnaire studies (Brown et al., 1980, 1987) have demonstrated that many drinkers expect and experience moderate doses of alcohol to have stimulant-like effects. Because drinking may be viewed as a purposive, goal-directed behavior (Ajzen & Fishbein, 1980; Cox & Klinger, 1988, 1990; Lang & Michalec, 1990) it was predicted that adolescents would report higher levels of motivation (defined as adolescents' ratings of the importance of, choice in, and desire to be engaged in their current activity) during drinking situations. Finally, this study investigated any

potential "hangover" effects from alcohol by comparing adolescents' subjective state on mornings after drinking to mornings when they did not drink the day before. It was hypothesized that mornings following drinking episodes would be characterized by lower motivation as well as depressed affect and arousal.



## CHAPTER II

### METHOD

#### Sample

The participants in this study were 220 ninth through twelfth graders (age 13-18 years) from two suburban neighborhoods near Chicago. One of the neighborhoods was in a middle- and upper-middle class suburban area, one was in a working-class suburban region. The adolescents were participating in the study as a continuation of a larger, cross-sequential longitudinal study.

The initial sample (when the adolescents were in 5th through 8th grade,  $n = 483$ ) was randomly selected from schools in the communities. The sample was composed almost exclusively of European Americans, represented their respective community populations with few differences, and were evenly distributed by gender, grade, and community via a stratification procedure. A complete description of the original sample is provided in Larson (1989). Few differences were found between those who participated in the larger study and the current sample under investigation

(Richards, Crowe, Larson, & Swarr, 1996). Attrition from the initial sample was somewhat higher for adolescents with low self-esteem (Larson, 1989). For the current sample under study, nonparticipation was somewhat higher for boys and depressed youth (Larson, Richards, Moneta, Holmbeck, & Duckett, 1996).

In order to investigate the frequency and intensity of use, a subsample of adolescents ( $n = 51$ ) who reported drinking during the sampling week was used. Of those adolescents, 46 provided reports while actively drinking. Only the reports provided by active drinkers were employed to examine the contexts and moods associated with adolescent alcohol use.

### Procedures

Prior to the start of the sampling period, the adolescents received instructions on the use of the pager and on completing the self-report forms (SRF). They were instructed to complete the forms as soon as possible after each signal. The adolescents were instructed not to share their information with each other and were assured of its confidentiality. At the end of the week, the booklets and pagers were collected, the participants were interviewed,

completed a series of questionnaires and were paid for their participation.

The ESM employs electronic pagers that emit stimulus signals according to a random schedule. The pagers signaled either by sound or vibration. The adolescents were instructed to use the vibrating signal during times that were inappropriate for audible disruptions (e.g., in school). When signaled, the respondents wrote down information regarding his or her current situation, activities, thoughts, companionship, and psychological states on a self-report form (SRF, see appendix). The adolescents typically responded by filling out their report with minimal delay. Of the 1717 individual responses to the pager made by the 51 adolescents who indicated drinking during the week, 51% were immediate and 92% were within 10 minutes of the stimulus signal. The signals were sent at random times within two-hour time blocks, between 7:30 a.m. and 10:30 p.m. on weekdays and between 8:00 a.m. and 12:00 a.m. on weekends. Although these times approximated the adolescents' waking hours, a small amount of their time awake was missed by the schedule (Larson, et al., 1996).

Adolescents provided reports for a large majority of the ESM signals. Overall, the participants responded 76% of

the signals by completing the SRF. Approximately 6% of the total signals were missed because of mechanical failure of the pager. The remainder of missed signals were attributable to a wide range of reasons from participants' forgetting to carry the pager with them to signals which occurred during behaviors that could not be interrupted such as exams, sport participation, and driving (Larson, 1989). Overall, the adolescents provided an average of 34.7 reports per person (Larson, et al., 1996). Although adolescents who reported drinking during the sampling week provided a slightly lower average of number of reports (33.5) than adolescents who did not report drinking (34.9), this difference is not significant,  $F(1,217) < 1$ .

Prior to analysis, the data from the self-report books were screened to eliminate respondents who gave questionable or inadequate reports. Both open-ended and scaled items were examined for impossible responses (e.g., Where were you? -on the moon) and/or response sets (e.g., circling identical ratings on all of the mood scales). If the total number of poor quality pages exceeded 40% of an adolescent's total number of responses, the data was excluded from analysis. Books in which the adolescents had filled less than 15 valid pages were dropped on the basis that they did

not constitute a true sample of their experience. Overall, 4% of the adolescents were screened out of the final sample because of incomplete or unreliable data.

Additionally, adolescents' self-reports of drinking during the sampling week were extensively screened for quality (table 1). A total of 54 adolescents reported drinking during the sampling week. Of these, 2 were judged as spurious reporters by the investigator and 1 adolescent was excluded as an outlier from all analyses. Thus, 51 adolescents provided 113 legitimate reports of alcohol use during the sampling week. This group of adolescents provided the data for analyses investigating the frequency of use, intensity of use, and morning after effects.

However, a number of these adolescents' reports of drinking were not during the actual event but occurred when an adolescent had just arrived home from being out ( $\underline{n} = 4$ ) or on the morning after drinking (e.g., when an adolescent does not respond to the pager on Saturday night but reports drinking on the first response on Sunday morning,  $\underline{n} = 11$ ). Because the adolescent was not currently drinking, these reports are inappropriate for investigating both contexts and moods associated with active use. Five adolescents provided solely retrospective reports of their drinking.

Table 1

Breakdown of Subject Exclusions for Analysis


---

54 adolescents reported using alcohol during the week

-2 spurious reports

-1 outlier

51 legitimate reporters of alcohol use<sup>a</sup>

51 legitimate reporters gave 113 reports of use

-5 postuse reporters ..... -15 postuse reports

46 active reporters<sup>b</sup> ..... 98 reports of use

---

<sup>a</sup> This sample of drinkers was employed to investigate frequency of use, intensity of use, and morning-after effects.

<sup>b</sup> This sample of active reporters was employed to investigate the contexts and moods associated with drinking.

Thus, 46 adolescents provided 98 active reports of their drinking behavior. This group of adolescents provided the data for analyses investigating the contexts and moods associated with alcohol use.

### Measures

On each SRF, the adolescents responded to a series of items asking them about their situation and state just prior to when they received the signal. Specific measures of the adolescents' subjective moods were chosen on the basis of expectancy questionnaires. For beep-level analyses in which multilevel modeling could not be used, the mood variables were converted to individualized z-scores as suggested by Larson and Delespaul (1992). This transformation, in which a score of 0.0 corresponds to each adolescent's mean and a score of 1.0 corresponds to that adolescent's standard deviation, allows us to investigate adolescents' feelings relative to their own distribution of mood scores. Thus, this transformation allows one to control for individual adolescents' response sets (i.e., controlling for trait differences) and enables a focus on changes in state relative to each individual's baseline (average) mood state.

Alcohol use. On the SRF, alcohol use was measured by adolescents' responses to the question "Since the last

beep...If you drank any alcohol, how many and what did you drink?" Three blanks were provided to indicate the number of beers, glasses of wine and amount of hard liquor consumed since the last stimulus signal. Based on these reports, a number of variables were created including: 1) whether or not an adolescent reported drinking at all during the week; 2) the number of occasions an adolescent drank during the week [an occasion was defined as a drinking episode during a single evening, afternoon or morning; sustained drinking (from morning through evening) was counted as double]; 3) total number of drinks during the week; 4) the greatest amount consumed on occasion; and 5) the average amount consumed on occasion.

At the end of the sampling week, adolescents completed a closed-response questionnaire regarding their alcohol use in general (see appendix). Measures taken from this include: 1) drinking frequency (i.e., How often do you drink on average?); 2) greatest number of drinks consumed on one occasion; and 3) average number of drinks consumed on one occasion. For questionnaire responses which indicated a range of drinks, the midpoint was used (e.g., 7-8 drinks was transformed to 7.5).



In addition, the difference between adolescents' questionnaire and ESM-derived reports of average number of drinks per occasion was computed. Thus, a positive value for this measure indicates that an adolescents' questionnaire report of average number of drinks was higher than that derived via ESM, while a negative value indicates that an adolescent's questionnaire report of average number of drinks was lower than that derived via ESM. Finally, three groups were formed based upon adolescents' responses to the question "How often do you drink on average?" and their ESM self-reports during the week: 1) adolescents who reported actively drinking during the sampling week ( $n = 46$ ); 2) adolescents who did not report drinking during the sampling week but indicated on the questionnaire that they drink at least once a month ( $n = 77$ ); and 3) adolescents who did not report drinking during the sampling week and indicated on the questionnaire that they drink less than once a month ( $n = 90$ ).

Location. Locations were determined by responses to the open-ended question "Where were you?" and were originally coded into 68 categories (interrater agreement = 99%). This variable was collapsed into 5 categories: home, friend's home, public, transition, and school.

Companionship. Companionship was determined by responses to a fixed-response item asking, "Who were you with (or talking to on the phone)?" Fifteen non-exclusive choices could be checked. Responses were coded into five superordinate categories: boyfriend/girlfriend, friends, family, alone, and other (interrater agreement = 93%). For a complete description of the composition of these codes and the reliability of the adolescents' companionship reports, see Larson and Richards (1991).

Time. On each self-report, adolescents were asked to indicate the time and day that they were signaled. These reports were compared to the sampling schedule for accuracy. For some analyses, adolescents' reports of time were coded into two categories: day (7:30 a.m. - 5:59 p.m.) and evening (6:00 p.m. - midnight). Reports of the day signaled were also coded into two categories: weekday (Sunday evening to Friday afternoon) and weekend (Friday evening to Sunday afternoon).

Sociability. Sociability was measured by ratings on three separate items on the SRF. Feelings of being accepted were measured by a four-point unipolar scale. Adolescents' perception of others as being friendly and joking were measured via two 7-point semantic differential scales on the

dimensions of friendly-unfriendly and serious-joking. The corrected item-total correlation among these three measures ranged from .25 to .38.

Romantic feelings. Romantic feelings were measured by responses to two separate items. Attractiveness was measured by responses to a 7-point semantic differential scale on the dimension of attractive-ugly and feelings of being in love were measured by responses to a 4-point unipolar item which asked how in love the adolescents felt at the moment of paging ( $r = .13$ ).

Tension-reduction. Tension reduction was measured by responses to a 7-point semantic differential scale on the dimension of stressed-relaxed.

Hedonic tone. Adolescents experience of personal pleasure was assessed by four variables: Affect was examined by aggregated mean ratings of three 7-point semantic differential scales ( $\alpha = .89$ ) on the dimensions of: happy-sad; cheerful-irritable; and friendly-angry. Feelings of being important and feeling great were measured by responses to two 4-point unipolar items which asked the adolescents how important and great they felt. Adolescents' experience of feeling excited was measured by responses to a 7-point semantic differential scale on the dimension of bored-

excited. The corrected item-total correlation among these four measures ranged from .43 to .57.

Arousal. This measure is expected to capture the CNS depressant/tension reduction effects of alcohol. Arousal was examined by ratings of two 7-point semantic differential scales ( $r = .42$ ) on the dimensions of: alert-drowsy and strong-weak.

Motivation. Adolescents' motivation to be engaged in their current behavior was measured by ratings on three 10-point semantic differential scales in response to the questions "How important was this activity to you?," "How much choice did you have in this activity?," and "Do you wish you had been doing something else?" Responses could vary from not at all to very much. The corrected item-total correlation among these three measures ranged from .40 to .58.

#### Analytical Approach: Questionnaire - ESM Comparison

The first set of analyses sought to investigate the level of agreement between measures of alcohol use derived via questionnaire and ESM. To do this, descriptive statistics of agreement between the two types of data were first provided. This included comparing questionnaire reports of drinking frequency to ESM reports of incidence in

the larger sample and, among adolescents who reported drinking during the ESM week, comparing: 1) questionnaire reports of drinking frequency to the number of drinking occasions reported via ESM; 2) questionnaire reports of the greatest number of drinks on one occasion to the greatest number of drinks on one occasion reported during the ESM week. Next, a paired-groups t-test was used to compare questionnaire and ESM-derived reports of the number of drinks consumed on average during one occasion by those adolescents who reported drinking during the ESM sampling week. Finally, grade and gender differences in the reporting of average number of drinks per occasion by method were assessed. To do this, an analysis of variance was used with the difference score (derived via subtracting the ESM-derived report of average number of drinks per occasion from the questionnaire report of the same) as the dependent variable and grade and gender as the independent variables.

#### Analytical Approach: Alcohol Use

The second set of analyses was concerned with grade and gender differences in the incidence, frequency, and intensity of adolescents' alcohol use. Based upon previous research, it was expected that boys and older adolescents would show a higher incidence of alcohol use. To determine

grade and gender differences in the incidence of alcohol use in the larger sample, a person-level logistic regression was used with grade and gender as the independent variables and a dichotomous variable indicating whether or not the adolescent reported drinking during the sampling week as the dependent variable. Among adolescents ( $n = 51$ ) who report drinking during the week, further analysis were conducted to examine grade and gender differences in the frequency and intensity of use. Because only a few ( $n = 4$ ) ninth grade adolescents reported drinking, grade was coded as a three-level variable (9-10, 11, 12) for all remaining analyses. It was expected that boys and older adolescents would report drinking more frequently and in greater quantities. Analysis of variance (ANOVA) with grade and gender as the independent variables, was used to investigate the number of drinking occasions, the average number of drinks per occasion, the greatest amount consumed on one occasion, and the total number of drinks consumed during the week.

#### Analytical Approach: Contextual Patterns

The third set of analyses were designed to examine temporal, environmental, and social contexts of adolescent drinking behavior by investigating the self-reports of the 46 adolescents who reported actively drinking during the

sampling period. To do this, descriptive statistics of the percent time adolescents drank in each temporal, environmental, and social context are first presented. Next, the percent time adolescents drink in each context was examined in relation to the proportion of time spent in that context. To do this correctly, the structure of the data needed to be considered. Although the data set included 1,593 self-reports, these moments are nested within 46 adolescents and therefore not statistically independent. For example, some adolescents may be more likely to report drinking with friends because a greater proportion of their responses occurred when they were in that companionship.

In order to accommodate for the hierarchical structure of ESM data, multilevel modeling, a regression procedure for modeling data with a nested structure (Goldstein, 1987), was used. Unlike linear regression or fixed-effect analysis of variance models, multilevel regression models do not assume that each observation (i.e., individual ESM report) is independent but do assume that data within clusters (i.e., individuals) are dependent to some degree. In these models, marginal maximum likelihood techniques are used to estimate the degree of dependency, which is then used to adjust the estimates of the usual model parameters (Hedeker, Gibbons, &

Flay, 1994). Thus, the advantage of using multilevel models to analyze hierarchical data is that one can make full use of the degrees of freedom offered by the number of individual (beep-level) moments in time (thus making the test more sensitive), while accounting for the fact that these moments are repeated measurements from different people and that these persons have provided a different number of moments. These analyses were conducted using MIXORD (Hedecker, 1993a), a program for conducting multilevel regression analysis with a nominal-level dependent variable, and took the following general form:

$$Y = \beta_1 + \beta_2 * GRD_A + \beta_3 * GRD_B + \beta_4 * SEX + \beta_{4...n} * X$$

in which the dichotomous variable Y indicated whether or not the adolescent reported actively drinking at the time of the self-report. Along with the intercept, the variables GRADE (9-10, 11, 12) and SEX (gender) were entered in each model. Because grade is a trichotomous variable, Helmert-type contrasts were used. Thus, the first grade term ( $GRD_A$ ) compared 9-10th grade adolescents to 11th & 12th grade adolescents, while the second grade term ( $GRD_B$ ) compared 11th grade adolescents to those in the 12th grade. To test the statistical difference between the nested models' improvement of fit, the likelihood ratio chi-square test was



used (Silvey, 1975). To briefly illustrate this, consider Model A which contains 2 explanatory variables (e.g., grade and gender) and Model B which contains those same two variables found in Model A plus an additional explanatory variable (e.g., drinking). Model A (grade, gender) is nested within Model B (grade, gender, drinking). To test whether Model A provides a significantly better fit than Model B:

$$\chi^2 = -2 * (\log L_1 - \log L_2)$$

where  $\log L_1$  is the log likelihood for Model A and  $\log L_2$  is the log likelihood for Model B. Degrees of freedom for this test are determined by the number of additional explanatory variables in the more complex model. In the present example, the degrees of freedom would be 1.

In summary, these analyses enabled us to examine the amount of time drinking within different contexts relative to the overall amount of time in those contexts and provide an estimate of the likelihood of adolescent drinking in a particular context. Additional independent variables and their interactions with grade and gender were added to each particular model as specified below.

Temporal context. As noted by Harford & colleagues (1983, 1987), few adolescents endorse drinking during

weekdays and during daytime. Therefore, it was expected that most adolescents would report drinking on weekends during evening hours. To investigate whether adolescents were significantly more likely to report drinking while in this temporal context, two dichotomous main-effect terms (and their interactions) were added to the general model: 1) TIME, indicating whether a report occurred during daytime or evening hours and 2) DAY, indicating whether a report occurred on a weekday or weekend.

Environmental context. Because of legal status of teenage drinking, it was expected that few adolescents would report drinking in public setting (including school and transportation). Previous survey research by Harford (et. al, 1983, 1987) suggests that that alcohol use is most likely at home and at a friend's home. To investigate whether an adolescent's presence in these environmental contexts significantly predicts whether they are drinking, five dichotomous variables indicating whether or not a report occurred at a particular location (viz., home, friend's home, school, public, transition) and their interactions with grade and gender were added independently to the general model.

Social context. Because solitary drinking is relatively rare among adolescents it was hypothesized that alcohol consumption would occur most often in the company of others. It was also expected that younger adolescents were more likely to report drinking in a family context. Because of age-related differences in heterosocial companionship (Richards, Crowe, Larson, and Swarr, 1996), it was hypothesized that older adolescents would report drinking more often with the opposite sex alone. To investigate whether an adolescent's presence in these social contexts significantly predicts whether they are drinking, five dichotomous variables indicating companionship (viz., boyfriend/girlfriend, friends, family, alone, and other) and their interactions with grade and gender were added independently to the general model.

Use and context. Additionally, the amount of alcohol used was compared across contexts to help ascertain whether certain drinking environments are associated with elevated levels of alcohol consumption. To do this beep-level analysis, times which adolescents reported drinking were selected and three ANOVA were performed with the number of drinks as the dependent variable. In addition to grade and gender, the independent variables chosen for this analysis

were based upon the results of the previous analyses investigating temporal, environmental, and social contexts and included collapsed versions of the context variables. The first ANOVA added two dichotomous terms for weekday and time. For the second ANOVA, social companionship was added as a three level (friends, boy/girlfriend, and other) independent variable. Finally, social contexts was added as a four level (boy/girlfriend, friends, alone, and other) independent variable for the last ANOVA.

#### Analytical Approach: Use and Mood

The final set of analyses was concerned with the impact of alcohol on adolescents' mood states and consisted of three subsets of analyses. First, in order to provide insight into the overall experience of alcohol use, adolescents' mood while actively drinking was compared to their non-drinking mood. The second series attempted to isolate the effects of alcohol consumption itself by investigating changes in adolescents' mood when progressing from a non-drinking state to a drinking state. Finally, the potential negative after-effects of drinking on adolescents' daily experience was examined. In all cases, the aforementioned mood variables served as dependent variables.

General comparison. This set of analyses sought to determine how adolescents' moods during alcohol use differ from their overall (non-drinking) experience and used a multilevel model of the following form.

$$Y = \beta_1 + \beta_2 * GRD_A + \beta_2 * GRD_B + \beta_3 * SEX + \beta_4 * DRINK + \\ \beta_4 * (GRADE * SEX) + \beta_5 * (GRADE * DRINK) + \beta_6 * (SEX * DRINK) + \\ \beta_7 * (GRADE * SEX * DRINK)$$

where Y was a mood variable (e.g., affect) and DRINK was a dichotomous variable indicating whether or not an adolescent reported actively drinking during that report. The regressions were done in a hierarchical fashion with the following sequence of nested models: Model I (intercept only), Model II (Model I + GENDER + GRADE contrasts), Model III (Model II + DRINK), Models IV-VI (Model III-V + 2-way interactions), Model VII (Model VI + GRADE\*SEX\*DRINK). To test the statistical difference between the models' improvement of fit, the likelihood ratio chi-square test (Silvey, 1975) was used. This model was computed twice for each mood variable: first by comparing drinking times to all other times, and then by comparing drinking times to other discretionary time (i.e., excluding reports while adolescents' were in school from the analysis). All

multilevel analyses investigating moods as dependent variables were conducted using MIXREG (Hedeker, 1993b), a program for conducting multilevel linear regressions.

For those mood variables successfully predicted by drinking status, an additional probe was conducted to determine whether the observed differences are dose-related. To do this, cases where adolescents reported drinking were selected and applied to the following multilevel model:

$$Y = \beta_1 + \beta_2 * GRD_A + \beta_2 * GRD_B + \beta_3 * SEX + \beta_4 * DOSE + \\ \beta_4 * (GRADE * SEX) + \beta_5 * (GRADE * DOSE) + \beta_6 * (SEX * DOSE) + \\ \beta_7 * (GRADE * SEX * DOSE)$$

where the dependent variable Y was a mood variable and DOSE was the number of drinks an adolescent reported drinking. These regressions were also be computed in a hierarchical fashion identical to the previous model.

Changes in state. While examining the differences between adolescents' experience of drinking to their overall experience provides useful information on the role alcohol plays in their lives, attributing any differences found to alcohol *per se* would be premature. If alcohol use varies by context (as predicted above), then differences in the experience of drinking versus nondrinking times could

possibly be attributable to those contexts and not alcohol itself. Thus, this analysis was designed in order to isolate the effects of alcohol on adolescents' experience.

To do this, pairs of reports from adolescents who provided active reports of drinking during the week which met the following criteria were drawn. The pairs must have occurred: 1) on the weekend; 2) after 12:00 p.m.; 3) within five hours of each other (to control for history effects); and 4) the adolescent went from a non-drinking (time 1) to a drinking (time 2) situation. In all, the adolescents who reported drinking during the week provided 42 pairs of reports which met this criteria. Adolescents who did not report drinking during the sampling week but indicated on the questionnaire that they drink at least once a month (non-active drinkers;  $\underline{n} = 46$ ) and adolescents who did not report drinking during the sampling week and indicated on the questionnaire that they drink less than once a month (non-drinkers;  $\underline{n} = 104$ ) served as nonequivalent control groups via selecting similar pairs of reports.

In order to test the comparability of reports between the three groups, three ANOVA were computed with time signaled at time 1, time signaled at time 2, and the amount of time between time one and time two as dependent

variables. Results indicated no significant differences between the groups (for all three,  $F(2,191) < 1$ , ns). The average time signaled at time 1 was 5:36 p.m. (SD = 133.8 minutes), the average time signaled at time 2 was 7:58 p.m. (SD = 134.6 minutes), and the average time between reports was 140.8 minutes (SD = 63.6 minutes).

Thus, a mixed-model ANCOVA was employed with drinking group (3 levels: active, non-active, & non-drinker), grade (3 levels: 9/10, 11, & 12), and gender as the between-groups factors, time (from time 1 to time 2) as the within-subjects factor, and the different moods (z-scored to control for individual differences) as dependent variables. In order to control for the effects of companionship, terms indicating whether or not an adolescent was with their peers at time 1 and also at time 2 were entered as a covariates. A time by drinking group interaction was predicted for these analyses; it was expected that active drinkers would report positive changes in mood states from time 1 to time 2 while no changes in state would be evident for non-active and non-drinker adolescents.

Finally, pairs of reports from adolescents who drank during the week (n = 42) were examined for any dose effects on their mood states. To do this, the number of drinks



adolescents reported consuming at time 2 was recoded into a 3-level variable (1-2, 3-5, and 6 or more drinks) and used as the between-groups factor in a mixed model employing time as the within subjects factor, grade, gender, and peer companionship as covariates, and z-scored mood states as dependent variables.

The morning after. Finally, this study investigated any potential "hangover" effects from alcohol by comparing adolescents' subjective state on mornings after drinking to mornings when they did not drink the day before. To do this, the first report of each day was selected from those adolescents who reported drinking during the week and a multilevel model of the following form was tested:

$$Y = \beta_1 + \beta_2 * GRD_A + \beta_2 * GRD_B + \beta_3 * SEX + \beta_4 * WEEKEND + \beta_5 * LSTNITE + \beta_{6-12} * (2\text{-way interactions}) + \beta_{13-19} * (3\text{-way interactions})$$

where the dependent variable Y is a mood variable, WEEKEND is a dummy variable indicating whether it is a weekend or weekday morning, and the dichotomous variable LSTNITE is whether an adolescent reported drinking the previous night. In order to be included, the first report of the day must have occurred by 1:00 p.m. It was hypothesized that, due to the after-effects of alcohol, mornings following drinking episodes would be characterized by lower motivation as well

as lower moods. In addition, in order to test for any dose-related hangover effects, a similar multilevel model was constructed by substituting the number of drinks adolescents reported consuming the night before in place of the dichotomous term LSTNITE.

## CHAPTER III

### RESULTS

Results for each of the four sets of analyses are presented in the order established in the methods section. First, the results of the comparison between ESM and questionnaire measures of alcohol use are presented. Second, the findings regarding grade and gender differences in the incidence, frequency and intensity of use are shown. Third, we present the results of analyses investigating the contexts of alcohol use and, finally, the results of analyses investigating the impact of alcohol on adolescents' moods are presented.

#### Questionnaire - ESM Comparison

The first set of analyses involved a comparison between this study's questionnaire and ESM measures of alcohol use behavior. Although the questionnaire measure asked adolescents about their use in general and the ESM focused on behavior during the sampling week, one would expect a level of agreement between the two measures sufficient to

establish convergent validity. This question was examined through several analyses.

First, adolescents' questionnaire reports of their drinking frequency were compared to the incidence of reported drinking during the ESM sampling week. Sixteen adolescents (8 boys and 8 girls) reported drinking at least once a week on the questionnaire, but did not report drinking during the ESM sampling week. Table 2 shows the proportion of adolescents who reported using alcohol during the sampling week for each response category of the questionnaire measure of drinking frequency.

Second, among those adolescents who reported drinking during the ESM sampling week ( $n = 51$ ), questionnaire reports of drinking frequency were compared to the number of drinking occasions reported during the ESM sampling week. The results indicated that 3 adolescents (6.3%) reported drinking more frequently on the questionnaire measure and that 4 adolescents (8.4%) reported a greater number of drinking occasions during the ESM sampling week than they reported drinking (on average) on the questionnaire measure. Thus, of the adolescents who reported drinking during the ESM sampling week, roughly 85 percent of them reported questionnaire measures of frequency of drinking that were in

Table 2

Proportion of ESM Use Incidence by Questionnaire ResponseCategories (N = 220)

<b>QUESTIONNAIRE</b>	<b>ESM INCIDENCE REPORT</b>	
	Did Not Report Drinking	Reported Drinking
"How often do you drink?"	%	%
Never ( <u>n</u> = 48)	100	0
Less than Once a Year ( <u>n</u> = 25)	100	0
Less than Once a Month ( <u>n</u> = 41)	97.6	2.4
About Once a Month ( <u>n</u> = 29)	72.4	27.6
3-4 Days a Month ( <u>n</u> = 31)	51.6	48.4
1-2 Days a Week ( <u>n</u> = 34)	42.4	57.6
3-4 Days a Week ( <u>n</u> = 6)	33.3	66.7
Everyday (n = 1)	0	100
Missing (n = 6)	50.0	50.0

agreement with the number of drinking occasions they reported via ESM.

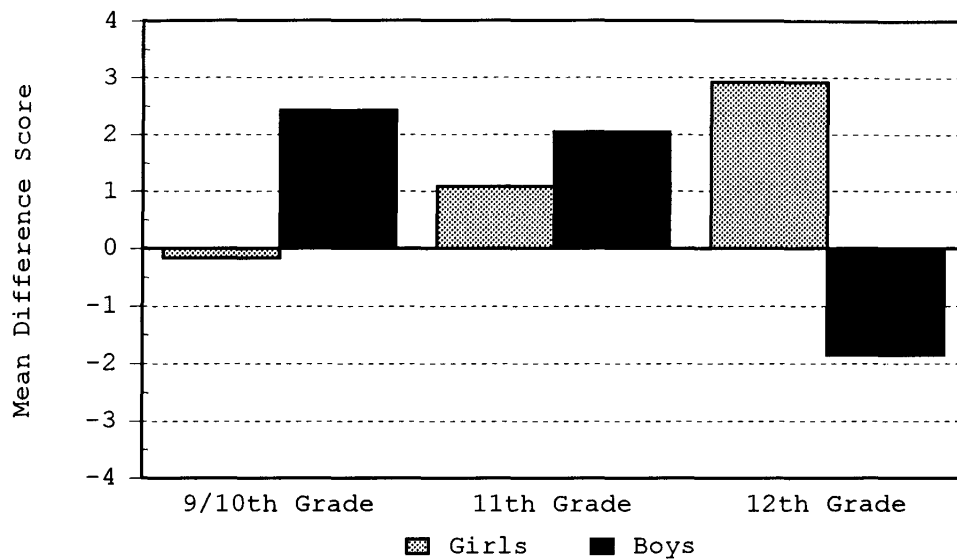
Third, among those adolescents who reported drinking during the ESM sampling week ( $n = 51$ ), questionnaire reports of the greatest number of drinks consumed on one occasion (ever) were compared to reports of the greatest number of drinks on one occasion derived via ESM. The majority of these adolescents (75%) reported having consumed a greater amount on the questionnaire measure. Seventeen percent of the adolescents reported drinking within the range of their questionnaire response during the sampling week (i.e., they drank as much as their reported lifetime high during the sampling week), while 8% of the adolescents reported drinking *in excess* of their response to questionnaire measure during the ESM sampling week.

Fourth, a paired-groups t-test was used to compare questionnaire and ESM-derived reports of the number of drinks consumed on average during one occasion by those adolescents who reported drinking during the ESM sampling week. For questionnaire responses which indicated a range of drinks, the midpoint was used (e.g., 7-8 drinks was transformed to 7.5). Results indicated that the difference between adolescents' reports of average drinks per occasion

via questionnaire ( $\underline{M} = 6.4$ ,  $\underline{SD} = 2.9$ ) and via ESM ( $\underline{M} = 5.5$ ,  $\underline{SD} = 3.6$ ) was not significant,  $\underline{t}(47) = 1.56$  ( $\underline{M}_D = 0.8$ ,  $\underline{SD} = 3.6$ ). The two questionnaire and ESM measures of adolescents average number of drinks per occasion were significantly correlated,  $\underline{r} = .41$ ,  $\underline{p} < .005$ .

Finally, grade and gender differences in the reporting of average number of drinks per occasion by method were assessed. To do this, a difference score was computed by subtracting the ESM measure of the average number of drinks per occasion from the questionnaire measure of the average number of drinks per occasion. Thus, positive values indicate that an adolescent's questionnaire report is greater than their ESM measure, while negative values indicate that an adolescent's questionnaire report is lower than the ESM measure. Analysis of variance with the difference score as the dependent variable and grade and gender as the independent variables indicated a significant grade by gender interaction,  $\underline{F}(2,47) = 4.89$ ,  $\underline{p} < .05$  (see figure 1). Post-hoc Scheffe analysis indicated that 12th grade boys' difference scores were significantly different from those of younger boys ( $\underline{p} < .05$ ) and 12th grade girls. Younger boys and older girls tended to overestimate their average number of drinks per occasion on the questionnaire

Figure 1.  
Questionnaire-ESM Estimates of Average Number of Drinks  
per Occasion ( $n = 51$ ).





measure while 12th grade boys' underestimated their drinking on the questionnaire.

In summary, the comparison of several questionnaire measures of alcohol use to companion ESM measures yielded the following findings. First, a number adolescents who indicated drinking at least once a week on their questionnaire did not report drinking during the ESM sampling week. Second, those adolescents who did report drinking during the ESM sampling week were mostly in agreement with their questionnaire measures of frequency, greatest number of drinks on one occasion, and average number of drinks per occasion. Finally, compared to 9th grade boys and 12th grade girls, 12th grade boys underestimated the average amount they drink per occasion on questionnaire measures of use.

### Alcohol Use

This set of analyses was concerned with grade and gender differences in the incidence, frequency, and intensity of adolescents' alcohol use. Based upon previous research, it was expected that boys and older adolescents would show a higher incidence of alcohol use.

Incidence. To determine grade and gender differences in the incidence of alcohol use in the larger sample, a

person-level logistic regression was used with grade and gender as the independent variables and a dichotomous variable indicating whether or not the adolescent reported drinking during the sampling week as the dependent variable. In partial support of the hypothesized relationship, the results of this analysis indicated that older adolescents were more likely to report drinking during the ESM sampling week than younger adolescents,  $\chi^2 = 5.11$ ,  $p < .05$ . Compared to adolescents in the ninth grade, the proportion of adolescents who reported drinking was over twice as large for 10th graders, and three times as large for adolescents in the 11th and 12th grade: Ten-percent of 9th graders, 23% of 10th graders, 31% of 11th graders, and 29% of 12th graders reported drinking during the sampling week. Because so few ( $n = 4$ ) ninth grade adolescents reported drinking, grade was coded as a three-level variable: 9-10 ( $n = 17$ ); 11 ( $n = 18$ ); and 12 ( $n = 16$ ) for all remaining analyses (including frequency, intensity, context, and mood). Contrary to the hypothesis, gender was not related to the incidence of alcohol use during the sampling week. Of the 51 adolescents reporting use, 26 were male and 25 were female. There was no significant interaction between grade and gender.

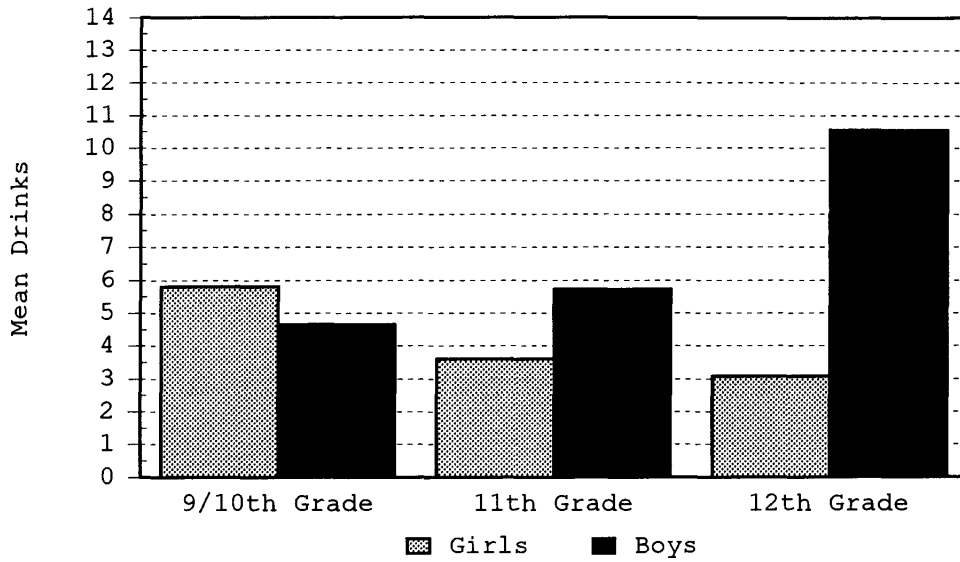
Frequency. Among adolescents ( $n = 51$ ) who reported drinking during the week, further analysis was conducted to examine grade and gender differences in the frequency of use (i.e., the number of occasions adolescents reported drinking). It was expected that boys and older adolescents would report drinking more frequently. Contrary to the hypothesis, the ANOVA indicated no significant grade or gender differences in the frequency of drinking. The majority of adolescents (63%) reported drinking on only one occasion during the sampling week. Twenty-three percent of the adolescents reported drinking twice and 14% reported drinking on three or more occasions during the sampling week. An additional probe of the relationship between drinking frequency, grade, and gender was done by collapsing frequency into a dichotomous variable (once vs. more than once) and running a series of nonparametric Chi-Square analyses. Providing equivocal support for the hypothesis, these analyses indicated that girls were significantly more likely to drink once a week while boys were equally likely to drink once or more than once a week. Of the 26 boys, 14 (54%) reported drinking only once during the sampling week while 12 (46%) reported drinking more than once. Of the 25 girls, 18 (72%) reported drinking only once during the

sampling week while 7 (28%) reported drinking more than once,  $\chi^2 = 4.84$ ,  $p < .05$ .

Intensity. This set of analyses was designed to investigate grade and gender differences in the intensity of alcohol use. To do this, adolescents' average number of drinks per occasion, the greatest amount consumed on one occasion, and the total number of drinks consumed during the ESM sampling week were used as dependent variables in a series of ANOVA with grade and gender as the independent variable. It was predicted that boys and older adolescents would report greater intensity of alcohol use.

The ANOVA with the average number of drinks per occasion as the dependent variable indicated a significant grade x gender interaction,  $F(2,50) = 4.30$ ,  $p < .05$ , which is presented in figure 2. In the follow-up analysis, this interaction was first probed by using post-hoc Scheffes and looking at grade differences among boys and girls separately. Among girls, no significant grade differences in the average number of drinks per occasion emerged. Among boys, 12th graders ( $M = 10.5$ ,  $SD = 6.0$ ) drank a significantly greater average number of drinks per occasion than those in the 9th grade ( $M = 4.7$ ,  $SD = 2.4$ ),  $p < .05$ . The interaction was then probed by selecting for grade to

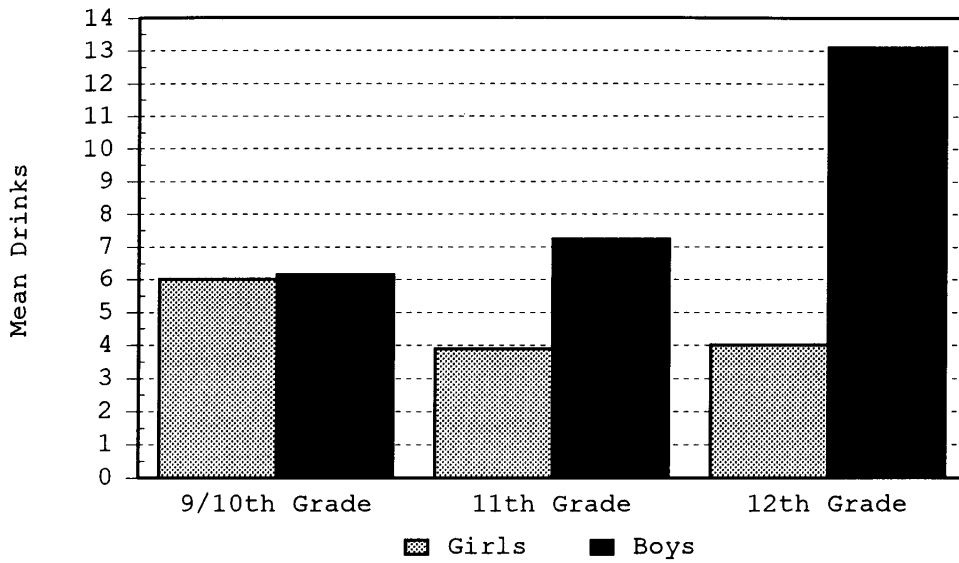
Figure 2.  
Average Number of Drinks per Occasion  
by Grade and Gender ( $n = 51$ ).



examine the simple main effects of gender via a series of one-way ANOVA. The only significant simple main effect of gender occurred among adolescents in 12th grade. This result indicated that boys ( $\underline{M} = 10.5$ ,  $\underline{SD} = 6.0$ ) reported averaging significantly more drinks per occasion than girls ( $\underline{M} = 3.1$ ,  $\underline{SD} = 1.7$ ),  $\underline{F}(1,15) = 8.61$ ,  $\underline{p} < .05$ . Thus, the prediction regarding grade and gender differences in the average number of drinks consumed per occasion met with mixed support. Older boys drank significantly more than both younger boys and older girls.

The ANOVA with the greatest number of drinks on one occasion as the dependent variable also indicated a significant grade x gender interaction,  $\underline{F}(2,50) = 3.23$ ,  $\underline{p} < .05$ , which is presented in figure 3. Like the previous analysis, this interaction was first probed by using post-hoc Scheffes to investigate grade differences among boys and girls separately. Among girls, no significant grade differences in the greatest number of drinks on one occasion emerged. Although the one-way ANOVA indicated a significant simple main effect of grade for boys [ $\underline{F}(2,25) = 3.70$ ,  $\underline{p} < .05$ ], the simple comparison utilizing a post-hoc Scheffe indicated that none of three grade groups were significantly different from each other. The interaction was then probed

Figure 3.  
Greatest Number of Drinks on One Occasion  
by Grade and Gender ( $n = 51$ ).



by selecting for grade to examine the simple main effects of gender via a series of one-way ANOVA. Similar to the findings regarding the average number of drinks per occasion, the only significant simple main effect of gender occurred among adolescents in 12th grade. This result indicated that older boys ( $\underline{M} = 13.1$ ,  $\underline{SD} = 6.6$ ) reported consuming a significantly higher greatest number of drinks on one occasion than older girls ( $\underline{M} = 4.0$ ,  $\underline{SD} = 3.5$ ),  $\underline{F}(1,15) = 9.64$ ,  $\underline{p} < .01$ . Thus, the prediction regarding grade and gender differences in the greatest number of drinks consumed on one occasion met with mixed support. Older boys reported consuming a significantly higher greatest number of drinks on one occasion than older girls.

Finally, grade and gender differences in the intensity of alcohol use were investigated by comparing these groups on the total number of drinks they consumed during the sampling week. It was expected that boys and older adolescents would report a greater total number of drinks. In partial support of this, the results of this analysis indicated a main effect of gender,  $\underline{F}(1,50) = 9.11$ ,  $\underline{p} < .005$ . On average, boys ( $\underline{M} = 12.7$ ,  $\underline{SD} = 6.9$ ) reported drinking over twice as many total drinks during the sampling week as girls ( $\underline{M} = 5.3$ ,  $\underline{SD} = 3.6$ ). Although they were predicted, no grade



differences in the total number of drinks consumed during the week emerged.

### Contextual Patterns

These analyses were designed to examine temporal, environmental, and social contexts of adolescent drinking behavior by utilizing the self-reports of the 46 adolescents who reported actively drinking during the sampling period. Table 3 presents a description and summary of the findings regarding the temporal, environmental, and social contexts of these adolescents' alcohol use.

Temporal context. It was predicted that most adolescents would report drinking during evening hours and on weekends. In support of this hypothesis, both the descriptive and multilevel analysis clearly indicated that alcohol use is more prevalent and more likely during the evening. As shown in table 3, roughly 70% of the reports of alcohol use occurred during the evening. Moreover, in relation to the amount of time spent in each context, evening hours ( $P = 12.9$ ) were associated with a significantly higher proportion of reports of drinking than daytime hours ( $P = 2.7$ ),  $\chi^2 = 32.84$ ,  $\beta = .64$ ,  $SE = .12$ ,  $p < .001$ .

Table 3

Contextual Patterns of Adolescent Alcohol Use

	% of time spent in this context ( <u>n</u> = 1593)	% of alcohol use reports ( <u>n</u> = 98)	% time alcohol use in this context <sup>a</sup>
Temporal			
Day	66.5	29.6	2.7
Evening	33.5	70.4	12.9 <sup>***</sup>
Weekday	73.0	48.0	4.0
Weekend	27.0	52.0	11.9 <sup>b</sup>
Environmental			
Home	34.7	37.0	6.4
Friend's Home	8.6	41.3	29.0 <sup>***</sup>
School	34.1	4.3	0.8 <sup>***</sup>
Public	13.6	10.9	4.8
Transition	9.0	6.5	4.3
Social			
Boy/Girlfriend	5.9	18.8	19.6 <sup>***</sup>
Friend(s)	24.7	44.8	11.1 <sup>b</sup>
Family	15.7	7.3	2.9
Alone	23.6	24.0	6.3
Other	30.1	5.2	1.1 <sup>***</sup>

<sup>a</sup> The multilevel analysis tests whether the proportion of time drinking in a particular context is significantly related to use compared to other contexts, relative to the amount of time spent in each.

<sup>b</sup> Indicates a significant grade x context interaction,  $p < .001$ .

<sup>\*\*\*</sup>  $p < .001$ .

The likelihood of adolescent drinking on weekends as compared to weekdays appears to vary by grade. The descriptive statistics indicated that reports of alcohol use were as likely to occur during the week (48%) as the weekend (52%). However, the multilevel analysis indicated a significant WEEK  $\times$  GRD<sub>A</sub> interaction,  $\chi^2 = 30.45$ ,  $p < .001$ , which is presented in figure 4. This interaction was first probed by selecting for GRADE (9/10th and 11/12th) in order to test the simple main effects of WEEK. The results indicated that older adolescents spent a significantly greater proportion of their weekend time drinking ( $\underline{P} = 13.2$ ) compared to weekdays ( $\underline{P} = 3.1$ ),  $\chi^2 = 40.91$ ,  $p < .001$ . Among younger adolescents, the proportion of time drinking during the weekend ( $\underline{P} = 8.3$ ) was not significantly different from that of weekdays ( $\underline{P} = 6.0$ ). Next, this interaction was probed by selecting for WEEK in order to test the simple main effects of GRADE. Results of these analyses indicate that younger adolescents ( $\underline{P} = 6.0$ ) reported spending a significantly greater proportion of their time drinking on weekdays than older adolescents ( $\underline{P} = 3.1$ ),  $\chi^2 = 5.82$ ,  $p < .05$ . Thus, the prediction that adolescent drinking would be

Figure 4.  
Young and Older Adolescents' Drinking by Weekday

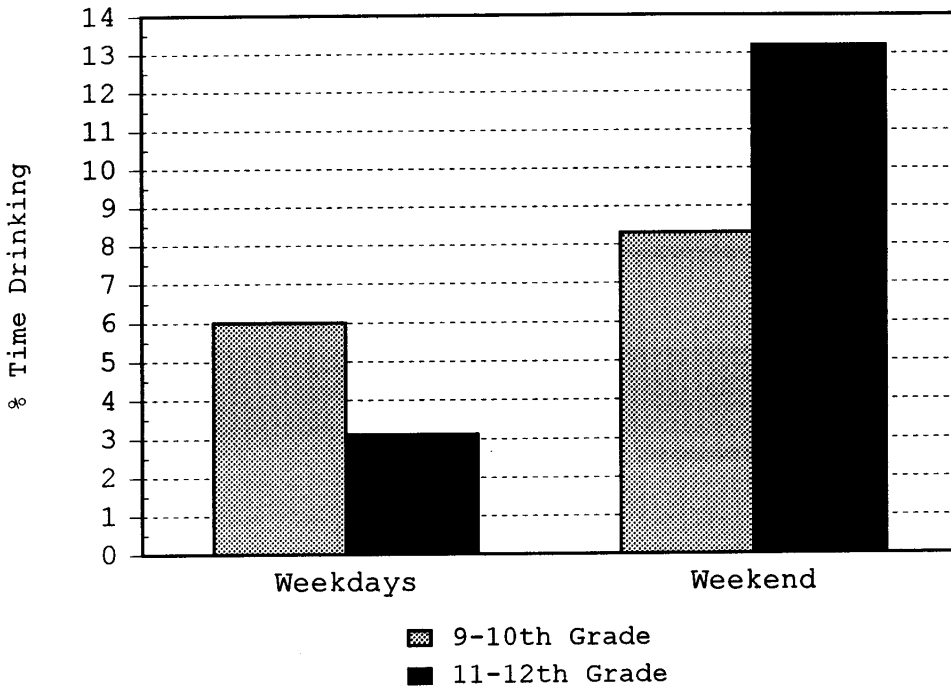
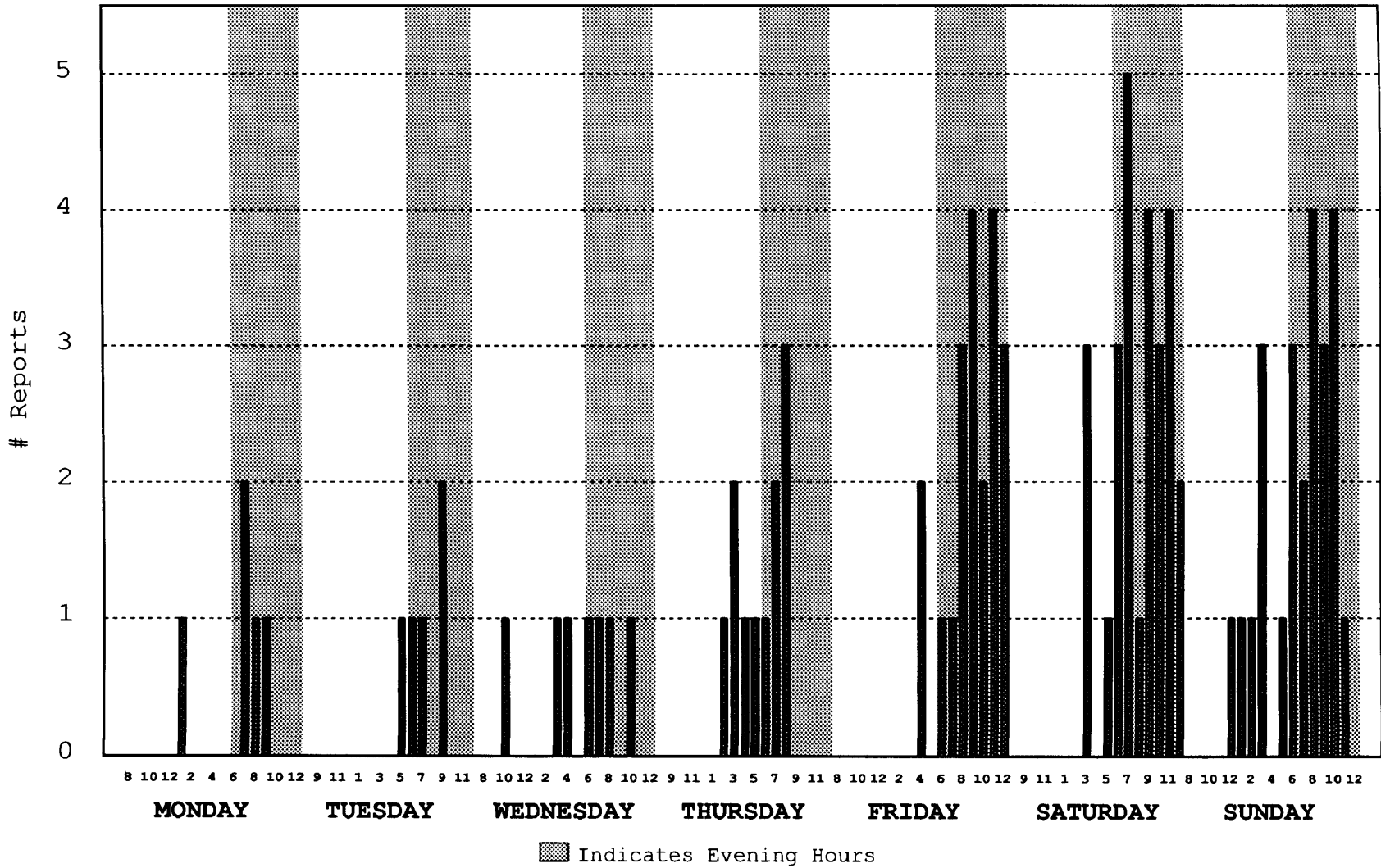


Figure 5.

Distribution of Alcohol Reports Over Days of the Week ( $n = 98$ ).



more likely during the weekend is supported only for older adolescents. Figure 5 illustrates the entire distribution of active alcohol reports during sampling period.

Environmental context. It was expected that few adolescents would report drinking in a public setting (including school and transportation) and that alcohol use would most likely occur at home and at a friend's home. In agreement with this, the descriptive statistics indicated that roughly 78% of the adolescents' reports of alcohol use occurred while they were either at home or at a friend's home (see table 3).

However, the results of the multilevel analyses indicated that, relative to the amount of time spent in each respective context, the only environmental contexts significantly related to the incidence of alcohol use were friend's home and school. For these adolescents, being at a friend's home ( $P = 29.0$ ) was associated with a significantly higher proportion of reports of drinking than when they were not at a friend's home ( $P = 3.9$ ),  $\chi^2 = 130.90$ ,  $\beta = 1.35$ ,  $SE = .13$ ,  $p < .001$ . Alcohol use was rarely reported while adolescents were in school. Results indicated that the context of school ( $P = 0.8$ ) was associated with a significantly lower proportion of reports of drinking when

compared to other environmental contexts ( $\underline{P} = 8.7$ ),  $\chi^2 = 71.93$ ,  $\beta = -1.38$ ,  $\underline{SE} = .36$ ,  $\underline{p} < .001$ . The environmental contexts of home, public, and transition were not significantly related to either a higher or lower rates of use, relative to the amount of time adolescents spent in those contexts.

Social context. It was hypothesized that alcohol consumption would occur most often in the company of others, that older adolescents would report drinking more often with the opposite sex alone, and that younger adolescents would be more likely to report drinking in a family context. The descriptive statistics presented in table 3 indicate that 76% of adolescents' reports of drinking occurred with other people present, and that roughly 64% of the reports of drinking were when adolescents reported being with their peers (i.e., boy/girlfriend and friends).

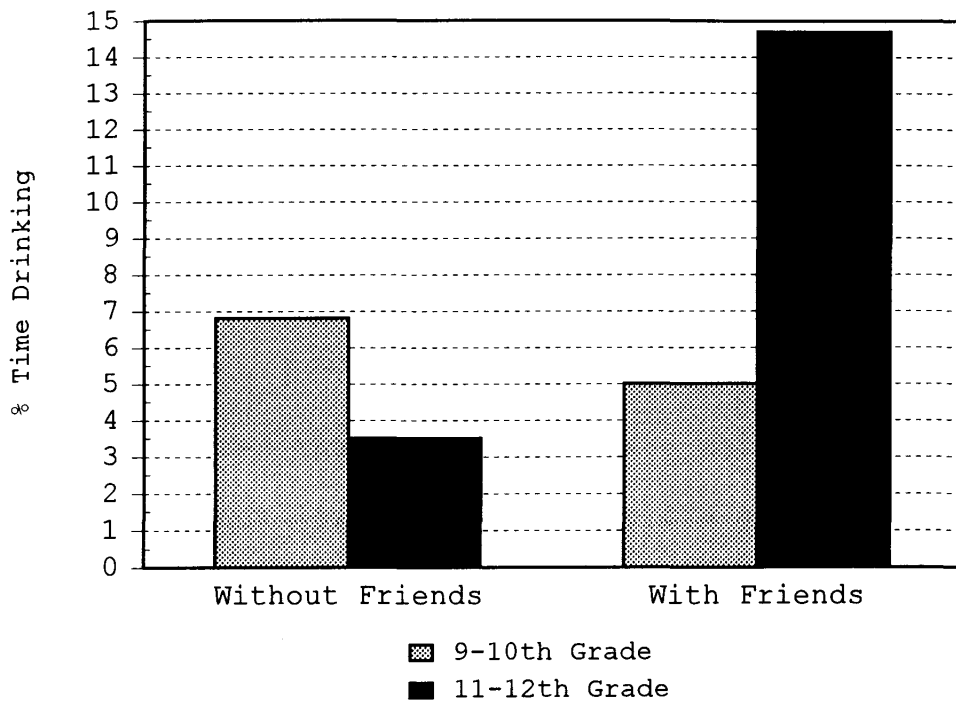
The multilevel analyses yielded a number of significant results. First, in relation to the amount of time spent in each context, time spent with boy/girlfriends ( $\underline{P} = 19.6$ ) was associated with a significantly higher proportion of reports of drinking than times outside that context ( $\underline{P} = 5.3$ ),  $\chi^2 = 38.43$ ,  $\beta = .84$ ,  $\underline{SE} = .15$ ,  $\underline{p} < .001$ . Thus, while being with

a boy/girlfriend was associated with a significantly greater likelihood of drinking, the predicted interaction of this context with GRADE was not significant.

Second, the likelihood of drinking with friends appeared to vary by grade. The multilevel analysis indicated a significant FRND x GRD<sub>A</sub> interaction,  $\chi^2 = 17.77$ ,  $p < .001$ , which is presented in figure 6. This interaction was first probed by selecting for GRADE (9/10th and 11/12th) in order to test the simple main effects of FRIEND. The results indicated that older adolescents were more likely to report drinking when they were with their friends ( $\underline{P} = 14.7$ ) than when they were in other social contexts ( $\underline{P} = 3.5$ ),  $\chi^2 = 41.21$ ,  $p < .001$ . Among younger adolescents the proportion of time drinking when with friends ( $\underline{P} = 5.0$ ) was not significantly different from of other companionships ( $\underline{P} = 6.8$ ). Next, this interaction was probed by selecting for companionship (i.e., with friends or not with friends) in order to test the simple main effects of GRADE. Results of these analyses indicated that younger adolescents ( $\underline{P} = 6.8$ ) were significantly more likely to report drinking when not with their friends than older adolescents ( $\underline{P} = 3.5$ ),  $\chi^2 = 6.27$ ,  $p < .05$  and that older adolescents ( $\underline{P} = 14.7$ ) spent a



Figure 6.  
Young and Older Adolescents' Drinking by Companionship



significantly greater proportion of time with friends drinking than younger adolescents ( $\underline{P} = 5.0$ ),  $\chi^2 = 6.27$ ,  $\underline{p} < .05$

Finally, in relation to the amount of time spent in each context, time spent with others ( $\underline{P} = 1.1$ ) was associated with a significantly lower proportion of reports of drinking than times outside of that social context ( $\underline{P} = 8.3$ ),  $\chi^2 = 54.90$ ,  $\beta = -1.04$ ,  $\underline{SE} = .19$ ,  $\underline{p} < .001$ . These results indicated that social contexts which do not involve either peers, family, or being alone are associated with a decreased likelihood of alcohol use. The contexts of family and being alone were not significantly related to use.

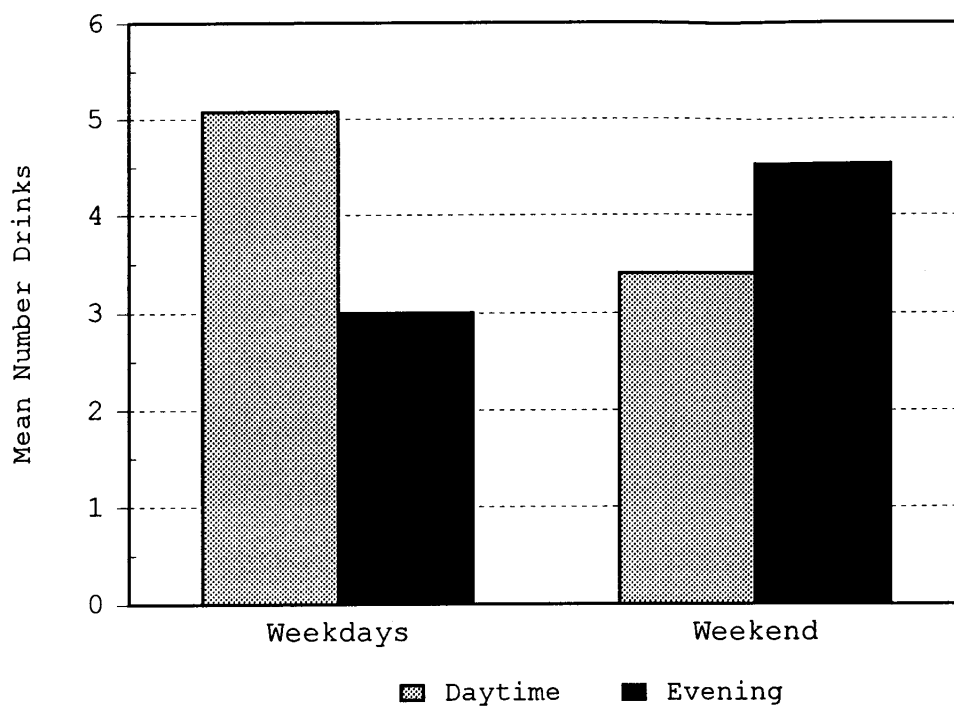
Use and context. In order to help ascertain whether certain drinking environments are associated with elevated levels of alcohol consumption, the amount of alcohol adolescents reported using was compared across contexts. To do this beep-level analysis, times which adolescents reported drinking were selected and series of ANOVA was performed using the number of drinks as the dependent variable.

Along with grade and gender, the first ANOVA included both WEEK (i.e., weekend vs. weekday) and TIME (i.e., day

vs. night) as independent variables. The results of this analysis indicated a significant WEEK x TIME interaction,  $F(1,97) = 6.55, p < .05$ , which is presented in figure 7. This interaction was first probed by selecting for WEEK in order to probe the simple main effects of TIME. During the weekend, the average number of drinks reportedly consumed during the day ( $M = 3.4, SD = 2.0$ ) was not significantly different from the night ( $M = 4.5, SD = 3.8$ ). During weekdays, the average number of drinks consumed during the day ( $M = 5.1, SD = 5.2$ ) tended to be higher than the night ( $M = 4.5, SD = 3.8$ ),  $F(1,46) = 3.05, p < .10$ . When only the reports of drinking that took place during the evening were compared, the results indicated that the number of drinks consumed during the evening tended to be higher on the weekend,  $F(1,97) = 3.45, p < .10$ .

The next two ANOVAs employed environmental contexts (recoded as a 3-level variable -- home, friend's home, and other) and social contexts (recoded as a 4-level variable -- boy/girlfriend, friends, alone, and other) as independent variables. No significant difference in the reported drinks consumed emerged from either of these comparisons. The average number of drinks adolescents reported consuming in

Figure 7.  
Number of Drinks by Day and Time of Report



their home, friend's home and other contexts was 3.9 (SD = 3.9), 4.5 (SD = 3.5), and 2.6 (SD = 2.0), respectively. The mean number of drinks adolescents reported consuming with their boy/girlfriend, friend(s), while alone, and with others was 3.6 (SD = 2.9), 3.9 (SD = 2.8), 4.3 (SD = 4.5), and 4.3 (SD = 5.4), respectively.

#### Use and Mood

The last set of analyses concerned the impact of alcohol on adolescents' mood states and consisted of three subsets of analyses.

General comparison. This set of analyses sought to determine how adolescents' moods during alcohol use differ from their overall (non-drinking) experience. The first group of these multilevel analyses compared drinking times to all other times. The second group of analyses compared drinking times to discretionary time (i.e., excluding reports while adolescents were in school or at work).

The results of the analyses comparing drinking times to all other times are presented in table 4. These results indicate that, compared to the rest of their daily life, time spent drinking was experienced as significantly more positive by these adolescents. A main effect of DRINK emerged for feelings of being accepted, the perception of

Table 4

Adolescents' Experience of Alcohol Use versus All Other Experience ( $n = 46$ )

	Mean Scores			$\chi^2$ DRINK
	All Reports ( $n = 1593$ )	Not Drinking ( $n = 1495$ )	While Drinking ( $n = 98$ )	
<b>Sociability</b>				
Accepted	2.64	2.62	2.87	5.55*
Others' Friendliness	5.85	5.82	6.23	10.53**
Others' Joking	4.46	4.41	5.18	12.26***
<b>Romance</b>				
Attractive	4.24	4.21	4.73	26.17***
In Love <sup>ab</sup>	2.33	2.29	2.84	25.90***
<b>Tension Reduction</b>				
Stressed	3.65	3.66	3.42	6.50*
<b>Hedonic Tone</b>				
Affect <sup>a</sup>	4.88	4.87	5.12	8.05**
Important <sup>a</sup>	2.48	2.46	2.80	10.33**
Great <sup>c</sup>	2.61	2.59	2.88	5.82*
Excited	4.05	4.00	4.83	22.98***
<b>Arousal</b>				
Arousal	4.39	4.39	4.44	< 1
<b>Motivation</b>				
Choice	6.95	6.87	8.22	18.33***
Importance	6.24	6.17	7.35	12.32***
Wish	5.71	5.59	7.56	33.79***

\* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ .

<sup>a</sup>drinking x gender interaction,  $p < .05$

<sup>b</sup>drinking x grade interaction,  $p < .05$

<sup>c</sup>drinking x gender x grade interaction,  $p < .05$

Note: Accepted, In Love, Important, & Great are 4-point scales, Motivation items are 10-point scales, all others are 7-point scales.

others as being friendly and joking, feeling attractive, feeling less stressed, being more excited, as well as ratings of choice, importance, and wishing to be engaged in current behavior. No significant relationship was found between alcohol use and feelings of arousal.

In addition, the comparison of drinking times to the rest of adolescents' experience yielded a number of significant interactions. First, drinking status interacted with both  $GRD_A$  ( $\chi^2 = 5.14$ ,  $p < .05$ ) and  $GENDER$  ( $\chi^2 = 4.98$ ,  $p < .05$ ) for feelings of being in love. These interactions with grade and gender are depicted in figures 8a and 8b, respectively. The drinking status x grade interaction was first probed by selecting for grade (9/10th versus 11/12th) in order to test the simple main effects of  $DRINK$ . Results of this analysis indicated that both younger ( $\chi^2 = 20.61$ ,  $p < .001$ ) and older adolescents ( $\chi^2 = 8.62$ ,  $p < .01$ ) felt significantly more in love while drinking. However, when the simple main effects of grade were examined no significant results were obtained. The drinking status x gender interaction was first probed by selecting for gender in order to test the simple main effects of  $DRINK$ . Results of this analysis indicated that both boys ( $\chi^2 = 5.44$ ,

Figure 8a.  
 Drinking versus All Other Times: Feelings of Being In Love  
 by Drinking Status and Grade

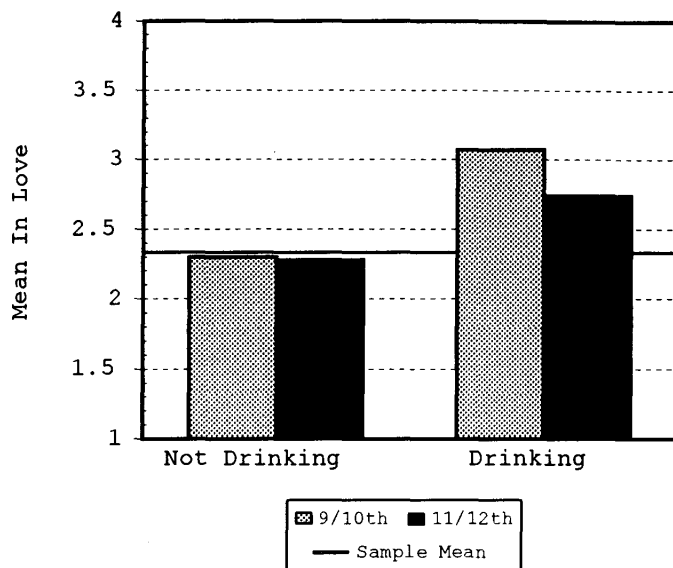


Figure 8b.  
 Drinking versus All Other Times: Feelings of Being In Love  
 by Drinking Status and Gender





$p < .05$ ) and girls ( $\chi^2 = 25.57$ ,  $p < .001$ ) felt significantly more in love while drinking. When the simple main effects of gender were examined, the results indicated that girls ( $M = 3.13$ ,  $SD = .92$ ) tended to feel more in love when they were drinking than boys ( $M = 2.63$ ,  $SD = 1.17$ ) did,  $\chi^2 = 3.66$ ,  $p < .10$ .

Second, drinking status interacted with gender for two of the four hedonic tone variables. DRINK x GENDER interactions emerged for feelings of affect ( $\chi^2 = 4.17$ ,  $p < .05$ ) and feeling important ( $\chi^2 = 3.90$ ,  $p < .05$ ) and are depicted, respectively, in figures 9 and 10. Both of these interactions were first probed by selecting for gender in order to test the simple main effects of drinking status. These analyses yielded similar results; Compared to the rest of their experience, girls reported significantly higher affect ( $\chi^2 = 10.99$ ,  $p < .001$ ) and feeling significantly more important ( $\chi^2 = 12.56$ ,  $p < .001$ ) when they were drinking. Boys' reports of affect and feeling important did not significantly vary by drinking status. When the simple main effects of gender were examined by selecting for drinking status, no significant differences in reports of affect and feeling important emerged when they

Figure 9.  
 Drinking versus All Other Times: Feelings of Being Important  
 by Drinking Status and Gender

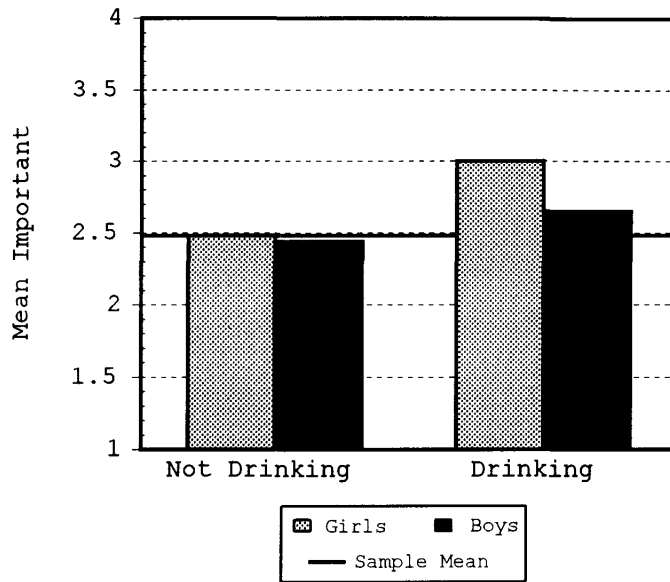


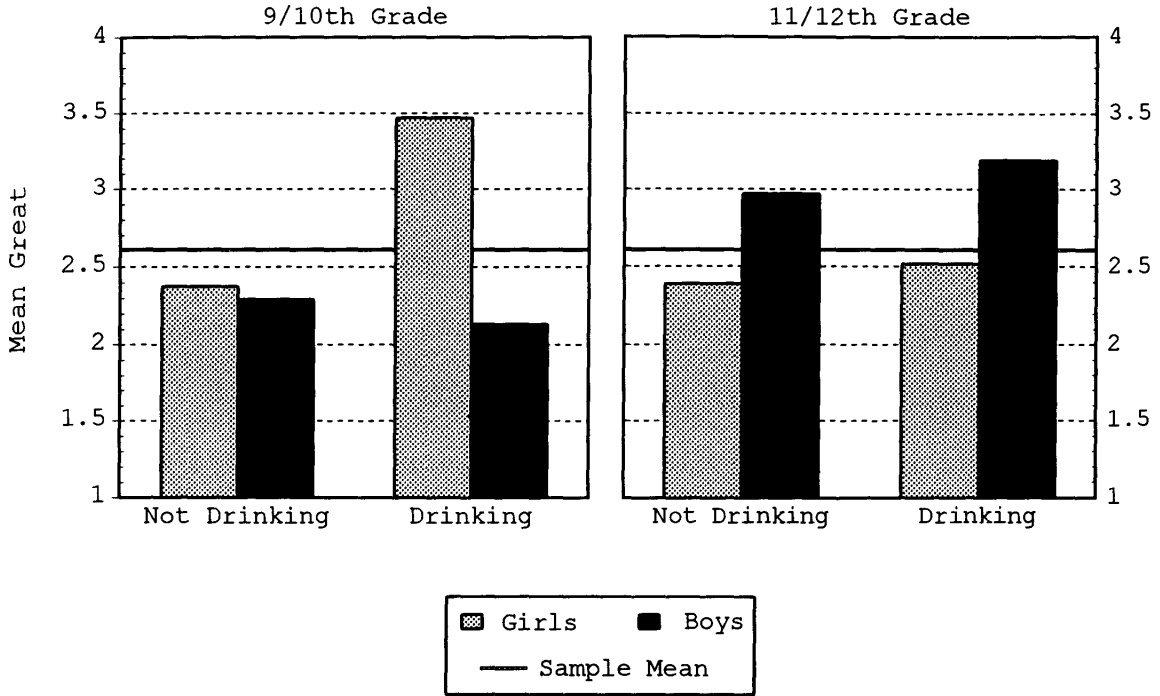
Figure 10.  
 Drinking versus All Other Times: Affect  
 by Drinking Status and Gender



were not drinking. However, when adolescents were drinking, girls ( $\underline{M} = 5.58$ ,  $\underline{SD} = 1.43$ ) reported significantly higher affect than boys ( $\underline{M} = 4.78$ ,  $\underline{SD} = 1.17$ ),  $\chi^2 = 5.24$ ,  $\underline{p} < .05$ , and tended to report feeling more important than boys,  $\chi^2 = 3.07$ ,  $\underline{p} < .10$  ( $\underline{M} = 3.00$ ,  $\underline{SD} = 1.01$  for girls and  $\underline{M} = 2.65$ ,  $\underline{SD} = 1.08$  for boys).

Finally, a significant DRINK x GRD<sub>A</sub> x GENDER interaction emerged for adolescents' reports of feeling great,  $\chi^2 = 5.40$ ,  $\underline{p} < .05$ , which is presented in figure 11. This interaction was first probed by looking at gender and drinking status effects for 9/10th and 11/12th graders separately. Among younger adolescents, a significant gender x drinking status interaction emerged ( $\chi^2 = 8.43$ ,  $\underline{p} < .01$ ). In the follow-up analysis, this interaction was probed by investigating the effects of drinking status for younger girls and boys separately. The results of this analysis indicate that younger girls reported feeling significantly more great when they are drinking ( $\underline{M} = 3.47$ ) compared to all other non-drinking times ( $\underline{M} = 2.37$ ),  $\chi^2 = 13.86$ ,  $\underline{p} < .01$ . Younger boys reports of feeling great did not significantly vary by drinking status. Among older adolescents, a simple main effect of gender emerged which indicated that boys

Figure 11.  
Drinking versus All Other Times: Feeling Great  
by Drinking Status, Grade, and Gender



reported feeling significantly more great than girls regardless of whether or not they were actively drinking ( $\chi^2 = 7.76, p < .01$ ). However, feeling great was not significantly related to drinking status for older adolescents.

The results of the analyses comparing the experience of drinking times to other discretionary times (i.e., when adolescents were not in school or at work) are presented in table 5. Similar to the comparison utilizing the total of adolescents' experience, these results indicate that time spent drinking was experienced as significantly more positive than other discretionary time by these adolescents. A main effect of DRINK emerged for feelings of being accepted, the perception of others as being friendly and joking, feeling attractive, feeling less stressed, affect, feeling important, being more excited, as well as ratings of choice, importance, and wishing to be engaged in current behavior. As with the comparison to their total experience, no significant relationship was found between alcohol use and feelings of arousal.

In addition, the comparison of drinking times to the adolescents' experience of other discretionary times yielded three significant interactions. First, drinking status once

Table 5

Adolescents' Experience of Alcohol Use versus Other  
Discretionary Time (n = 46)

	Mean Scores			$\chi^2$ DRINK
	All Reports ( <u>n</u> = 1071)	Not Drinking ( <u>n</u> = 977)	While Drinking ( <u>n</u> = 94)	
<b>Sociability</b>				
Accepted	2.61	2.58	2.88	8.40**
Others' Friendliness	5.82	5.76	6.31	13.58***
Others' Joking	4.47	4.40	5.18	12.23***
<b>Romance</b>				
Attractive	4.25	4.20	4.78	26.18***
In Love <sup>ab</sup>	2.41	2.36	2.86	20.20***
<b>Tension Reduction</b>				
Stressed	3.48	3.50	3.33	6.01*
<b>Hedonic Tone</b>				
Affect	4.93	4.91	5.17	8.81**
Important	2.51	2.47	2.82	11.43***
Great <sup>c</sup>	2.67	2.65	2.93	5.79*
Excited	4.24	4.18	4.90	17.91***
<b>Arousal</b>				
Arousal	4.47	4.47	4.51	< 1
<b>Motivation</b>				
Choice	7.79	7.74	8.23	5.42*
Importance	6.69	6.64	7.29	4.07*
Wish	6.42	6.30	7.69	18.55***

\* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ .

<sup>a</sup>drinking x gender interaction,  $p < .05$

<sup>b</sup>drinking x grade interaction,  $p < .05$

<sup>c</sup>drinking x gender x grade interaction,  $p < .05$

Note: Accepted, In Love, Important, & Great are 4-point scales, Motivation items are 10-point scales, all others are 7-point scales.

again interacted with both  $GRD_A$  ( $\chi^2 = 5.17$ ,  $p < .05$ ) and GENDER ( $\chi^2 = 5.61$ ,  $p < .05$ ) for feelings of being in love. These interactions with grade and gender are depicted in figures 12a and 12b, respectively. The drinking status x grade interaction was first probed by selecting for grade (9/10th versus 11/12th) in order to test the simple main effects of DRINK. Similar to the findings involving all other experience, the results of this analysis indicated that both younger ( $\chi^2 = 9.89$ ,  $p < .01$ ) and older adolescents ( $\chi^2 = 4.87$ ,  $p < .05$ ) felt significantly more in love while drinking. When the simple main effects of grade were examined no significant results were obtained. Although younger adolescents reported feeling somewhat more in love than older adolescents while drinking, this difference was not statistically significant. The drinking status x gender interaction was first probed by selecting for gender in order to test the simple main effects of DRINK. Results of this analysis indicated that both boys ( $\chi^2 = 4.47$ ,  $p < .05$ ) and girls ( $\chi^2 = 10.96$ ,  $p < .001$ ) felt significantly more in love while drinking.

The third significant interaction in the comparison of adolescents' experience of drinking to other discretionary

Figure 12a.  
 Drinking versus Other Discretionary Time:  
 Feelings of Being In Love by Drinking Status and Grade

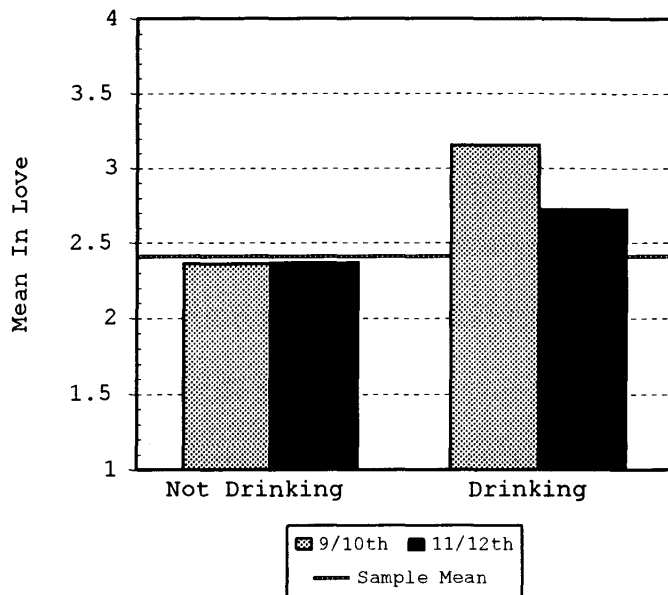
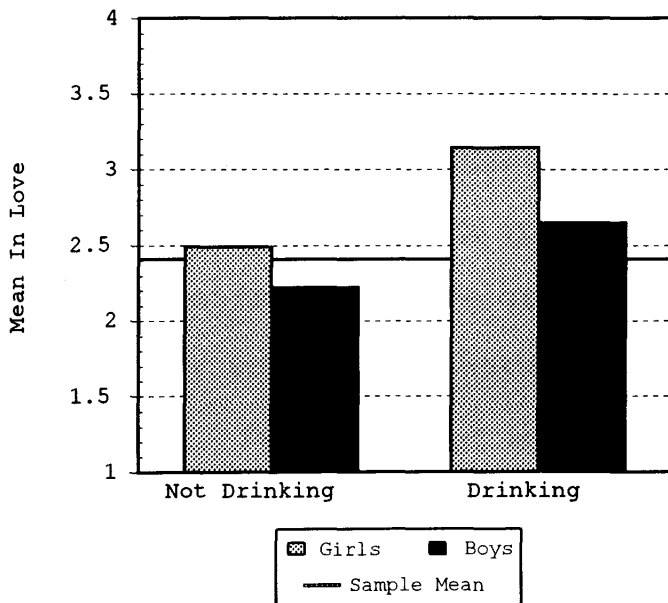


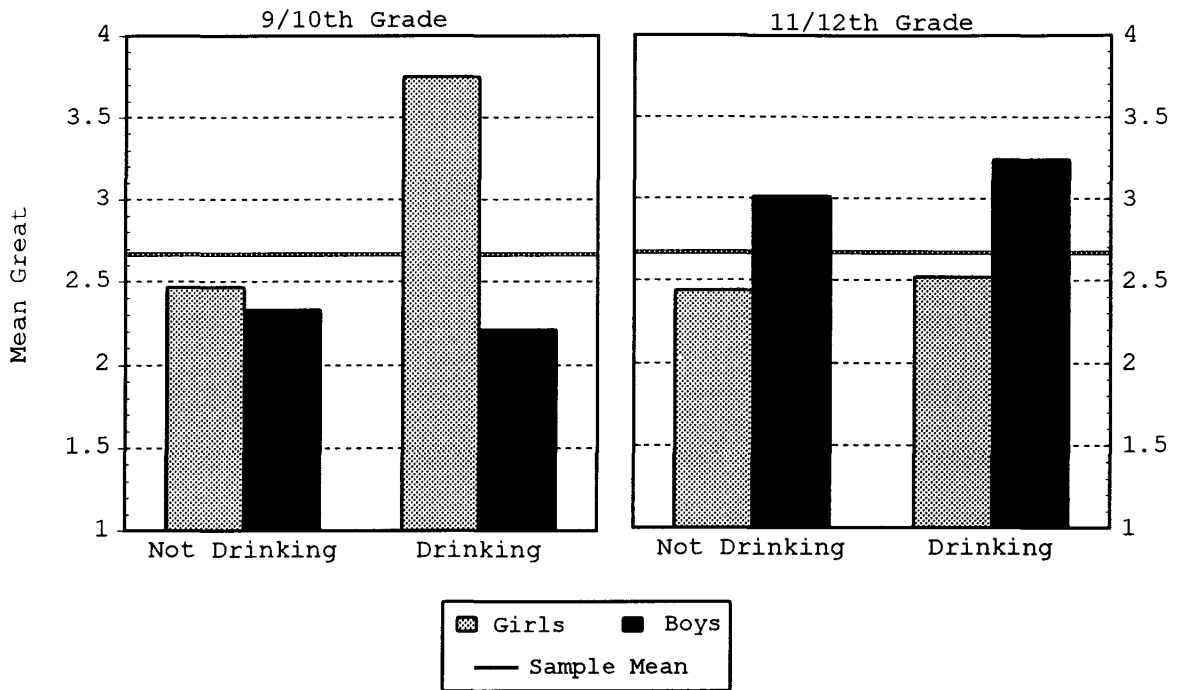
Figure 12b.  
 Drinking versus Other Discretionary Time:  
 Feelings of Being In Love by Drinking Status and Gender





time was also present in the analysis investigating all other times. A significant DRINK x GRD<sub>A</sub> x GENDER interaction emerged for adolescents' reports of feeling great,  $\chi^2 = 5.89$ ,  $p < .05$ , which is presented in figure 13. This interaction was first probed by looking at gender and drinking status effects for 9/10th and 11/12th graders separately. Among younger adolescents, a significant gender x drinking status interaction emerged ( $\chi^2 = 9.64$ ,  $p < .01$ ). In the follow-up analysis, this interaction was probed by investigating the effects of drinking status for younger girls and boys separately. The results of this analysis indicate that younger girls reported feeling significantly more great when they are drinking ( $M = 2.92$ ) compared to other discretionary times ( $M = 2.45$ ),  $\chi^2 = 8.43$ ,  $p < .01$ . Younger boys reports of feeling great did not significantly vary by drinking status. Among older adolescents, a simple main effect of gender emerged which indicated that boys reported feeling significantly more great than girls regardless of whether or not they were actively drinking ( $\chi^2 = 8.61$ ,  $p < .01$ ). Feeling great was not significantly related to drinking status for older adolescents. Thus, the results of the follow-up analysis to this interaction mirror

Figure 13.  
Drinking versus Other Discretionary Time: Feeling Great  
by Drinking Status, Grade, and Gender



the findings from when drinking times were compared to all other times.

An additional probe of the findings was conducted to determine whether the observed differences in moods was dose-related. To do this, cases where adolescents reported actively drinking ( $n = 98$ ) were selected and the number of drinks an adolescent reported consuming (since their last report) was used as an independent variable, predicting to each mood variable, in a series of multilevel models. The number of drinks adolescents reported consuming since their last report ranged from 1 to 16 ( $M = 3.9$ ,  $SD = 3.6$ ). The results of these analyses indicated that only 2 of the 13 mood variables which significantly changed by drinking status were found to significantly vary by a linear dose term. First, adolescents who reported consuming more drinks since the last report expressed feeling significantly lower stress than those consuming fewer drinks,  $\chi^2 = 4.61$ ,  $p < .05$ . Second, adolescents who reported consuming more drinks since the last report felt that their current activity (which involved drinking alcohol) was more important to them than those consuming fewer drinks,  $\chi^2 = 5.01$ ,  $p < .05$ .

Changes in state. This second subset of analyses attempted to isolate the effects of alcohol consumption itself by investigating changes in adolescents' mood when progressing from a non-drinking state to a drinking state. To do this, pairs of reports from active drinkers, non-active drinkers, and non-drinkers were compared. As noted previously, these reports occurred on the weekend with the first report and second report occurring (on average) around 5:30 p.m. and 8:00 p.m., respectively. For the active drinkers group, the first report involved no alcohol use while the second report occurred after they had consumed alcohol. A mixed model ANCOVA was used with drinking group, grade, and gender as the between-groups factors, time (from time 1 to time 2) as the within-subjects factor, the different moods (z-scored to control for individual differences) as dependent variables, and 2 dummy variables indicating the presence/absence of peer companionship at time 1 and time 2 as covariates. Because the purpose of these analyses was to examine changes in state associated with alcohol consumption only within-subject (time) effects that include an interaction with drinking group are presented. A time x drinking group interaction (indicating that active drinkers experienced change) was predicted for

all mood states. For space considerations, only the results for variables which interacted with drinking group and time are presented.

As shown in the table 6, the analyses yielded a number of interactions involving time and group effects. First, a time x group x grade trend emerged for adolescents' feelings of being accepted. This interaction was first probed by selecting for grade (9/10, 11, & 12) and testing for the presence of a time x group interaction. The results of these analyses indicated a significant group x time effect only for younger adolescents (i.e., 9th and 10th graders),  $F(2,77) = 4.79, p < .05$ , which is presented in figure 14. The follow-up analysis to this interaction, which involved selecting for drinking group in order to test the time effect for active drinkers, non-active drinkers, and non-drinkers separately, indicated that the only group to report significant changes in feelings of acceptance from time 1 to time 2 were active 9th & 10th grade drinkers,  $F(1,11) = 5.98, p < .05$ . Second, a significant time x group interaction emerged for adolescents' perception of others' friendliness (table 6). This interaction, presented in figure 15, was probed by selecting for drinking group in order to test the time effect for active drinkers, non-

Table 6

Changes in State between Drinking Groups: Feeling Accepted, Perceiving Others as Friendly, Affect, and Choice

Source	df	<u>F</u>			
		Accept	Friendly	Affect	Choice
Time(T)	1	5.88*	2.63	6.63*	0.98
T x Group(G)	2	2.94 <sup>†</sup>	4.06*	3.98*	2.07
T x G x Grade(GR)	4	2.10 <sup>†</sup>	0.93	1.34	2.51*
T x G x Sex(S)	2	0.18	0.38	1.88	3.02 <sup>†</sup>
T x G X GR x S	4	0.34	1.13	1.17	0.63
T x Subject w/i group error	-	(0.84)	(0.80)	(0.81)	(0.52)
Peer Covariate					
Time 1		1.06	1.73 <sup>†</sup>	-1.21	-1.16
Time 2		1.94 <sup>†</sup>	1.61	3.21**	0.60

Note. Due to missing data, degrees of freedom for error term vary by dependent variables. Appropriate values are 162, 111, 163, & 169 for Accepted, Friendliness of Other, Affect, & Choice respectively. Values enclosed in parentheses represent mean square errors. Values presented for Peer Covariates are t-values.

<sup>†</sup>p < .10. \*p < .05. \*\*p < .01.

Figure 14.  
Changes in State: 9/10th Grade Adolescents'  
Feelings of Being Accepted by Drinking Group

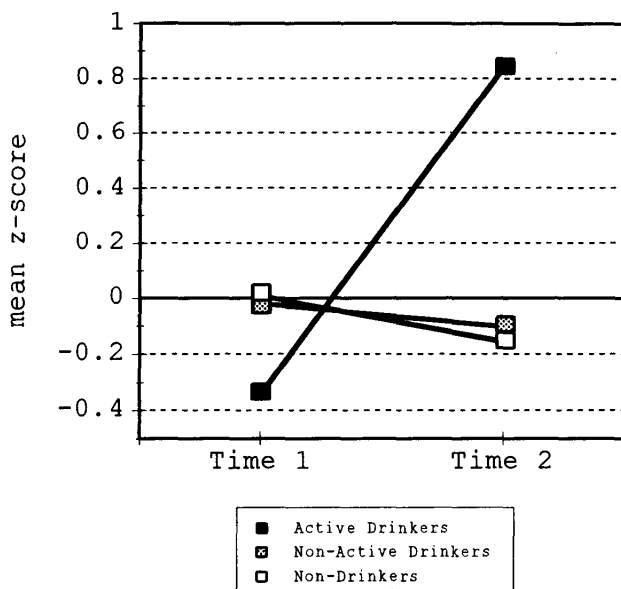
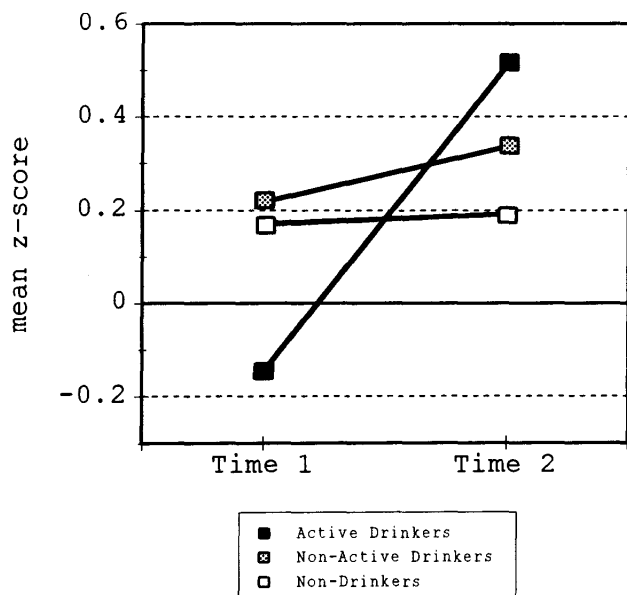


Figure 15.  
Changes in State: Adolescents' Perception of  
Others' Friendliness by Drinking Group



active drinkers, and non-drinkers separately. Results of this probe indicated that the only group of adolescents who reported significant changes in their perception of others' friendliness from time 1 to time 2 were active drinkers,  $F(1,30) = 5.83, p < .05$ . Third, a significant time x group interaction emerged for adolescents' reported affect (see table 6). This relationship is presented in figure 16. When probed by selecting for drinking group the results indicated that the only group of adolescents to report significant changes in their affect were active drinkers,  $F(1,37) = 11.37, p < .01$ . Fourth, a time x group x gender trend emerged for adolescents' feelings of choice. However, follow-up analyses probing this interaction by selecting for gender failed to indicate any significant group x time effects for either boys or girls. Finally, a significant time x group x grade interaction emerged for adolescents' feelings of choice. This interaction was first probed by selecting for grade (9/10, 11, & 12) and testing for the presence of a time x group interaction. The results of these analyses indicated a significant group x time effect only for the oldest adolescents (i.e., 12th graders),  $F(2,52) = 4.39, p < .05$ , which is presented in figure 17. The follow-up analysis to this interaction, which involved



Figure 16.  
Changes in State: Adolescents' Feelings of **Affect**  
by **Drinking Group**

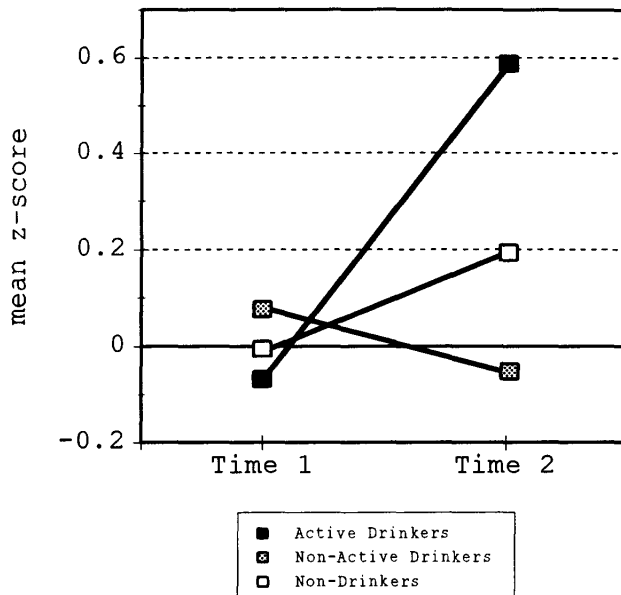
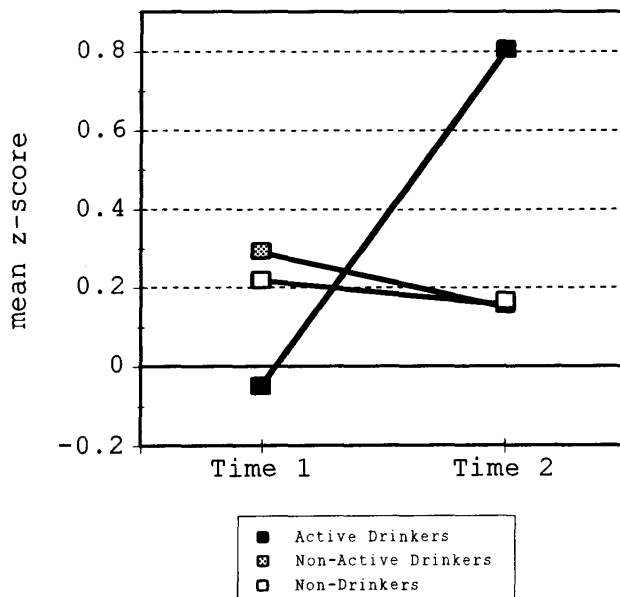


Figure 17.  
Changes in State: 12th Grade Adolescents'  
Feelings of **Choice** by **Drinking Group**



selecting for drinking group in order to test the time effect for active drinkers, non-active drinkers, and non-drinkers separately, indicated that the only group who reported significant changes in feelings of choice from time 1 to time 2 were active drinkers in the 12th grade,  $F(1,13) = 15.93$ ,  $p < .01$ .

In addition to the aforementioned interactions, the results also indicated that regardless of whether they were active drinkers, nonactive drinkers, or non-drinkers, adolescents' feelings of being attractive [ $F(1,134) = 8.95$ ,  $p < .01$ ], less stressed [ $F(1,162) = 6.59$ ,  $p < .05$ ], great [ $F(1,164) = 5.66$ ,  $p < .05$ ], excited [ $F(1,162) = 7.00$ ,  $p < .01$ ], and wishing to do current activity [ $F(1,169) = 4.52$ ,  $p < .05$ ] increased significantly from time 1 to time 2. The peer covariate at time 1 was not significant for any of the variables. However, the time 2 peer covariant [which indicated whether or not an adolescent was with their friend(s) at time 2] was significant for feelings of arousal ( $p < .01$ ), affect ( $p < .01$ ), important ( $p < .05$ ), great ( $p < .001$ ), and excited ( $p < .001$ ).

In summary, the results of these analyses indicated that when adolescent drinkers consume alcohol, they experience a significant increase in their affect and their

perception of others' friendliness. When young adolescent drinkers consume alcohol, they experience a significant increase in their feelings of being accepted while older adolescents experience a significant increase in their feelings of choice.

Next, using a similar repeated-measures design, pairs of reports from adolescents who drank during the weekend were examined for any dose effects on their mood states. A time x dose interaction was predicted for all mood variables. Thus, among active drinkers, it was expected that changes in mood states from time 1 to time 2 would vary as a function of the number of drinks consumed.

The results of these analyses indicated that changes in state appeared to vary by dose for only two of the fourteen mood states. The results of the repeated measures ANCOVA for these two variables are presented in table 7. First, a time x dose trend emerged for feelings of stress (figure 18). When this interaction was probed by selecting for dose (i.e., 1-2, 3-5, & 6+) in order to test for a time effect, the results indicated that only the high dose group reported a significant decrease in stress,  $F(1,9) = 9.97, p < .05$ . Second, a significant time x dose interaction emerged for feelings of choice (figure 19). Similar to the findings for

Table 7

Changes in State by Alcohol Dose: Stress and Choice

Source	df	<u>F</u>	
		Stress	Choice
Time (T)	1	7.40*	3.40†
T x Dose	2	2.84†	3.48*
T x Subject w/i group error	-	(0.78)	(0.35)
Covariates			
w/ Peers @ Time 1		1.85†	-0.34
w/ Peers @ Time 2		-1.06	0.14
Grade		0.42	-2.59*
Gender		-0.82	-1.03

Note. Due to missing data, degrees of freedom for error term vary by dependent variables. Appropriate values are 32 & 39 for Stress & Choice, respectively. Values enclosed in parentheses represent mean square errors. Values presented for Covariates are t-values. † $p < .10$ . \* $p < .05$ .

Figure 18.  
Changes in State: Active Drinkers'  
Feelings of **Stress** by Dose

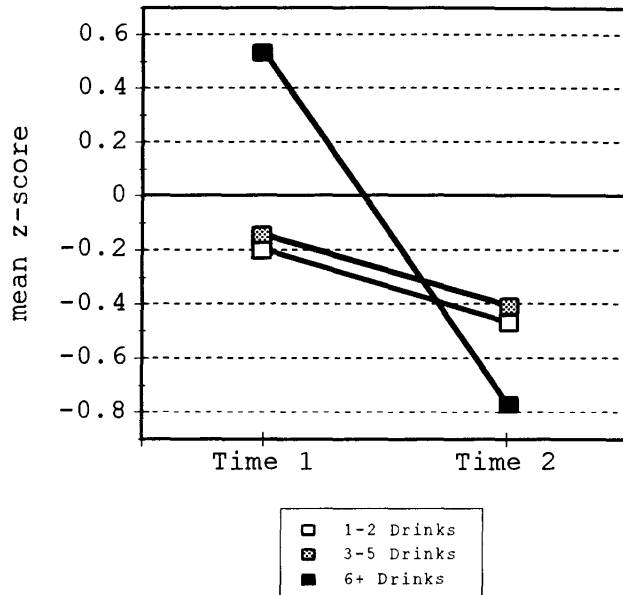
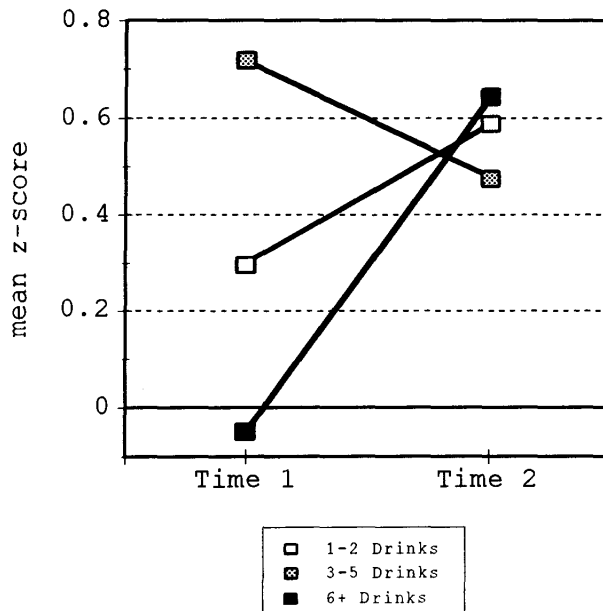


Figure 19.  
Changes in State: Active Drinkers'  
Feelings of **Choice** by Dose



stress, the results for the probe of this interaction indicated that only the high dose group reported a significant change in their feelings of choice,  $F(1,11) = 7.27$ ,  $p < .05$ . When this interaction was probed by selecting for time in order to assess any differences between the dose groups at both time 1 and time 2, the results indicated a significant curvilinear effect of dose at time 1. Post-hoc Scheffe analysis indicated that, prior to drinking, adolescents who later drank 3-5 drinks expressed significantly greater choice in their activity than those adolescents who later drank six or more drinks ( $p < .05$ ). No significant differences in choice were found between the three dose groups at time 2.

In summary, the results of the changes in state analyses investigating dose effects indicated that adolescents who consumed six or more drinks within a five hour range perceived significantly greater changes in their feelings of stress and choice than those who consumed fewer drinks.

The morning after. Finally, this study sought to illustrate any potential "hangover" effects from alcohol by comparing adolescents' subjective state on mornings after drinking to mornings when they did not drink the day before.

To do this, the first report of each day was selected from those adolescents who reported drinking during the week ( $n = 51$ ) and, using grade, gender, and weekend/weekday status as control variables, a multilevel model using their previous night's behavior (drink/did not drink) as a predictor was tested for each of the mood variables. Out of the 75 drinking occasions reported, 66 (88%) were followed by a report by 1:00 p.m. the next day. Four (7.8%) of the 51 adolescents who reported drinking during the week failed to provide a report by 1:00 p.m. the next day. It was hypothesized that mornings following drinking episodes would be characterized by lower motivation as well as depressed moods.

Although the differences were in the expected direction for most variables, no significant main effects of the previous night's behavior emerged for any of the fourteen moods tested. For most of the mood variables (9 out of 14) a significant main effect of weekday/weekend status was present, with morning moods being more positive on weekends (results not shown). However, adolescents' moods on mornings following drinking episodes did interact with gender for two variables. First, a significant drank x gender interaction was indicated for adolescents' perception

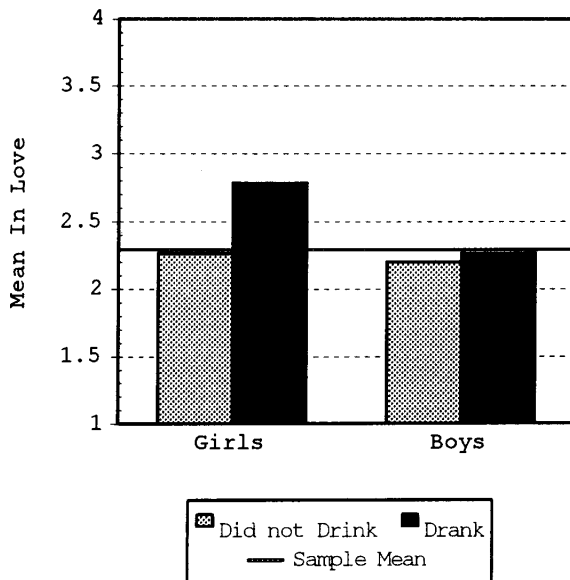
of others' friendliness,  $\chi^2 = 5.51$ ,  $p < .05$ . This relationship is presented in figure 20. This interaction was probed by selecting for gender in order to test for morning-after effects in boys and girls separately. The results of these analyses indicated that boys perceived others as being significantly less friendly on mornings after they drank ( $\underline{M} = 4.97$ ,  $\underline{SD} = 1.61$ ) than on mornings when they did not drink the night before ( $\underline{M} = 5.49$ ,  $\underline{SD} = 1.16$ ),  $\chi^2 = 4.97$ ,  $p < .05$ . Girls' perception of others' friendliness did not vary by their previous nights behavior. Second, a significant drank x gender interaction was indicated for adolescents' feelings of being in love,  $\chi^2 = 7.42$ ,  $p < .01$ , which is presented in figure 21. When this interaction was probed by selecting for gender, the results indicated that girls felt significantly more in love on mornings after they drank ( $\underline{M} = 2.78$ ,  $\underline{SD} = 1.15$ ) than on mornings when they did not drink the night before ( $\underline{M} = 2.26$ ,  $\underline{SD} = 1.07$ ),  $\chi^2 = 7.92$ ,  $p < .01$ . Boys' feelings of being in love did not vary by their previous nights behavior. When the number of drinks consumed on the previous night was entered into the multilevel model in lieu of the dichotomous drank/did not drink variable, only one significant main



Figure 20.  
 The Morning After: Perception of Others' Friendliness  
 by Previous Night's Drinking Behavior and Gender



Figure 21.  
 The Morning After: Feelings of Being In Love  
 by Previous Night's Drinking Behavior and Gender



effect emerged: The more drinks an adolescent reported having the night before, the less attractive they felt the following morning,  $\chi^2 = 5.05$ ,  $\beta = -.03$ ,  $\underline{SE} = .01$ ,  $\underline{p} < .05$ .

In summary, few morning-after effects were reported by these adolescents. Girls felt significantly more in love and boys perceived others' as being less friendly on mornings after they drank.

## CHAPTER IV

### DISCUSSION

Utilizing the Experience Sampling Method, this study presents a number of important findings: (a) The comparison of ESM- and questionnaire-derived indices of alcohol indicated, for the most part, a high level of agreement between the two types of measurement methods; (b) Data gathered on the incidence, quantity, and frequency of alcohol via a one-week time-sampling methodology closely mirrored trends evident in national survey samples; (c) Although alcohol use was primarily reported in only a few contexts, not all of these contexts were associated with an increased risk of use relative to the overall amount of time spent in them; (d) The relative risk of alcohol use in some contexts varied by adolescents' age; (e) While both boys and girls experienced times using alcohol as very positive compared to the rest of their experience, some gender differences emerged in this comparison; (f) The analysis of pairs of reports from adolescent drinkers and nondrinkers indicate that many of the experienced effects of alcohol may

be due to situational factors; (g) Adolescents who are heavier drinkers experienced more negative reinforcement from alcohol use; and (h) Adolescents' experience of the mornings after drinking differs little from other mornings when they did not drink the night before.

The discussion of the present study is divided into five parts. First, the results of the analyses are interpreted and related to previous research and the predicted results. The second part focuses on the application of the findings to several theories of adolescent alcohol use. Next, the findings of the current study are applied to adolescent alcohol prevention and treatment. The fourth section discusses the limitations of the current study and the last section provides directions for future research utilizing time-sampling to study adolescent alcohol use.

### Interpretation of Results

In order to organize the interpretation of the large number of analyses conducted, the findings of this study are discussed in the order established previously in the manuscript. Thus, the discussion begins with the interpretation of the results obtained in the comparison of ESM- to questionnaire-derived indices of alcohol use. Next,

the results of the analyses investigating grade and gender differences in alcohol use patterns are interpreted. The discussion then moves to findings regarding the contexts of adolescent alcohol use and ends with the interpretation of the results investigating the impact of alcohol on adolescents' mood states.

Questionnaire - ESM Comparison. While a number of studies have compared questionnaire measures of alcohol use to diary reports (Lemmens, Tan, & Knibbe, 1992; Webb, Redman, Sanson-Fisher, & Gibberd, 1990), this study presents the first systematic comparison of self-reports of alcohol use derived via questionnaire to those derived via time-sampling.

The results indicated that almost half of the adolescents who reported drinking at least once or twice a week on average on the questionnaire did not report drinking during the ESM sampling week. Although this may suggest either a failure to report use by these adolescents or a failure of ESM in capturing their drinking activity, previous research provides evidence that neither may be the case. Drinking behavior, unless one is completely abstinent, tends to vary widely over time (Dunham, 1983). In contrast to asking about behavior "on average" or within

a single finite period of time (e.g., 28 days), more recent alcohol use questionnaires take the variability of drinking patterns into consideration by asking respondents about quantity and frequency patterns over a number of different time periods (Dunham, 1983; Lemmens, et al., 1992; Webb, et al., 1990; Werch, 1990). Thus, given the high degree of intra-individual variation in alcohol use patterns and that the questionnaire used in the present study asked adolescents to report their "usual" behavior, the failure of some of these adolescents to provide reports of drinking during the ESM week is little cause to question the validity of either ESM or questionnaire methods. Moreover, because the questionnaire utilized in the current study asked adolescents about their use in general (and not about the week during which they were sampled) the two types of measurements must be considered qualitatively different.

When the ESM reports of adolescents who reported drinking during the week were compared to their questionnaire reports, the results indicated a high level of agreement between the two types of measures. In terms of the frequency of drinking, 85% of the adolescents' reports were in agreement. When comparing adolescents' reports of the greatest amount of alcohol ever consumed on one occasion by

measurement method, 75% of the adolescents who drank during the week reported consuming fewer beverages on their peak ESM occasion compared to their questionnaire report. This finding is not really surprising because one would not necessarily expect adolescents to match the greatest amount of drinks they had ever consumed in their lifetime during the ESM sampling week. However, the results investigating peak drinking also indicated that 25% of the adolescents had drunk as much (17%) or in excess (8%) of their reported lifetime high. This finding suggests that most adolescents usually drink below their peak levels, but some may routinely meet the greatest number of drinks they have ever had whenever they drink. When indices of the average number of drinks per occasion were compared, the questionnaire measure yielded a slightly larger, but not significantly different, number of drinks. This finding is consistent with those of Lemmens and colleagues (1992) who found that retrospective questionnaire reports of usual quantity were largely in agreement with those derived via a one week diary measure.

Finally, when grade and gender differences in the reporting of average number of drinks per occasion by method were assessed, it was found that younger boys and older

girls tended to overestimate their average number of drinks per occasion on the questionnaire measure while 12th grade boys' underestimated their drinking on the questionnaire. Because older boys reported consuming significantly more drinks per occasion than the rest of the drinkers in this study, this finding suggests that heavier drinkers may underreport their average number of drinks per occasion on questionnaire measures. Although preliminary, this result is consistent with Hochhauser's (1979) assertion that demand characteristics, underreporting, and forgetting in drug abuse survey research varies by the extent of use and suggests that studies that rely solely upon retrospective measures of usual quantity may be subject to underreporting by those who use the most.

In summary, as the first systematic comparison of alcohol use measures derived via time-sampling and by questionnaire, these analyses make a number of important contributions to the field of alcohol use measurement. First and foremost, they establish that a generally high level of agreement exists between ESM- and questionnaire-based measures of alcohol use methods. Second, the results suggest that roughly a quarter of adolescent alcohol users routinely meet the greatest number of drinks they have ever



had whenever they drink. Finally, the results indicate that the accuracy of questionnaire reports of the amount of alcohol typically used varies by both age and gender -- a finding with important implications for studies that rely solely on questionnaire measures of alcohol use.

Alcohol Use. The examination of grade and gender differences in the incidence, frequency, and intensity of adolescents' alcohol use yielded findings largely consistent with the predicted relationships (i.e., boys and older adolescents would report higher levels of each).

In agreement with previous research on developmental trends in alcohol use (Johnston, O'Malley, & Bachman, 1993; Martin and Pritchard, 1991; Newcomb and McGee, 1989; Oetting & Beauvais, 1990; Pandina, 1986), this study found that older adolescents were more likely than younger adolescents to report a drinking episode during the ESM sampling week. Compared to adolescents in the ninth grade (10% of whom reported drinking), the proportion of adolescents who reported drinking was over twice as large for 10th graders (23%), and three times as large for adolescents in the 11th and 12th grade (31% & 29%, respectively). Although the time frames studied were different, these proportions closely mirror incidence rates found in a recent national survey

asking students about their use in the past two weeks (Johnston, O'Malley, & Bachman, 1993). However, contrary to previous research which indicates that boys start drinking at an earlier age (Beck & Summons, 1987b), no gender differences were found in the incidence of use during the ESM sampling week. Although boys may have an earlier age of onset, a review of the literature by Pandina (1986) indicates that the majority of adolescents (both boys and girls) have used alcohol at least once by the time they are 13 years of age -- the youngest age group in our sample. Thus, the failure of the current study to find gender differences in the incidence of use during the week may be related to the age of the current sample.

Based upon numerous studies (Martin & Pritchard, 1991; Newcomb and McGee, 1989; Oetting & Beauvais, 1990; O'Hare, 1990), the expected grade and gender differences in the frequency of drinking (i.e., number of occasions) met little support. Although girls were more likely than not to report only one drinking episode, no significant grade or gender differences in the number of drinking occasions emerged. While the majority of adolescents (63%) reported drinking on only one occasion during the week, a substantial proportion

(37%) of adolescents reported drinking on more than one day of the sampling week.

Although recent survey research has found that a small percentage of high school seniors are alcohol dependent and drink on a daily basis (Johnston, et al., 1993), no adolescents in this study reported drinking on a daily basis during the sampling week. One possible explanation for this finding is that adolescents who are severely dependent on alcohol are probably unlikely to participate in a study that utilizes a demanding methodology, such as ESM. This, and other sampling issues, will be explored further when the limitations of the current study are discussed.

When the intensity of adolescents' drinking was investigated, the results clearly indicated both grade and gender differences in the predicted direction. Boys in the 12th grade reported an average number of drinks per occasion which was over twice that reported by younger boys and three times as great as older girls. In terms of peak drinking (i.e., the greatest number of drinks consumed on one occasion), older boys reported consuming nearly three times as much as older girls. Finally, when the total number of drinks consumed during the week was considered, boys reported consuming almost twice as much as girls. These

results are consistent with the bulk of research which indicates that older boys drink with greater intensity than the rest of their peers (e.g., Martin & Pritchard, 1991; O'Hare, 1990). Compared to a recent national sample, the adolescents in this study, especially the older boys, may drink more intensely. While the annual national survey of high school seniors conducted by the University of Michigan (1991) indicated that almost a third of the graduating class of 1990 reported drinking five or more drinks in a sitting during the previous two weeks, almost 45% of the adolescents in this study who reported drinking during the ESM week averaged five or more drinks per occasion.

Some recent research has suggested that the established gender gap in alcohol consumption is narrowing because of a reported increase in both the frequency and intensity of drinking by female adolescents (Jenson, et al., 1995; Midanik & Clark, 1994). However, the results of the current study suggest that this may be true only in terms of whether or not and how often they drink. Although no significant gender differences emerged in the incidence and frequency of drinking, the results of this study clearly indicate that boys, especially those in the 12th grade, drank with greater intensity. Research suggests that these gender differences

in the intensity of drinking may be attributable to different norms and expectations for young men and women (Carmen and Holmgren, 1986) as well as the extent that gender-roles are internalized (Huselid & Cooper, 1992).

In summary, while no other studies have utilized time-sampling techniques to investigate grade and gender differences in adolescent alcohol use patterns, the results of the current study suggest a pattern which is largely consistent with questionnaire-based research. Older adolescents were more likely to report drinking during the week, and older boys reported drinking with greater intensity. Finally, the results indicate that adolescent girls are just as likely to drink as boys, but consume less alcohol when they do drink.

Contextual Patterns. The analysis of the contextual patterns of alcohol use yielded a number of significant findings consistent with previous research and also provided new evidence of developmental differences in the contexts of adolescent alcohol use. Additionally, the results of the multilevel analyses provide new data on the relative risk of adolescent drinking in different contexts.

As predicted, the majority of the reports of alcohol use occurred during evening hours. This finding is

consistent with previous research utilizing a retrospective questionnaire (Kouzis and Labouvie, 1992) and with Larson's ESM investigation (Larson, et al., 1984). Moreover, the multilevel analysis indicated that evening hours were associated with a significantly higher proportion of reports of drinking than that reported during daytime hours. Thus, compared to daytime hours, the adolescents in this study were significantly more likely to drink during the evening.

In contrast to the findings of Kouzis and Labouvie (1992) and those of Larson (Larson, et al., 1984) which indicate that the majority of adolescent alcohol use occurs during the weekend, the results of this study indicate that almost half of the reports of alcohol use occurred during weekdays. However, Kouzis and Labouvie (1992) asked their respondents to report times they thought were appropriate for drinking, not the times that they actually drank. Taken in conjunction with the results of the current study this suggests that, while adolescents may not approve of drinking during weekdays, a large percentage of adolescent drinking occurs during this time. Compared to Larson's earlier ESM study of adolescent drinkers (which found that roughly 14% of adolescents' reports of drinking occurred during the

weekday) the percentage of reports of alcohol use during the weekday in the current study was over three times as large. This discrepancy, which appeared despite the use of nearly identical methodologies in the two studies, might be explained by the fact that the samples employed in each study may have differed in unmeasured characteristics related to the probability of weekday drinking such as access to alcohol at home and after-school parental monitoring (Harford & Spiegler, 1983; Milgram, 1982).

As expected based upon prior research (Harford, et al., 1983; Harford & Grant, 1987; Kouzis and Labouvie, 1992; Larson, et al., 1984), almost all of the drinking reported by these adolescents took place at either their own, or a friend's home. Even though a large percentage of reports of use occurred while adolescents were home, the multilevel analysis indicated that this context was not associated with a higher risk for use than other contexts. However, when the adolescents in this study were at a friend's home, they reported drinking almost a third of the time.

The investigation of the social contexts of adolescent alcohol use also yielded findings essentially consistent with earlier research investigating companionship during alcohol use (Harford & Grant, 1987; Larson, et al., 1984)

and the importance of alcohol-using friends as a correlate of use (Dielman, et al., 1991; Dielman, et al., 1993; Peterson et al., 1994). Most adolescents reported drinking with other people and well over half of the of the reports occurred while adolescents were with their peers (i.e., both friends and boy/girlfriend). Although a large percentage of their reports occurred when they were with their friends, the multilevel analyses indicated that being with friends was only associated with a greater likelihood of drinking for older adolescents. However, adolescents were nearly five times as likely to report drinking when they were with their boyfriend or girlfriend than when were not. Moreover, almost a fifth of the time these adolescents spent with their partner included drinking alcohol. Although in contrast to the findings of Harford's study of college-age students (which indicated that being in a relationship was associated with decreased levels of use), this result suggests that, for some adolescents, alcohol use plays a major role in their early heterosocial relationships.

The multilevel analyses also indicated a number of developmental differences in the relative risks of alcohol consumption in different contexts. Younger adolescents were roughly twice as likely to report drinking on weekdays and



without their friends than older adolescents, while older adolescents were almost three times more likely to report drinking with their friends than younger adolescents. These findings add an important contribution to our current understanding of the development of alcohol use by providing evidence, consistent with that of Bauman (Bauman & Ennett, 1994; Fisher & Bauman, 1988), that alcohol use in adolescence may begin prior to exposure to situational peer "pressure" and that, as adolescents get older, they naturally gravitate into peer groups in which drinking alcohol plays an important role.

In summary, these results expand upon what is already known about the contexts of adolescent alcohol use. Similar to previous research, adolescents reported using alcohol primarily in the evening, with their peers, and either at home or at a friend's home. However, in contrast to previous findings (i.e., Kouzis and Labouvie, 1992; Larson, et al., 1984), the results of the current study indicate that adolescents are just as likely to drink on weekdays as weekends. Finally, the use of multilevel modeling to assess the relative risk of alcohol use in different contexts provides a unique perspective on the contexts of adolescent alcohol use. Importantly, these analyses identify several

developmental differences in the contexts of alcohol use that suggest that alcohol use begins prior to exposure to situational peer pressure and evolves into an important aspect of peer relations.

Impact on Mood. Consistent with Larson's previous work (Larson, et al., 1984), the findings of this study indicated that, compared to the rest of their experience, the times when these adolescents reported drinking were experienced as significantly more positive for 13 of the 14 mood variables (arousal being the exception). For these adolescents, alcohol use was experienced as period of increased sociability, excitement, and motivation for their current activity. Moreover, when these adolescents' experience of drinking was compared to their other discretionary time (by omitting comparisons to when they were at school or work), virtually identical differences were found. These findings add to our understanding of an earlier study (Crowe, et al., 1997) which indicated that greater involvement with alcohol, while unrelated to adolescents' overall daily mood states, was associated with greater variability of mood across different contexts and negative moods when alone and with family by providing evidence that it is the experience of alcohol use which elevates these adolescents' experience

and eliminates differences between drinkers and nondrinkers in their average moods states. This suggests that poor emotional experiences while with family and when alone may serve as motivating factors in adolescent alcohol consumption. Moreover, because the experience of alcohol use is so positive, the motivation to continue using it is likely very strong.

Research on adolescents' alcohol expectancies suggests that gender differences in the experience of alcohol use might be found within hedonic tone or the experience of personal pleasure (Brown, 1990). To some extent, this was supported; When adolescents' experience of alcohol use was compared to their overall experience, only girls reported significantly higher affect, feeling more great, and more important when drinking. However, as the experience which was compared to alcohol use became more selective (by eliminating nondiscretionary time from the analyses) these gender differences all but disappeared. The important implication of this pattern of findings is that:

- (a) adolescents compare alcohol use to the rest of their experience when asked to describe its effects, and
- (b) gender differences in alcohol expectancies may not be related to the actual experience of use, but may simply be

an artifact of gender differences in the experience of non-discretionary time. This, and other implications of this pattern of findings for expectancy theory, are discussed at a later point.

In this study, the most stringent test of the effect of alcohol on adolescents' moods involved pairs of reports drawn from weekend afternoons and evenings. These analyses provided a snapshot of adolescent drinkers' movement from a nondrinking to a drinking situation and compared it to similar times provided by abstainers and nonactive drinkers. Importantly, the preponderance of moods which were significant in the multilevel mood analyses (which investigated differences between drinking states and overall moods) was not found here. For many of the moods, a main effect of time and/or a significant peer companionship covariate emerged with no interaction between drinking group and time present. This suggests that many of the reported effects attributed to alcohol may really be due to situational factors, such as time or companionship associated with use, which serve as a signal for conviviality and merriment-- a position maintained by a number of theorists (Heath, 1990).

Still, active drinkers changed differentially over time from other adolescents on four mood variables. The finding that only younger adolescents drinkers reported an increase in feeling accepted as they started drinking suggests that, compared to older drinkers, they may: (a) actually receive more social reinforcement from drinking; (b) perceive alcohol use as engendering more social approval; or (c) feel empowered by alcohol to be more social and active in their relationships, or any combination of these. Older adolescent drinkers, on the other hand, experienced an increase in their feelings of choice when they start drinking. This finding somewhat supports Jessor's (1977) assertion that drinking behavior serves as a claim to adult status. Rather than being concerned about others' acceptance older adolescents, similar to adults, may tend to view their drinking more as a matter of personal choice.

Consistent with Larson (Larson et al., 1984), the analysis of the weekend pairs also indicated that only active drinkers reported a significant increase in both affect and their perception of others' friendliness. Although not a focus of the current analysis and not supported by univariate probes, the figures representing the interactions between drinking groups and changes in state

(figures 14-17) suggest a stress-negative affect model of adolescent alcohol use because the active drinkers' moods at time 1 (i.e., prior to drinking) appear to be somewhat lower than their abstaining and not-actively- drinking peers. In these models, alcohol use is seen as an attempt to alleviate negative affect resulting from possible stressful experiences (Colder & Chassin, 1993; Cooper, Frone, Russell, & Mudar, 1995; Hussong & Chassin, 1994; Tschenn, Adler, Irwin, Millstein, Turner, & Kegeles, 1994; Wagner, 1993). Future research utilizing ESM to test this position would be better served by employing lag designs to study the immediate emotional precursors to consuming alcohol (e.g., Brown & Moskowitz, 1997).

Regardless of the analytic technique employed, one mood construct that was significantly associated with alcohol use was sociability. The enhancement of sociability by using alcohol has been described in song and story for centuries (Heath, 1990). Moreover, alcohol expectancy research indicates that among adolescents and college students the enhancement of social and physical pleasure is seen as the primary expected effect of alcohol (Brown et al., 1980; Christiansen, et al., 1982). Recent research suggests that

many adolescents, especially those heavily involved in alcohol use, may consume alcohol to compensate for poor social skills (Hover & Gaffney, 1991).

The results of the analysis of dose-effects among those adolescents who reported drinking during the week are consistent with stress-negative affect models and research which indicates that adolescents who drink for negative reinforcement and/or coping tend to drink more excessively than their peers (Elman & Offer, 1993; Jones, 1968, 1971). In both the multilevel and repeated-measures analysis of dose effects, heavier drinkers reported a greater impact of drinking on stress than those who drank less. Moreover, adolescents who drank greater amounts of alcohol also reported that they were more highly motivated to be engaged in activities involving alcohol use than other drinkers. Thus, the results of this study indicate that adolescents who drink large amount of alcohol: (a) report feeling less stress when drinking; (b) experience a greater reduction in stress when going from a non-drinking to a drinking state; (c) view activities involving alcohol consumption as more important; and (d) experience more positive increases in their feelings of choice when they go from a non-drinking to a drinking state relative to their peers who consumed

less alcohol. These findings are consistent with recent research on the stress-negative affect model of adolescent alcohol use (Colder & Chassin, 1993; Cooper, et al., 1995; Elman & Offer, 1993; Hussong & Chassin, 1994; Tschenn, et al., 1994) and suggest that drinking for negative reinforcement is related to abusive drinking patterns among adolescents. Moreover, Conger's (1951, 1956) classic tension-reduction theory of alcoholic drinking suggests that adolescents who drink for (and receive) negative reinforcement from alcohol are more likely to develop into problem drinkers and alcoholics. However, in order to fully test this hypothesis, longitudinal designs linking early drinking experiences with adult drinking patterns would need to be employed.

According to Kaminski (1992) the alcohol hangover is marked by headaches, nausea, thirst, fatigue, anxiety, and general malaise. However the final set of analyses, which investigated the impact of alcohol on adolescents' mood states on mornings after they had consumed alcohol, provided scant evidence that adolescents experience mornings after drinking as different from mornings when they did not drink the night before. A number of interpretations of this lack of results can be offered. First, some experts in the field



believe that the hangover is a symptom of an early alcohol withdrawal syndrome (Ray & Ksir, 1993). Thus, adolescents who have not been drinking to the extent of developing tolerance to alcohol may experience fewer symptoms of the hangover. Second, the amount of alcohol typically consumed by these adolescents may not have been sufficient to cause a hangover; although some adolescents drank quite a large number of drinks, the average number of drinks per occasion consumed by these adolescents was less than six drinks. Third, the criteria for inclusion in the analysis (i.e., they must have made their first report of the day after drinking by 1:00 p.m.) may have excluded those adolescents who were experiencing the greatest hangover effects. While only 12% of all the drinking occasions were not followed by morning after reports, one can certainly imagine that the degree of hangover adolescents experienced would influence their willingness to respond. This and other potential influences of the demands ESM places on participants are discussed at a later point. Finally, the results of this study suggest that the impact of a hangover on adolescents' mood may be moderated by other factors. The significance of the weekday/weekend covariate these adolescents' morning moods suggest that the adolescents' experience of a hangover

may vary by whether or not they have to attend school that day. Thus, the responsibilities that adolescents have on a day after drinking may moderate their experience of a hangover. Interestingly, adolescent girls felt significantly more in love on mornings after they drank compared to mornings when they did not drink the night before. This result suggests that the impact of a hangover on adolescents' moods may be moderated by reminiscing about the previous night's enjoyment and implies that cognitive factors play an important role in not only the perceived costs of alcohol use (Cox & Klinger, 1988, 1990) but also in the experienced costs of alcohol use.

In summary, the use of a time-sampling methodology in the present study provides unique data on adolescents' experience of alcohol use. The multilevel analyses indicate that, compared to the rest of their daily lives and even to other discretionary time, adolescents' experience of alcohol use is emotionally very positive and is characterized by feelings of enhanced sociability, elevated romantic feelings, reduced stress, personal enjoyment, and positive motivation. However, the analysis of pairs of reports drawn from their weekend suggest that many of these effects may be due to situational factors. In addition, the analysis of

dose effects provides compelling new evidence in support of stress-negative affect models of alcohol use. Finally, the lack of hangover effects from alcohol reported by these adolescents provides important new evidence on adolescents' experience of the costs of alcohol use. The impact of this finding on alcohol prevention efforts will be further discussed in a later section.

### Application to Theory

In terms of application to existing theories of adolescent alcohol use, the results of this investigation into the subjective experience of active alcohol use may have greatest impact on our understanding of alcohol expectancy theory (Christiansen, et al., 1982; Brown, et al., 1987; Brown, 1985; Lang & Michalec, 1990) and reciprocal theories of substance use such as the theory of triadic influence (Flay & Petraitis, 1994; Petraitis, Flay, & Miller, 1995).

Expectancy theory. Previous research on adolescents' expectations of the effects of alcohol was used to select the various mood constructs employed in the current study on the basis that one's expectancies of alcohol's effects reflect one's experience of use (Lang & Michalec, 1990). Based upon a large body of literature (e.g., Christiansen,

et al., 1982; DeWitt et al., 1987, 1989; Fromme, et al., 1993; Johnson & Fromme, 1994; Leigh, 1987), it was expected that times using alcohol would be experienced as more positive than other times. Additionally, based upon Brown's (1990) work on gender differences in adolescent alcohol expectancies, it was expected that girls would report greater increases in hedonic tone while drinking than boys.

When adolescents' experience of alcohol use was compared to their rest of their experience (including non-discretionary time), the hypothesized differences in moods were found and the results supported the proposed gender differences in the experience of hedonic tone. In addition, the findings regarding motivation suggest that positive motivation while drinking is an important experiential factor which has not been represented in previous expectancy questionnaires. However, when the comparison times were changed by excluding non-discretionary time from the analysis, the gender differences in the experience of alcohol use all but disappeared. Moreover, when the analysis of the impact of alcohol was made even more stringent by using pairs of reports drawn from the adolescents' weekend, the results showed a much more restricted impact of alcohol.

The changing pattern of significance in this series of analyses suggests an important implication for the study of adolescent alcohol expectancies: it implies that when adolescents respond to questions about the effects of alcohol, they may be doing so in comparison to the rest of their daily experience and not describing what they expect from alcohol *per se*. Moreover, the weekend analysis (although limited in that it does not address weekday drinking) suggests that many of the effects attributed to alcohol by adolescents may be due to characteristics of the situations surrounding alcohol use -- often on the weekend, and usually with peers. This interpretation is consistent with Delespaul's (1995) position on the risk of aggregation bias when employing retrospective questionnaires and suggests that alcohol expectancy questionnaires reflect, at best, only a generalized memory of the experience of alcohol in relation to the rest of experience and not the actual impact of alcohol *per se* on adolescents' moods. Thus, by measuring behavior as it occurs in the natural environment, ESM provides an important tool for research on the subjective experience of adolescent alcohol use.

What this interpretation implies is that these alcohol expectancy questionnaires, in addition to including dose-

response type measures as suggested by Fromme (Fromme, et al., 1993) should also routinely: (a) ask adolescents to differentiate between the effects of alcohol and the impact of situations surrounding alcohol use and/or (b) ask adolescents to describe the expected effects of alcohol within different social and temporal situations. For example, expectancy questionnaires could easily ask adolescents to differentiate between the experience of drinking alone and drinking at a party.

Theory of Triadic Influence. Most of the research on adolescent alcohol use has focused on it as an outcome variable. However, there is a growing understanding in the field that alcohol use is not just an outcome variable of intrapersonal, interpersonal, and environmental factors such as expectations, parent-child relationships, and peer support for use, but is part of a reciprocal system that feeds back to and influences predictors of use which, in turn, influence later decisions to drink (Flay & Petraitis, 1994). The Theory of Triadic Influence (TTI; Flay & Petraitis, 1994; Petraitis, et al., 1995) is one of the first theories of adolescent health behaviors to suggest such feedback loops between alcohol use and predictors of use.

While TTI suggests that it is important to understand the reciprocal relationship between alcohol consumption and predictors of use, this area has little information on what the actual experience of use entails. In conjunction with Larson's earlier work (Larson, et al. 1984), this study has helped to broaden our understanding of the adolescents' experience of alcohol use -- an understanding which is necessary to interpret any reciprocal relationship between use and predictors of use.

When we relate the findings of this study to factors known (but not tested in the current study) to be related to use, the nature of the impact of alcohol use on predictors of use becomes clearer. In general, this study indicates that the experience of alcohol use is very positive for these adolescents and very few negative effects on mood were experienced on the day(s) after drinking. This type of drinking experience would likely reinforce positive and reduce negative alcohol expectancies, both of which have been found to predict drinking (Bauman, et al., 1985; Brown et al., 1987). The analysis of pairs of reports drawn from the weekend suggest that younger adolescents (who reported feeling significantly more accepted when drinking) would be more susceptible to social approval in future decisions to

drink, while older adolescents (who reported significant increases in their feelings of choice) may be seen as reinforcing feelings surrounding adolescent claims to adult status (Jessor, 1987).

Finally the investigation of hangover effects suggests that, in addition to active experience, the consequences of use may feedback to prior predictors. An abundance of research indicates that poor parent-child relationships are related to adolescent alcohol use (Barnea, et al., 1992; Martin & Pritchard, 1991; Protinsky & Shilts, 1990). In our study, adolescent boys perceived others (presumably their parents) as being less friendly towards them on mornings after they drank than on mornings when they had not drunk the night before. Regardless whether this is only their perception or if their parents are actually being less friendly to them, the parent-child relationship has been strained by their drinking. This may, in turn, increase the likelihood of future alcohol consumption by these adolescents.

#### Application to Prevention and Treatment

In addition to theory, the results of this study are also applicable to the prevention and treatment of adolescent alcohol use. First and foremost, the multilevel



analysis of adolescents' moods speaks to the difficulty of preventing adolescent alcohol use once it is initiated (i.e., secondary prevention). Compared to the rest of their daily lives and even their other discretionary time, times which adolescents drank were experienced as very positive and reinforcing. Importantly however, the analysis of pairs of reports from the weekend (which compared active drinkers to abstainers and nonactive drinkers) indicates a much more restricted effect of alcohol on mood states, given comparable times and companionship. This suggests that prevention techniques which focus on alternatives to drinking may succeed by providing activities/situations that provide a comparable impact on mood. Future research, via employing ESM, can assist in identifying circumstances under which adolescent drinkers experience mood elevation similar to that of alcohol use.

By identifying the contexts in which adolescent alcohol use takes place and the relative risk of use in different contexts, we are better informed to prevent it. For example, the results of this study indicate that almost 30% of the time these adolescents spent at their friend's home and almost 20% of the time they spent with their boyfriend or girlfriend involved consuming alcohol.

In agreement with other research (Arnett 1992a; Arnett & Balle-Jensen, 1993; Dishion, Capaldi, Spracklen, & Li, 1995), the results of the current study indicate that the majority of adolescent alcohol use occurs in a context of low parental monitoring: when adolescents reported drinking at home (which constituted 37% of their use reports), their parents were present less than a fifth of the time.

Assuming a similar situation when adolescents are at a friend's home, this suggests that the majority of adolescent use takes place outside the presence of adults. Thus, parents interested in minimizing their adolescent's alcohol use should not only monitor their child at home, but make sure that when their child visits a friend's home that the parent(s) of the friend is also present. As suggested by previous research, this may be facilitated by parent-to-parent communication via an informal network (Johnson, Bryant, Strader, & Bucholtz, 1996; Rohrbach, Hodgson, Broder, & Montgomery, 1994).

While making the positive effects of alcohol less salient and the negative impact of alcohol more salient is often a component of cognitive-affective based prevention strategies [for example, Janz & Becker's (1984) Health Belief Model], the results of this study suggest that

prevention techniques which emphasize the negative impact of alcohol use on adolescents' mood the next day may be misguided. For whichever of the reasons that were suggested previously, there was little evidence that adolescents in the present study experienced any deleterious effects of alcohol on their mood on mornings after they consumed alcohol. This inconsistency with their experience may make adolescent drinkers less receptive to other prevention messages (Petraitis, et al., 1995). Thus, while questionnaire research indicates that adolescent drinkers may perceive alcohol hangovers as less likely for themselves than for others (Leigh, 1987), ESM provides unique evidence that adolescent drinkers actually do not experience pronounced hangover effects on their mood.

Harm-reduction models of alcohol prevention acknowledge that adolescent experimentation with alcohol is almost inevitable (Marlatt, Larimer, Baer, & Quigley, 1993). In an effort to reduce the damage associated with excessive alcohol use, proponents of this model seek to encourage adolescents to consume alcohol moderately and responsibly when they drink (Marlatt, et al., 1993). The results of the current study support this approach in that we found the majority of the positive effects of alcohol on mood

experienced by adolescents are not dose related. Thus, our results indicate that adolescents may be able to enjoy the reported benefits of alcohol consumption without drinking to dangerous excess. The implication of this is that, rather than telling adolescents not to drink alcohol, we should ask them that when (and if) they drink to do so in a moderate and responsible fashion. Although somewhat controversial, this approach may help to minimize damage caused by adolescent alcohol consumption (Marlatt, et al., 1993).

Teaching adolescents to drink responsibly may be related to parental behavior and attitudes which, in turn, are often culturally bound. For example, in a broad review of British research on adolescent alcohol use, Sharp and Lowe (1989) concluded that many British parents introduce their children to alcohol and that these adolescents generally exhibit safer drinking habits (i.e., less binge drinking and driving under the influence) than their peers who were either: (a) provided with a poor parental model of alcohol use (i.e., alcohol-abusing parents), (b) encouraged to drink as a sign of adulthood, or (c) were not taught about drinking alcohol whatsoever by their parents. Thus, in the United States, both law and cultural attitudes regarding alcohol use by youth may actually contribute to

abusive drinking patterns. Age-restrictions on alcohol use may contribute to adolescents' (and parents') perception of alcohol use as sign of adult status (Jessor, 1987) while intolerant views about adolescent alcohol consumption may impede potentially useful dialogue (Buhringer, 1995).

Finally, this study demonstrates the potential utility of ESM as clinical tool in the treatment of adolescent alcohol abuse. By using ESM, clinicians may be able to: (a) receive a more accurate (than diary or interview) report of their client's alcohol consumption over a target week; (b) identify situational and emotional precursors to drinking by their clients; and (c) identify other non-drinking times in which their client reports mood elevations similar to that experienced under the influence of alcohol which, in turn, can be suggested as suitable and desirable alternatives to drinking (Donner, 1992).

#### Limitations of Current Study

While this study presents a number of new and important findings made possible through ESM, it is also characterized by a number of limitations that warrant examination. For discussion, these limitations are organized into factors affecting the external and internal validity of the results.

While sampling in the natural environment provides data that is clearly more externally valid than that derived from contrived laboratory techniques, the generality of the results of the current study may still be limited in a number of important ways. These limitations are primarily due to: (a) the homogeneity of the sample and (b) the intensive data collection procedures of ESM. First, the appropriateness of generalizing the results from the current sample of Caucasian, middle-class, high-school-age adolescents to adolescents of other ethnic, socioeconomic, and age groups is uncertain. For example, both theory (Hirschi, 1969) and research (West & Sutker, 1990) suggest that alcohol consumption among more economically-deprived youth may revolve more around the negative reinforcing effects of alcohol due to the presence of greater stress in their day-to-day lives. The paucity of developmental differences in the experience of alcohol use found in the current study may be related to the restricted age group that was studied. Although previous research suggests that younger and older adolescents expect to experience alcohol somewhat differently, these differences essentially vanish past the age of 14 when most adolescents have already had some experience with the drug (Christiansen, et al., 1980,

1985). Thus, the impact that alcohol use displayed on the mood of these high-school age adolescents may not accurately generalize to early or primary experiences with alcohol.

As noted by a number of researchers, studies utilizing intensive time-sampling techniques such as ESM place a great demand on their participants (Hormuth, 1986; Larson & Csikszentmihalyi, 1983; Stone, Kessler, & Haythornthwaite, 1991). Not surprisingly, the use of this methodology may subject the current study to limits of generality. For example, it is not hard to imagine that extremely heavy users of alcohol would be less likely to volunteer and participate in a study utilizing ESM -- an idea put forward by Larson in 1984 (Larson, et al., 1984). Thus, the results of this study may not apply to adolescents who are highly involved with alcohol.

Because the goal of ESM is rich descriptions of experiences in naturalistic environments and participants are allowed to self-select their environments, studies utilizing ESM are not generally characterized by a high degree of internal validity typically found in more controlled laboratory studies (Larson & Delespaul, 1992). While admitting this general limitation, a number of

specific threats to the validity of this study's results deserve particular mention.

First, a small percentage of adolescents who drank during the week provided no reports while they were actively drinking but reported their use only after the occasion was over (either when they returned home or on the morning after drinking). The reasons for their nonreporting are unknown, but may certainly be related to their experience of alcohol use. For example, these adolescents may have been too intoxicated to respond or, perhaps because of the importance of their drinking occasions to them, purposefully neglected to respond to or carry their signal device. Thus, within the current sample of adolescents, the experience of retrospective reporters of alcohol use may have differed systematically from those who provided active reports. Moreover, there is a possibility that some adolescents drank during the week but failed to even retrospectively report their use. While the comparison of ESM data to their questionnaire reports of alcohol use may support this notion (almost half of the adolescents who reported drinking at least once or twice a week on average on the questionnaire did not report drinking whatsoever during the ESM sampling week), the variability evident in drinking patterns makes it



difficult to be confident in this conclusion (Dunham, 1983). Still, like those adolescents who provided retrospective reports, one can imagine that the experience of alcohol use among those who failed to report use was systematically different from that of adolescents who supplied reports.

Another issue that may impact upon the validity of the mood findings is the notion of concurrent use of other substances. Although the ESM self-report form asked adolescents to report their drug use, only four adolescents in the current study reported using any other drug while drinking. While this may be the case, research indicates that many adolescent drinkers also use other drugs, especially illicit substances such as marijuana and cocaine (Jessor, 1987; Johnston et al., 1994). Moreover, many drugs may interact with alcohol in either an additive or synergistic fashion. Thus, if a substantial proportion of the adolescents in the study were using other drugs while drinking and failed to report this, the clarity of alcohol's impact on adolescents' moods would be compromised.

Some may suggest that, due to the effects of alcohol, asking adolescents to describe their experience of alcohol use while they are actively using results in inaccurate reports. However, unless an adolescent was intoxicated to

the point of being unable to write, this is unlikely. A wealth of research has successfully utilized self-reports to describe subjective reactions to alcohol consumption (DeWitt, et al., 1989, 1987; Lang & Michalec, 1990). A more important concern is the veracity of the adolescents' reports of use. Although each individual report of alcohol use was screened by the investigator in order to assess its validity, there is still a possibility that some of these adolescents provided spurious reports. This may be especially true in terms of the number of drinks consumed; one can certainly image that some adolescents (most likely males) might inflate the number of drinks they consumed while others (likely females) might underreport the number of drinks. Moreover, the accuracy of adolescents' recall of the amount they consumed would likely vary as a function of the number of drinks they actually have had and the length of time since they last reported.

Related to this, a final constraint on the validity of the current results involves the issue of alcohol dosage and the inability of the current study to even roughly estimate blood alcohol levels (BAL). This problem is due to both the way alcohol consumption was measured on the self-report form and the variability of delay between stimulus signals. The

SRF asked adolescents how many alcoholic beverages they had consumed since the last signal -- a time-frame varying widely both within and between adolescents and exacerbated by missed reports. One possible solution to this would be to divide the number of drinks an adolescent reported consuming by the interval of time since their last response. Even then however, adolescents' rate of consumption (a factor closely related to BALs) was free to vary. Moreover, additional factors which impact upon BALs (such as a participants' weight) were not considered. Because of these reasons, the findings regarding dose must be considered preliminary. Suggestions to improve this and other aspects of the current ESM design for the study of adolescent alcohol use are provided in the next and final section.

#### Direction for Future Research

Although this study may have a number of limitations, it clearly demonstrates that time-sampling methodologies such as ESM can be utilized to study adolescent alcohol use and can provide unique findings that help us to better understand the contextual and emotional adjuncts of that behavior. This section first discusses ways in which the design of this study could be modified to better realize this goal and then suggests a number of important questions

about adolescent alcohol use that ESM can help to address in the future.

Perhaps because the data from the current study were not collected with the sole purpose of investigating alcohol use, a number of improvements upon the current design could be made for future research. The author's suggestions for improvement fall under four larger areas: the sampling of alcohol use; the self-report form; supplemental field data; and additional retrospective questionnaires.

One of the primary limitations of the current study was that some adolescent drinkers failed to report while they were using alcohol. Although some of these missed reports may have been so on purpose, if the drinking occasion was of short duration it could easily have been missed by the sampling schedule. Thus it is suggested that, in addition to utilizing time-sampling, research which seeks to explore the subjective experience of alcohol use in natural environments should also employ event sampling. By asking adolescents to report each time they consume a drink, a much more accurate estimate of their use would be derived (Stone, et al. 1991). While this might place an even greater demand on participants, the event report form could be simplified to reduce its impact.

Another way in which the current study could be improved upon is the items included on the self-report form. As noted by Hormuth (1986) item selection for the SRF should be based upon the subject of interest and the goals of the research. While the available SRF items were able to be adequately mapped upon factors identified by expectancy literature, they were not chosen with alcohol use specifically in mind and could have been more appropriate. Specifically, no subjective physiological responses associated with alcohol were included. These responses include such factors as numbness, warmth, dizziness, and impaired motor/speech control (Maisto, Connors, Tucker, & McCollam, 1980). Research suggests that these responses are an important aspect of the subjective experience of alcohol use and that may be related the affective experience of alcohol use (Strizke, Lang, & Patrick, 1996). Thus, it would behoove future research to include such items on the SRF.

In order to assess both the accuracy and veracity of adolescents' reports of alcohol use and to more accurately explore the relationship between dose and experience, the use of compact and inexpensive breathalyzers in conjunction with the ESM or event sampling procedure could prove very

useful. While doing this may add to the demand placed upon participants, a number of studies using ESM-type procedures have successfully integrated physiological measures (Donner, 1985; Hoover, 1983; Hoover, 1984).

Additionally, the current design could be enhanced with the inclusion of at least two additional types of retrospective questionnaires. First, a 7-day retrospective diary measure of alcohol use, as employed by Webb (Webb et al., 1990), would be very useful in assessing the accuracy of adolescents recall about their alcohol use. Second, an alcohol expectancy questionnaire, such as the AEQ-A (Christiansen, Goldman, & Inn, 1982) or CEOA (Fromme, Stoop, & Kaplan, 1993) could be administered before and after the ESM sampling week. This would not only enable researchers to more accurately examine the relationship between expected and experienced effects, but would also allow investigators to determine whether adolescents' alcohol expectancies are modified by their recent drinking and help determine the veracity of their reports of use.

In conclusion, the findings presented in this study, while providing evidence for the utility of employing ESM to study alcohol use, represent a small portion of the important questions concerning adolescent alcohol use that

ESM may help address. Future studies can and should investigate whether the experience of alcohol use varies by such factors as the extent of alcohol involvement, parental alcohol use, ethnicity, and culture. For example, adolescents living in an impoverished or oppressive environment might be more likely to drink for and derive greater negative reinforcement from alcohol consumption. Additionally, by utilizing ESM in conjunction with time-lag analytic techniques, the immediate emotional and situational precursors to adolescent alcohol use can be identified. Finally, longitudinal studies employing ESM would be useful in determining whether early experiences with alcohol predict to later drinking problems and how the experience of alcohol use may act in a reciprocal fashion with predictors of use.

## APPENDIX



Alcohol Questionnaire

THE QUESTIONS IN THIS SECTION ASK ABOUT YOUR EXPERIENCE WITH BEER WINE AND LIQUOR. QUESTIONS WHICH ASK ABOUT YOUR USE OF ALCOHOL REFER TO EITHER BEER, WINE, OR LIQUOR (GIN, VODKA, SCOTCH, ETC.) PLEASE TRY TO ANSWER ALL QUESTIONS AS TRUTHFULLY AS POSSIBLE.

1. How old were you when you had your first drink of alcohol (not including just a sip or taste)?

- years  
 never have

2. How often do you usually have an alcoholic drink (not including those at religious services)?

- Everyday  
 3 or 4 days a week  
 1 or 2 days a week  
 3 or 4 days a month  
 About once a month  
 Less than once a month, but at least once a year  
 Less than once a year

3. Think of all the times you have had liquor recently. When you usually drink alcohol, how much do you usually have at one time, on the average?

- |                                      |                                   |                                      |
|--------------------------------------|-----------------------------------|--------------------------------------|
| <input type="checkbox"/> 12 or more  | <input type="checkbox"/> 6 drinks | <input type="checkbox"/> 3 drinks    |
| <input type="checkbox"/> 9-11 drinks | <input type="checkbox"/> 5 drinks | <input type="checkbox"/> 2 drinks    |
| <input type="checkbox"/> 7-8 drinks  | <input type="checkbox"/> 4 drinks | <input type="checkbox"/> 1 drink     |
|                                      |                                   | <input type="checkbox"/> less than 1 |

4. What is the greatest amount of alcohol you have ever had at one time?

- |                                      |                                   |                                      |
|--------------------------------------|-----------------------------------|--------------------------------------|
| <input type="checkbox"/> 12 or more  | <input type="checkbox"/> 6 drinks | <input type="checkbox"/> 3 drinks    |
| <input type="checkbox"/> 9-11 drinks | <input type="checkbox"/> 5 drinks | <input type="checkbox"/> 2 drinks    |
| <input type="checkbox"/> 7-8 drinks  | <input type="checkbox"/> 4 drinks | <input type="checkbox"/> 1 drink     |
|                                      |                                   | <input type="checkbox"/> less than 1 |



<b>BORED</b>	0	0	0	0	0	0	0	<b>EXCITED</b>
<b>FAT</b>	0	0	0	0	0	0	0	<b>THIN</b>
<b>ATTRACTIVE</b>	0	0	0	0	0	0	0	<b>UGLY</b>

\*\*\*\*\*

**WHO WERE YOU WITH?** (Check all that apply)

- |  |   |
|--|---|
| <input type="checkbox"/> ALONE, OTHERS NEAR    | <input type="checkbox"/> ONE FRIEND - A BOY             |
| <input type="checkbox"/> ALONE, NO ONE AROUND  | <input type="checkbox"/> ONE FRIEND - A GIRL            |
| <input type="checkbox"/> MOTHER                | <input type="checkbox"/> SEVERAL FRIENDS - BOYS         |
| <input type="checkbox"/> FATHER                | <input type="checkbox"/> SEVERAL FRIENDS - GIRLS        |
| <input type="checkbox"/> SISTER(S)             | <input type="checkbox"/> SEVERAL FRIENDS - BOYS & GIRLS |
| <input type="checkbox"/> BROTHER(S)            | <input type="checkbox"/> BOYFRIEND/GIRLFRIEND           |
| <input type="checkbox"/> BOSS/COACH/SUPERVISOR | <input type="checkbox"/> IN CLASS                       |
| <input type="checkbox"/> COWORKER(S)           | <input type="checkbox"/> OTHER _____                    |

WOULD YOU HAVE RATHER BEEN:  ALONE  W/ FRIENDS  W/ FAMILY

\*\*\*\*\*

IF YOU WERE WITH OTHER PEOPLE, WERE THEY...

	VERY	QUITE	SOME	NEITHER	SOME	QUITE	VERY	
<b>FRIENDLY</b>	0	0	0	0	0	0	0	<b>UNFRIENDLY</b>
<b>SERIOUS</b>	0	0	0	0	0	0	0	<b>JOKING</b>

IF YOU WERE A LOT OF SOMETHING, WHY DID YOU FEEL THAT WAY?

I FELT \_\_\_\_\_ BECAUSE \_\_\_\_\_

\*\*\*\*\*

SINCE THE LAST BEEP:

DO YOU FEEL YOU ATE  TOO MUCH  JUST ENOUGH  TOO LITTLE  NOTHING

<b>IF YOU DRANK ANY ALCOHOL</b>	<b>NO. OF</b>	<b>NO. OF</b>	<b>AMNT. OF</b>
<b>HOW MANY AND</b>	<b>GLASSES</b>	<b>GLASSES</b>	<b>HARD</b>
<b>WHAT DID YOU DRINK?</b>	<b>BEERS</b> _____	<b>WINE</b> _____	<b>LIQUOR</b> _____

IF YOU USED ANY DRUGS, WHAT TYPE AND AMOUNT? \_\_\_\_\_

\*\*\*\*\*

GREAT THOUGHTS, NASTY CRACKS, CARTOONS AND JOKES, EXCUSES

\*\*\*\*\*

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## VITA

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