Testing the Construct Validity of Self-efficacy in Relation to College Student Drinking

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Dissertation submitted to the faculty of the Virginia Polytechnic Institute and State University in partial fulfillment of the requirements for the degree of

Doctor of Philosophy In
Clinical Psychology

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August 18, 2008
Blacksburg, Virginia

Keywords: Self-efficacy, outcome expectancies, construct validity, structural equation modeling (SEM)

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ABSTRACT

In this study, 236 heavy-drinking college students completed measures of self-efficacy for limiting drinking, specific coping skills for limiting drinking, outcome expectancies associated both with expected effects of drinking and expected effects of limiting drinking, and retrospective drinking behavior. Confirmatory factor analyses were conducted to examine reliability and validity, as well as serving as a pre-requisite for structural equation modeling (SEM). Results were generally consistent with predictions and supported the distinction between self-efficacy and outcome expectancies. One notable exception was that positive expectancies for limiting drinking did not load heavily on the predicted expectancy construct. Three models predicting drinking were compared utilizing SEM. The first was a model in which all constructs predicted drinking with no indirect effects. The second was based upon the ideas of Kirsch (1995) and predicted that outcome expectancies influence self-efficacy judgments. The third was based upon Bandura's (1986) theory and predicted that self-efficacy judgments would instead influence outcome expectancies. Both the models based on Kirsch and Bandura appeared to better fit the data than the model with no indirect effects. Differences in model-fit between models based on Kirsch and Bandura were not large, but slightly supported the Kirsch model. Additional analyses also supported the importance of outcome expectancies in predicting drinking behavior. Implications for theory and future directions for research are discussed.

Table of Contents

List of Figures

List of Tables

Author's Acknowledgements

Thank you to Robert Stephens, Ph.D. for his support, targeted questioning, and perseverance. Thank you to Drs. Jack Finney, George Clum, Richard Winett, and Danny Axsom for their service on my committee, including invaluable feedback and supportive guidance. Special thanks Gayle Kennedy for her kindness in helping me accomplish essential tasks from afar.

Thank you to my husband, son, parents, and friends for their love, encouraging my continued efforts when obstacles seemed insurmountable and for tons of technical and emotional support.

Testing the Construct Validity of Self-efficacy in Relation to College Student Drinking

Self-efficacy is a commonly measured and utilized construct in substance abuse research (DiClemente, Fairhurst, & Piotrowski, 1995; Stephens, Wertz, & Roffman, 1995; Victoir, Eertmans, Van den Bergh, & Van den Broucke, 2007; Wilson, Wallston, & King, 1990). Bandura defined self-efficacy as a "judgment of one's capability to accomplish a certain level of performance" (Bandura, 1986, p. 391). According to the theory, self-efficacy determines both the expected consequences of performing a behavior, termed outcome expectancies, and future behavior (Bandura, 1986). Self-efficacy has typically been operationalized as a judgment of one's ability to avoid or limit substance abuse in specific situations. Higher levels of self-efficacy have been shown to predict continued abstinence after cessation from cigarette smoking (e.g. Colletti, Supnick, & Payne, 1985; Hoving, Mudde, & DeVries, 2006; Wilson, Wallston, & King, 1990;), alcohol use (e.g. Moos & Moos, 2006; Sitharthan & Kavanagh, 1991; Solomon & Annis, 1990; Young, Connor, Ricciardelli, & Saunders, 2006), and marijuana use (Lozano, Stephens, & Roffman, 2006; Stephens, Wertz, & Roffman, 1993; Stephens, Wertz, & Roffman, 1995). However, few studies have been directed toward providing evidence of the construct validity of self-efficacy and there remains a need for more research in this regard.

Construct validity refers to "the validity of inferences about unobserved variables (the constructs) on the basis of observed variables (their presumed indicators)" (Pedhazur & Schmelkin, 1991, p. 52). In simple terms, it refers to whether or not one is really measuring what one thinks is being assessed. Construct validity subsumes other types of validity, such as content validity, predictive or criterion-related validity, and

convergent/discriminant validity. There are several reasons why more construct validity studies of self-efficacy are needed.

First, self-efficacy has not been entirely supported as a mediator between past and future behavior, as proposed by Bandura. Bandura (1986) proposed that there were four sources of self-efficacy judgments: past performance accomplishments, vicarious learning, verbal persuasion, and physiological arousal. Past performance was hypothesized to be the most important source of self-efficacy judgments. However, Stephens, Wertz, and Roffman (1995) found that self-efficacy did not completely mediate the relationship between prior and future use of marijuana. These authors also found that temptation and likelihood of engaging in coping behaviors were "more important in explaining efficacy judgments than recent marijuana use" (Stephens et. al., 1995, p. 1028). Baer, Holt, and Lichtenstein (1986) also found that self-efficacy did not completely mediate the influence of prior use on future use in a sample of cigarette smokers. Thus, the presumed causes of self-efficacy judgments and self-efficacy's role as a mediator have not been entirely supported.

There has been confusion regarding the distinction between self-efficacy and outcome expectancies, both at the theoretical and at the measurement level. Several researchers have confused temptation ratings with self-efficacy judgments at the measurement level (Aas et. al., 1995; Dijkstra et. al., 1996; Fitzgerald & Prochaska, 1990; Willemsen et. al., 1996; Wilson et. al., 1990). For example, Willemsen et. al. (1996) equated self-efficacy with the difficulty or ease of avoiding smoking. Difficulty likely represents a judgment of temptation to use together with skills for negating that temptation. Although self-efficacy and temptation are moderately, negatively correlated

(e.g. DiClemente et. al., 1985; DiClemente et. al., 1991; Stotts et. al., 1996), temptation more likely reflects expected positive outcomes of substance use and/or relief from negative outcomes associated with nonuse. A person can believe that he or she would be highly tempted to smoke in a certain situation, but still believe that he or she can avoid smoking in that situation. Thus, level of difficulty may be related to self-efficacy judgments, but it is not equivalent to self-efficacy.

Adding to the complexity of the relationships among self-efficacy, outcome expectancies, and behavior is that there are two types of outcome expectancies within the area of alcohol use. The first, hereafter referred to as effect expectancies, have been operationalized as the expected effects of actually consuming alcohol. These include such outcomes as becoming aggressive and enjoying the buzz. Effect expectancies have been studied frequently with college student drinkers and they have been shown to predict alcohol use (Armeli, Mohr, Todd, & Maltby, 2005; Leigh & Stacey, 1993; Young, Connor, Ricciardelli, & Saunders, 2006). The second type of alcohol outcome expectancies, hereafter referred to as change expectancies, refers to the expected consequences (costs and benefits) of changing use. This measure was originally developed for use in treatment samples (see Solomon & Annis, 1989), but has been adapted for use with college students. The measure has been shown to predict alcohol use (Greaves, Stephens, & Curtin, 1992; Mitton, 1997 Solomon & Annis, 1990).

At a theoretical level, outcome expectancies, which are determined by self-efficacy judgments according to Bandura's original (1986) theory, have been proposed instead to be a source of self-efficacy judgments. Kirsch (1982) suggested that outcome expectancies may determine self-efficacy judgments when the behavior to be performed

is aversive in some respect. To test this idea, Kirsch asked snake phobics to rate their efficacy for two tasks: approaching a snake and throwing a paper wad into a wastebasket. When offered hypothetical monetary incentives, the snake phobics changed their efficacy ratings for the tasks involving snakes much more often than for throwing the paper wad. Reasons cited by the participants for changing or not changing their efficacy ratings suggested that money, a consequence of performing the behavior, altered efficacy ratings for approaching and handling snakes. However, monetary incentives did not alter efficacy ratings for a task that depended much more on ability (throwing the paper wad). Corcoran and Rutledge (1989) extended these findings to cigarette smokers and Mitton (1997) extended the findings to a sample of heavy-drinking college students. Thus, there is some evidence that self- efficacy judgments may be influenced by outcome expectancies, contrary to Bandura's original theory.

However, a second study (Mitton, 1997) suggested that people can and do discriminate between ability and willingness judgments. Heavy-drinking college students in this study were presented with two different versions of a standard self-efficacy measure (Situational Confidence Questionnaire; Annis & Graham, 1988), with order of presentation counterbalanced. One version asked participants to rate their ability (e.g. "how confident are you that you are able to resist drinking") and one version asked participants to rate their willingness (e.g. "how confident are you that you would be willing to resist drinking"). Ability ratings were higher than willingness ratings and principle components analysis indicated that willingness and ability represented distinct constructs. Thus, there is a question of the directional relation between self-efficacy and outcome expectancies.

The lack of research on the relative predictive power of self-efficacy and outcome expectancies in substance abuse also indicates a need for more construct validity studies. Although studies have supported both the predictive power of self-efficacy (Chang, Lee, Lai, Chiang, Lee, & Chen, 2006; Sitharthan & Kavanagh, 1991; Wilson, Wallston, & King, 1990) and outcome expectancies (Goldman, Brown, & Christiansen, 1987; Leigh, 1989), few studies have examined both simultaneously. Such studies represent discriminant validity studies in that they seek to examine the unique contribution of each construct in predicting actual substance use.

Several studies have supported the role of outcome expectancies. Hansen and Graham (1991) found that changing the acceptability of substance use was more effective in preventing use than resistance skills training over a one-year period. In a similar study, Donaldson, Graham, and Hansen (1994) found that a preventive program aimed at decreasing beliefs about the prevalence and acceptability of substance use, which can be considered to alter outcome expectancies, was more effective at decreasing actual use over a 3-year period than was a resistance skills training approach, which can be considered to increase self-efficacy. In fact, the adolescents who received only resistance training had the highest prevalence estimates, leading the authors to suggest that "resistance training by itself may lead adolescents to believe that drug use among their peers is prevalent" (Donaldson et. al., 1994, p. 211). Greaves and Stephens (1992) compared the relative utility of alcohol expectancies and self-efficacy in predicting alcohol-related problems among college students and found that both self-efficacy and outcome expectancies contributed uniquely to the prediction of drinking-related problems.

Other studies have supported self-efficacy as the better predictor. Young, Connor, Ricciardelli, & Saunders (2006) found that self-efficacy contributed additional variance to the prediction of three different measures of drinking after controlling for the effects of both positive and negative outcome expectancies in a sample of college student drinkers. Haaga (1989) found that self-efficacy was the best discriminator between smoking lapsers and abstainers over a 3-month period, but outcome expectancies did discriminate between the two groups to a lesser degree. In a prospective investigation of smokers planning to quit smoking within the next 30 days, Carey, Kalra, Carey, Halperin, and Richards (1993) found that successful quitters had significantly higher self-efficacy, but did not differ in terms of outcome expectancies. Solomon & Annis (1990) found that self-efficacy accounted for more of the variance in drinking behavior than did outcome expectancies. Greaves, Stephens, and Curtin (1992) found that coping efficacy (a measure of ability to utilize specific coping strategies to avoid drinking heavily) explained additional variance (22-26%) in drinking after controlling for the influence of alcohol expectancies. However, alcohol expectancies contributed little (1-2%) after controlling for the role of coping self-efficacy. Greaves and Stephens (1994) found that neither efficacy nor outcome expectancies for reduced drinking predicted a significant amount of variance in behavioral intentions for moderate drinking among college students, but efficacy predicted how many drinks participants intended to consume per drinking occasion and how many times they intended to reach a .10 blood-alcohol content (BAC) in the next month. Outcome expectations did not account for a significant amount of variance in these dependent variables. However, if outcome expectancies do influence

self-efficacy judgments, these results could mask important indirect effects of outcome expectancies (mediated by self-efficacy) on future substance use.

To summarize, a need for studies concentrating on the construct validity of self-efficacy is indicated by a lack of studies incorporating both self-efficacy and outcome expectancies, conflicting results regarding the relative predictive utility of self-efficacy and outcome expectancies, confusion regarding the distinction between self-efficacy and outcome expectancies, and alternative conceptualizations of the relations among self-efficacy, outcome expectancies, and behavior. The purpose of the present study is to contribute to research on the construct validity of self-efficacy by including measures of both outcome expectancies and self-efficacy and evaluating the adequacy of competing models with regard to the relationships among self-efficacy, outcome expectancies, and drinking.

The first model is based upon the ideas of Kirsch (1995) and Maddux (1995). In this model (see Figure 1), effect expectancies, defined as the expected effects of consuming alcohol (e.g. being more sociable, losing motor coordination), are proposed to directly influence both drinking and change expectancies (judgments of the costs and benefits involved in changing one's drinking). Effect expectancies have demonstrated relationships with future drinking (for reviews, see Goldman, Brown, & Christiansen, 1987; Hull & Bond, 1986; Leigh, 1989) and have received support as mediators between distal risk factors and later substance consumption (e.g. Henderson et. al., 1994). It makes sense that effect expectancies would influence change expectancies because effect expectancies are the pleasant or unpleasant physiological and emotional effects of consuming alcohol. Individuals' effect expectancies would likely influence their change

expectancies. Change expectancies are then hypothesized to influence self-efficacy judgments.

Coping efficacy is also proposed to affect both self-efficacy and change expectancies. Coping efficacy has been defined by Maddux (1995) as "beliefs about one's ability to prevent, control, or cope with potential difficulty" involved in performing a behavior (Maddux, 1995, p. 378). Perceived ability to perform various coping skills for limiting drinking well is one potential operational definition that has been utilized in previous studies (Greaves, Stephens, & Curtin, 1992). Another potential operational definition is the ability to have fun or enjoy oneself while limiting drinking. Coping efficacy is hypothesized to have direct effects on overall self-efficacy judgments and change expectancies. This makes logical sense because one's perceived ability to cope with difficulties related to changing drinking (e.g. temptation to drink at a party) likely influences overall self-efficacy judgments and judgments of the costs and benefits related to changing one's drinking. Furthermore, coping skills for managing tempting or high-risk situations are often assumed to be important in avoiding substance use (e.g. Marlatt & Gordon, 1985).

Finally, self-efficacy is proposed to influence drinking. This hypothesis, as discussed earlier, is supported by several studies indicating the predictive validity of self-efficacy (Colletti, Supnick, & Payne, 1985; Sitharthan & Kavanagh, 1991; Solomon & Annis, 1990; Stephens, Wertz, & Roffman, 1993; Stephens, Wertz, & Roffman, 1995; Wilson, Wallston, & King, 1990). It should be noted that self-efficacy is distinct from coping efficacy. Coping efficacy refers to perceived ability to cope with potential difficulties involved in limiting drinking, but self-efficacy refers to an overall estimate of

one's ability to limit drinking, which is proposed to include the mediated and direct effects of outcome expectancies.

The second model is based upon Bandura's (1986) hypotheses. In this model (see Figure 2), coping efficacy is hypothesized to influence self-efficacy, consistent with Bandura's statement that self-efficacy does not refer to elementary motor acts, but to judgments of abilities to cope with the expected outcomes of certain behaviors (Bandura, 1978). With this line of reasoning, perceived ability to utilize coping strategies for limiting drinking would influence one's judgments of one's ability to limit drinking in specific situations. Self-efficacy is then proposed to influence drinking, both directly, and through change expectancies. Effect expectancies are proposed to directly influence drinking. Although Bandura (1997) maintains that self-efficacy judgments affect outcome expectancies, he has also stated that "the degree to which outcome expectations contribute to performance motivation independently of self-efficacy beliefs is partly determined by the structural relation between actions and outcomes in a particular domain" (Bandura, 1989, p. 1180). It is unlikely that Bandura would view self-efficacy judgments as affecting effect expectancies because effect expectancies associated with drinking are not dependent on one's ability to drink.

The primary questions addressed in this study are: (1) is the distinction between self-efficacy and expectancies as separate constructs supported by convergent and discriminant validity analyses, (2) do theoretical models involving indirect effects represent an improvement over predicting drinking with no indirect effects and (3) which of the two conceptual models discussed fits the data better.

Method

Participants.

Participants were 236 heavy-drinking college students (94 males, 142 females) recruited from psychology courses at Virginia Tech. Participants ranged in age from 18 to 25 years (missing data = 1), with 97.4% (N = 229) falling between the ages of 18 and 22. The sample was mostly Caucasian (86.4%), but included Asian Americans (5.1%), African Americans (2.5%), and Hispanics (2.1%). Heavy drinking was operationally defined as having consumed at least 4 standard drinks per occasion for females or 5 standard drinks per occasion for males within the previous 30 days. Interest in reducing college student drinking focuses on those students who binge drink and this has frequently been operationalized using the 4/5 standard drinks per occasion criteria (Caudill, Crosse, Campbell, & Howard, 2006). With this consumption amount, individuals may experience euphoria, dizziness, sedation, and slowed reaction times (Naranjo & Bremner, 1993). Risk of fatal car accidents, falls, fires and burns, drownings, and other accidents also increases as BAC levels increase (Hingson, Heeren, Zakocs, Kopstein, & Wechsler, 2002; Naranjo & Bremner, 1993).

Procedure.

Participants were recruited by posting a sign-up sheet in the fifth floor lobby of Derring Hall. The sign-up sheet requested participants to help provide information regarding college students' drinking patterns and beliefs and specifically requested "Drinkers Only" in order to discourage large numbers of abstainers from signing up. Included in the file with the sign-up sheet was a copy of the informed consent form so

that participants could better understand the procedures to be utilized in the study prior to signing up for it.

Participants were scheduled in groups of approximately 10-15 people. Upon arriving, individuals were given an informed consent form with a participant number at the end of it (Appendix A) and the experimenter reviewed the informed consent form orally. Demographic information, including participant gender, age, race, and student status, was also collected (Appendix B).

Participants were given a handout that explained the meaning of blood alcohol content (BAC) and allowed them to determine how many drinks they would have to consume over a four-hour period in order to reach a .08 BAC (see Appendix C). A standard drink was defined as the equivalent one 12-ounce beer, one 4-ounce glass of wine, or one shot of 86-proof liquor. The four-hour time period closely approximated the mean number of hours participants reported drinking in an earlier study (Mitton, 1997).

Next, two outcome expectancy measures were administered. One of the outcome expectancy measures assessed the expected effects of consuming alcohol (effect expectancies), while the other assessed the expected consequences of changing one's alcohol consumption (costs and benefits or change expectancies). Next, the timeline follow-back procedure (Sobell, Sobell, Klajner, Pavan, & Basian, 1986) was utilized to obtain information on participants' usual drinking patterns.

Participants then completed the two measures of coping efficacy, rating their perceived ability to perform various coping strategies for limiting drinking and rating their perceived ability to utilize other methods for avoiding potential negative consequences of limiting drinking. Finally, the measure of situational self-efficacy, the

Situational Confidence Questionnaire (SCQ; Annis & Graham, 1988), was administered. Participants were thanked for their participation and debriefed.

Measures. This study utilized a modified version of the SCQ (Annis & Graham, 1988; see Appendix D). The SCQ is a standard measure of situational self-efficacy for avoiding heavy drinking that has been utilized primarily in clinical populations. Participants indicated perceived confidence in their ability to resist the urge to drink above a .08 BAC in a variety of different situations (e.g. "how confident are you that you are able to resist drinking above a .08 BAC") on a 6-point scale ranging from 0-100 (increments of 20), with higher numbers reflecting greater confidence. The modification of the SCQ involved the addition of several items more specific to college student drinking situations (e.g. fraternity party) and the removal of several items less relevant to college student drinking (e.g. "If I passed by a liquor store", "If I convinced myself that I was a new person and could take a few drinks"), resulting in a total of 36 items. In an earlier study (Mitton, 1997), the modified SCQ demonstrated adequate internal consistency reliability (alpha = .96). With clinical populations, the existence of only one factor has generally been supported (Annis & Graham, 1988) and scores are generally summed to arrive at a total score. In previous studies with college student samples, the modified version of the SCQ appears to have only one factor, explaining between 43% (Mitton, 1997) and 49% (Mitton, 1999) of the variance in scores. In a pilot study, this version of the SCQ correlated -.50 with number of drinking occasions and -.45 with average number of drinks consumed per drinking occasion. In this study, the SCQ demonstrated adequate internal consistency reliability (alpha = .96), with one factor explaining 43% of the variance.

A coping efficacy questionnaire consisting of 36 items representing cognitive and behavioral skills for avoiding excessive alcohol consumption (e.g. confining drinking to certain times of the day, setting limits on the number of drinks consumed per sitting) was also utilized. These items corresponded to coping strategies frequently used by college students (Werch & Gorman, 1986). Participants rated their perceived ability to perform these strategies well (Appendix E) on a scale from 0 to 100 (increments of 20). In this study, two factors appeared to account for the variance, one labeled behavioral coping efficacy (acesbeh, alpha = .93) and one labeled cognitive coping efficacy (acescog, alpha = .95).

The second measure of coping efficacy consisted of 18 items related to methods college students could utilize to limit their drinking and still enjoy parties or other social activities (Appendix F). These items were generated with reference to potential costs involved in limiting drinking and by considering methods to avoid these costs. A one-factor solution appeared to best account for the variance (40.5%), with an internal consistency reliability of .91.

Participants also completed an alcohol outcome expectancy scale that measured expectancies about the effects of alcohol on the individual (effect expectancies; Leigh & Stacy, 1993; Appendix G). This 34-item inventory required students to rate how likely it was that the effect would happen to them if they consumed alcohol on a scale ranging from 1 (No chance) to 6 (Certain to Happen). The scale included both positive (18 items, alpha = .87) and negative (16 items, alpha = .80) effects and individual items were averaged in order to construct these scales for data analysis.

A modified version of the Outcome Expectancy Scale (costs/benefits; Solomon & Annis, 1989) was employed to measure positive (26 items, alpha = .93) and negative (20 items, alpha = .88.) consequences expected to result from a change in one's drinking pattern on a 5-point scale ranging from strongly agree(1) to strongly disagree (5). Individual items were averaged for each of the subscales in order to compose indices of positive and negative expectancies. The 48-item version used in this study included more items specific to college students (Appendix H). Due to a clerical error, items 15 and 29 were exactly the same, so one of these was dropped for all analyses.

Measures of drinking were collected utilizing a timeline follow-back procedure (Appendix I). This procedure involved giving participants calendar pages for the 60 days preceding the session and prompting the use of memory aides (e.g. dates of parties, when bands played, and test dates) to help them recall their drinking during that period. Students were instructed to enter the number of drinks consumed, the type of drinks consumed, and the number of hours spent drinking for each day on which they consumed alcohol of any type. This procedure has demonstrated high test-retest reliability across several different populations, including college students (Sobell & Sobell, 1991). This measure was utilized to create indices of the number of drinking occasions in the past 60 days, number of drinks per occasion, and number of binge drinking occasions.

Two measures, one of consequences related to drinking (RAPI, Appendix J) and one of seven questions relating to the stages of change (Appendix K) were added for exploratory purposes.

Results

Prior to further analyses, the data were screened. The data met criteria for plausibility, outliers, normality, and linearity. All variables had less than 5% missing data, data were missing completely at random, and missing data points were estimated using the expectation maximization method, consistent with recommended practices (Tabachnick & Fidell, 2001). Descriptives for each composite variable are shown in Table 1.

All the computations for CFA and SEM models are estimated with AMOS version 6.0, a package that is designed specifically for fitting structural equation models (Arbuckle, 2005). The initial measurement model is shown in Figure 3. Factor loadings were estimated for latent variables with more than one indicator variable. Examination of the reliability coefficients revealed that the reliability of positive change expectancies (CEPOS) was .008, so this observed variable was dropped from the model. Results indicated that the data fit the measurement model well (Chi-square = 49.7, df=11, $p<0.001$). This supports self-efficacy and expectancies as separate and distinct constructs in that items purporting to measure self-efficacy loaded on that latent construct and items presumed to measure expectancies loaded on those latent constructs.

Reliability and validity analyses are required before proceeding with SEM and these analyses also provide additional evidence regarding construct validity. Unstandardized and standardized loadings, reliability, and validity estimates are shown in Table 2. The reliability of an indicator (observed variable) is defined as the square of the correlation (squared multiple correlation or SMC) between a latent factor and that indicator. For instance, looking at Table 2, the standardized loading for the path

between positive effect expectancies and effect expectancies is 0.85 and the reliability is 0.72.

The variance extracted estimate assesses the amount of variance that is explained by an underlying factor in relation to the amount of variance due to measurement error (see Table 2). For instance, the variance extracted estimate for effect expectancies is .48, meaning that 48% of the variance is explained by the construct and 52% is due to measurement error. Fornell and Larcker (1981) suggest that constructs should exhibit estimates of .50 or larger. However, Hatcher (1994) cautions that the variances extracted estimate test is conservative; reliabilities can be acceptable even if variances extracted estimates are less than .50. It should be noted that variance extracted estimates are not reported for constructs with single indicators because, consistent with Joreskog and Sorbom's (1989) recommendation, the specification of the reliability is 0.85 to appropriately estimate parameters for use in SEM.

Convergent validity was assessed by reviewing the t-tests for the factor loadings. If all the factor loadings for the indicators were greater than twice their standard errors, the parameter estimates demonstrated convergent validity. That all t-tests were significant showed that all indicators were effectively measuring the same construct (Anderson & Gerbing, 1988). Consider the convergent validity of the two indicators that measure effect expectancies, positive effect expectancies and negative effect expectancies. The results show that the t-values for these two indicators range from 2.12 to 2.47 (critical t=1.96 for p=0.05). These results support the convergent validity of these two measures.

Discriminant validity was assessed through the use of the variance extracted test. The variance extracted estimates for the two factors of interest were compared with the square of the correlation between the two factors. Discriminant validity is demonstrated if both variance extracted estimates are greater than the squared correlation. The squared correlation between effect expectancy and coping efficacy is 0.10 and the average variance extracted estimates for effect expectancies and coping efficacy are 0.48 and 0.72, respectively. The average variance extracted estimates are greater than the squared correlation, so support for discriminant validity is evident.

Two models were created, one based on the ideas of Kirsch and one based on Bandura's theory. The Goodness of Fit statistics for each of these models and the model with no indirect effects (referred to as null model for convenience purposes) are shown in Table 3.

In Model 1 (based on Kirsch, see Figure 1), drinking is considered dependent on self-efficacy, effect expectancies, and change expectancies. Self-efficacy is dependent on coping efficacy and change expectancies. The latent variable change expectancies is explained by effect expectancies and coping efficacy. There were no replicate measures for the latent constructs of drinking, self-efficacy, and change expectancies, so error estimates were computed according to Joreskog & Sorbom's reliability formula (1989). Assuming that no measure is infallible, the specification of the reliability is done by assigning the fixed value .15 times the variance of the variable to the error variance. For instance, the variance of scq scores is .67. The estimated variance of the error is computed as .67*.15, or .10. The error variance estimates for drinking (number of binge

drinking occasions) and negative change expectancies (ceneg) are 3.04 and .08, respectively. These estimates were applied to each model.

The chi-square statistic for this model was 10.49 with 12 degrees of freedom, p=.573, GFI = .99, CFI = 1.00, and RMSEA=.00 with a CI (confidence interval) for RMSEA (.000; .059). Chi-square is a measure of the compatibility of the data with the hypothesis. A chi-square value this small relative to the degrees of freedom indicates a good fit between the estimated and actual covariance matrices. The goodness-of-fit index (GFI) was developed by Joreskog & Sorbom (1984) and deals with error in reproducing the variance-covariance matrix. Values for GFI range from 0 to 1, with 1 being a perfect fit. Values greater than .90 are considered excellent (Bentler & Chou, 1987). The comparative fit index (CFI) compares the current model with a null model that assumes the latent variables are independent (uncorrelated) and a CFI > .90 is considered a good fit (Raykov & Marcoulides, 2000). The root mean square error of approximation (RMSEA) is a measure of closeness of fit, with values less than .05 indicating good model fit, and values up to .08 indicating reasonable model fit (Browne & Cudeck, 1993; Hu & Bentler, 1999). Steiger (1990), Brown and Cudeck (1993), and MacCallum, Browne, and Sugawara (1996) suggested that a confidence interval (CI) be calculated and include values between 0 and .05 to indicate the possibility of good fit. All of these indices indicate that Model 1 fits the data well.

The parameter estimates are shown in Table 4. It was hypothesized that coping efficacy and effect expectancies influence self-efficacy indirectly through change expectancies. Looking at the individual parameter estimates, the direct effect of coping efficacy on self-efficacy is statistically significant, unstandardized beta = .479, standard

error = .067, critical ratio = 7.107, standardized beta = .597, and p<.001. In other words, as coping efficacy increases one unit, self-efficacy will increase by .479 units. The critical ratio (C.R.) represents the parameter estimate divided by its standard error. Based on a level of .05, the test statistic should be > the absolute value of 1.96 before the null hypothesis that the estimate is equal to 0 can be rejected (Byrne, 2001). The path model with standardized betas and significance levels is shown in Figure 4. Most of the path coefficients are consistent with predictions from the model. However, effect expectancies and change expectancies do not have significant direct effects on drinking, as predicted.

The second model estimated was based on Bandura's theory (see Figure 2). In this model, coping efficacy directly affects self-efficacy, effect expectancies affect drinking and change expectancies, change expectancies affect drinking, and self-efficacy affects both change expectancies and drinking. The parameter estimates are shown in Table 5. The chi-square statistic for this model was 17.863 with 12 degrees of freedom, p=.120, GFI = .98, CFI = .99, and RMSEA=.046 with a CI (confidence interval) for RMSEA (.000; .087). All of these indices support the fit of the model. That coping efficacy has a direct relationship with self-efficacy is supported by the statistically significant regression coefficient, .594 (unstandarized, p<.001; standardized beta = .636). Effect expectancies and self-efficacy have significant effects on change expectancies. The path model with standardized betas and significance levels is shown in Figure 5. All of the path coefficients in this model were significant.

In the null model, Chi-square is 680.26 with 28 degrees of freedom, p = .000, GFI = .510, CFI = .000, RMSEA = .315. This model does not appear to fit the data well and

both models (based on Kirsch and Bandura) represent improvements over the null model in which all latent constructs predict drinking through direct effects. An assessment of which of the two remaining models fits the data better may be made by looking at the goodness-of-fit estimates in Table 3. Model 1 has a lower chi-square value relative to degrees of freedom, 10.49 compared to 17.86 with 12 degrees of freedom in each model. Model 1 also has higher estimates for GFI (.99 versus .98), CFI (1.00 versus .99), and a lower RMSEA (.000 versus .046). These are all indications of a better model fit in the first (Kirsch) model.

The differences between these models did not appear great, but direct statistical tests for non-nested models are not possible. Although effect expectancies have consistently been related to drinking in the literature, a strict interpretation of Bandura's original model might propose to remove the path from effect expectancies to drinking. Comparison of the models with and without this path was conducted as an additional analysis. Without the path from effect expectancies to drinking, chi-square was 56.73 with 13 df, $p<.001$, GFI = .94, CFI = .93, RMSEA = .120. The nested model comparison was significant (chi-square = 38.86, df = 1, $p < .001$), meaning that the path from effect expectancies to drinking significantly improved model fit. The same procedure was followed for Kirsch's model by comparing nested models with and without the path from effect expectancies to drinking. The difference here was not statistically significant (chi-square = .192, df = 1, p = .66).

Discussion

There have been very few studies that have explicitly included measures of both outcome expectancies and self-efficacy in relation to drinking. Studies have focused on

either self-efficacy or expectancies, but have not examined both constructs simultaneously and incorporated models based on theory. This study successfully adds to the literature, supporting many of the measures utilized and constructs hypothesized within the field of alcohol use and abuse. More importantly, the study finds validity for two theoretically derived models of the interrelationships of these constructs and drinking behavior.

The CFA portion of the study suggested that the measures do load as predicted. The results of the CFA support self-efficacy and outcome expectancies as distinct and separate constructs, further building upon previous research investigating distinctions between self-efficacy and outcome expectancies (Mitton, 1997; Mitton, 1999). The exception to the predicted factor loadings was that the effect of change expectancies (construct) on the measure of positive change expectancies was small and these items from the measure were not supported. In general, studies have supported the positive items scale of this measure (Solomon & Annis, 1989). However, the measure has not been frequently utilized with a college student sample and it is possible that these items (e.g. "I would have more sudden urges to drink") are less relevant for college students than for samples of older people who have have been drinking heavily for longer periods of time. It may also be that heavy-drinking college students perceive few positive consequences to limiting their drinking and the positive consequences they do perceive may be idiosyncratic.

The model based on Kirsch's ideas fit slightly better for predicting number of binge drinking occasions. These results, along with studies mentioned earlier, suggest that in the area of alcohol use, outcome expectancies may have a significant influence on

self-efficacy judgments. Theoretically, this suggests the need for modifications to Bandura's original theory on the relationship between self-efficacy and outcome expectancies, at least in the area of alcohol use. Practically, these results suggest a need to focus intervention programs on perceived outcomes of limiting drinking. Interventions designed to reduce college student drinking could be much more effective by focusing on the expectancies of drinking and the expected effects of limiting or reducing drinking. Self-efficacy for drinking may be as much influenced by these expectancies as by judgments of ability for reduced drinking.

While the model based on Kirsch's ideas was slightly more supported, the differences in model fit were not extreme. Although not reported here, models based on the two theories using different operational definitions for dependent variable of drinking (drinking quantity and drinking frequency) produced results similar to those reported for number of binge drinking occasions. However, taking out the path representing the effect of effect expectancies on drinking in the Bandura model resulted in a statistically significant reduction in the overall model fit. This is consistent with Kirsch's theory, that outcome expectancies are very important in determining drinking behaviors and that they contribute to drinking independent of self-efficacy judgments.

While this study included both outcome expectancies and self-efficacy, other concepts, such as the social network of college students, goals regarding limiting drinking, social anxiety, or knowledge of health risks were not assessed (Bandura, 2004). These may be important additional determinants of self-efficacy and outcome expectancies and could be included in future studies of college student drinking.

The relationships among the constructs may also differ based on the population of drinkers and this represents another area for future studies. College student drinkers are very different from heavily drinking or alcohol dependent adults and the preference for one model may vary based on population characteristics. It may be that self-efficacy is more influential in determining drinking among older adults who have experienced multiple negative effects of drinking and may be more motivated to attempt limiting drinking.

Finally, structural equation modeling allowed comparison of competing theories, but is limited in supporting the theoretically implied causal relations, as are all techniques using correlation data. The study was based on correlational data and the models suggested are just models based on theories. Although both conceptual models were preferred to atheoretical models, other models could be possible. Adding to the complexity, the constructs studied, such as effect expectancies, drinking quantity, and self-efficacy are reciprocal, meaning that previous experience with one (e.g. drinking) may affect later judgments of the other (e.g. effect expectancies), which may again affect drinking. Such reciprocal influences are not easily disentangled and quantified. More studies are needed, particularly longitudinal studies. Further longitudinal and/or experimental designs including self-efficacy and outcome expectancies could aid in disentangling these reciprocally influential constructs.

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Appendix A

Informed Consent for Participants of Investigative Projects

Title: Testing the Construct Validity of Self-efficacy in Relation to College Student Drinking

Investigators: Felicity L. Mitton, MS and Robert S. Stephens, Ph.D.

The Purpose of this Research

The purpose of this research is to examine the construct validity (whether or not one is really measuring what one thinks is being measured) of self-efficacy (judged ability to limit drinking) in relation to college student drinking. For this purpose, approximately 200 participants will be sought to provide information regarding their beliefs about drinking and actual drinking.

Procedures

Persons choosing to participate will be asked to provide information (complete several surveys) regarding their beliefs about drinking and their actual drinking. This session should take no more than two hours to complete and will be conducted in groups of about 15 people per session. The sessions will be conducted in classrooms specifically reserved for this purpose. There is **no interaction** with other participants in the session. All information collected is confidential and will not be shared in raw form with anyone not involved in conducting the study.

Risks

It is possible that you may feel uncomfortable thinking about your drinking. If you feel this way during the study, do not hesitate to contact either investigator or call any of the numbers listed on the debriefing form that will be provided to you.

Benefits

One potential benefit is that you may learn something about yourself, how you feel about drinking, etc. Additionally, you have the opportunity to earn two extra credit points toward your class grade. Also, you will be helping to provide valuable information to further scientific knowledge.

No promise or guarantee of benefits has been made to encourage you to participate.

Extent of Confidentiality

Following the session, there will be no way of associating you with the data you provide. Information collected will only be available to persons directly involved in conducting the study and will not be released in any manner that identifies you.

Compensation

You will earn two extra credit points for your participation. Extra credit points are only available to those students whose instructors permit the use of extra credit points. In all these courses, the syllabus should describe alternative ways in which you can earn extra credit points. This means participation in this study is only one way in which you can earn extra credit points. If you have questions about how else you can earn extra credit, contact the instructor for the course in which you want to earn extra credit. Extra credit points will impact your grade differently, depending on how your instructor has

organized your class. Please consult your syllabus or instructor to determine the impact of extra credit points on your grade.

Freedom to Withdraw

You are free to withdraw from this study at any time without penalty. If you choose to withdraw, you will not be penalized by a reduction in points. This means that we will not deduct points from your course grade if you decide to withdraw. You are also free not to answer any questions you choose without penalty.

Approval of Research

This research project has been approved, as required, by the Institutional Review Board for Research Involving Human Subjects at Virginia Polytechnic Institute and State University and by the Department of Psychology.

Participant's Responsibilities

I voluntarily agree to participate in this study. I have the following responsibilities:
Complete surveys, provided I choose to.
Not be disruptive or impolite toward others who choose to participate.

Participant's Permission

I have read and understand the informed consent and conditions of this project. I have had all my questions answered. I hereby acknowledge the above and give my voluntary consent for participation in this project.
If I participate, I may withdraw at any time without penalty. I agree to abide by the rules of this project.

_____ _____

Signature Date

Should I have any questions about this research or its conduct, I may contact:

Felicity L. Mitton, MS Investigator	231-6914
Robert S. Stephens, Ph.D. Faculty Advisor	231-6304
H.T. Hurd Chair, IRB	231-5281
Dr. D.W. Harrison Chair, HSC	231-4422

Appendix B

1. Please indicate your gender. (1)_____Female (2)_____Male

2. Please put your age in the blank. _____years

3. Please indicate your race. (1)_____African-American
   (2)_____Asian-American
   (3)_____Hispanic
   (4)_____Native American
   (5)_____White/European
   (6)_____Other

4. Please indicate which student status best describes you.
   (1)_____Freshman
   (2)_____Sophmore
   (3)_____Junior
   (4)_____Senior
   (5)_____Special Student

5. Please indicate your current weight in pounds. _____pounds

Appendix C

What is Blood Alcohol Content (BAC)? BAC is the ratio of alcohol to blood in the bloodstream. BAC can typically be predicted from the amount of alcohol that is in an individual's bloodstream when that person's sex and weight are known.

The chart below indicates how many drinks you would need to consume during a four-hour time period in order to have a BAC of .08. Please locate your gender and weight in this chart in order to determine how many drinks you would need to consume. Remember that one drink is equivalent to 12 oz. of beer or 4 oz. of wine or one standard cocktail containing 1 oz. of 86 proof liquor.

If you have any questions about how to interpret this chart, please ask the experimenter.

Write down how many drinks you would need to consume during a four-hour time period in order to reach a .08 BAC

_____drinks

FEMALE		MALE	
Weight	Drinks	Weight	Drinks
≤ 119	3	≤ 119	4
120-139	4	120-159	5
140-179	5	160-179	6
180-219	6	180-199	7
220-239	7	200-239	8
240-279	8	240-259	9
280-299	9	260-279	10
≥ 300	10	280-299	11
		≥ 300	12

Appendix D

Write the number of drinks you would need to consume during a four-hour period in order to reach a blood alcohol level of .08 here: _____

Please respond to the following situations by indicating how confident you are that you are able to resist drinking above a .08 BAC (the equivalent of the number you wrote in the space above).

0% confidence = 0
20% confidence = 1
40% confidence = 2
60% confidence = 3
80% confidence = 4
100% confidence = 5

1. If I felt uneasy in the presence of someone
2. If I unexpectedly found a bottle of my favorite booze
3. If I were at a party and other people were drinking
4. If I felt I had let myself down
5. If I broke up with my significant other
6. If I were talking to an attractive member of the opposite sex
7. If I suddenly had the urge to drink
8. If I were angry at the way something had turned out
9. If other people didn't seem to like me
10. If I were at a friend's place and they were playing drinking games
11. If someone pressured me to be a "good sport" and have a drink
12. If I was at a fraternity party
13. If someone criticized me
14. If I were on a date and my date was drinking
15. If I had just finished a long day of classes or work
16. If it was a week-end
17. If I felt lonely

If I was at a casual get-together
If I had some extra money

20. If a friend was buying me drinks
21. If I felt anxious and wanted to relax
22. If I had an argument with a friend or roommate
23. If I were in a restaurant and the people with me ordered pitchers of beer and mixed drinks
24. If I were at a tailgate party for a football game
25. If someone I was attracted to was drinking
26. If there were problems at school or work
27. If other people made me tense
28. If I was with friends watching TV
29. If I were at happy hour with a group of friends
30. If I was bored

0% confidence = 0
20% confidence = 1
40% confidence = 2
60% confidence = 3
80% confidence = 4
100% confidence = 5

31. If I had just gotten a good grade on a test
32. If I were at a bar having a good time
33. If I was at a party where I didn't know many people
34. If I wanted to celebrate with a friend
35. If I was talking to someone I didn't know well
36. If I were enjoying myself at a party and wanted to feel even better

Appendix E

Please enter the number of drinks you would need to consume to reach a blood alcohol content level of .08 _____.

Listed below are a number of behaviors that individuals report engaging in when they want to control their drinking. Indicate how confident you are that you are that you are able to use each of these strategies to keep your BAC below .08 (or drink fewer than the number of drinks you wrote above).

0% confidence = 0
20% confidence = 1
40% confidence = 2
60% confidence = 3
80% confidence = 4
100% confidence = 5

1. Reward myself for drinking less
2. Refuse unwanted drinks
3. Get my friends to help me limit my drinking
4. Set limits on how long I'll drink
5. Drink nonalcoholic beverages
6. Avoid playing drinking games
7. Select drinks that I drink slowly
8. Eat before or while I'm drinking
9. Drink less when I am going to drive
10. Ask my family for support to help me limit my drinking
11. Set a limit on the number of drinks I have in a sitting
12. Avoid drinking with heavy drinkers
13. Participate in activities such as tennis, running, etc. when I feel like drinking
14. Stop drinking alcohol for some period of time
15. Use my body sensations to let me know when I should slow my drinking down
16. Not keep alcohol at home
17. Avoid drinking during boring or repetitious activities
18. Substitute other means for feeling friendly or sociable
19. Avoid drinking with those who pressure me to drink
20. Punish myself for failing to limit my drinking
21. Drink beer from a bottle instead of from kegs or pitchers
22. Offer to be the designated driver
23. Keep track of the number of drinks I consume
24. Avoid drinking during or after stressful events
25. Select drinks lower in alcohol content
26. Avoid drinking on occasions when I over-drink
27. Think about the consequences of my drinking
28. Reward myself for not drinking
29. Avoid drinking wine or liquor from the bottle
30. Limit the amount of money I carry
31. Substitute other means for dealing with stress, depression, and anxiety
32. Drink only after a certain hour of the day
33. Avoid drinking in places where I over-drink

0% confidence = 0
20% confidence = 1
40% confidence = 2
60% confidence = 3
80% confidence = 4
100% confidence = 5

34. Purposely take slow sips on my drink
35. Engage in activities during drinking (e.g. dancing, talking)
36. Confine drinking to certain times of the day

Appendix F

Please enter the number of drinks you would need to consume to reach a blood alcohol content level of .08 _____.

Listed below are a number of potential strategies for having fun and/or maintaining one's social life while limiting drinking to below a .08 BAC. Please rate how confident you are that you are able you are to use each of these strategies to limit your drinking to below a .08 BAC.

0% confidence = 0
20% confidence = 1
40% confidence = 2
60% confidence = 3
80% confidence = 4
100% confidence = 5

1. Dance more at parties/bars
2. Hang out with non-drinkers or light drinkers at parties
3. Initiate conversations with people I don't know very well
4. Start a conversation with friends about things unrelated to drinking
5. Play games (not drinking games)
6. Arrange to go out to dinner or a movie, instead of going to a bar or a party with drinking
7. Say you have to be up early, so you can't drink much
8. Say you have to do some work later, so you can't drink much
9. Volunteer to be a designated driver, so your friends will appreciate the fact that you're not drinking
10. Volunteer to be the one who takes care of those who drink too much
11. Notice or pay more attention to how stupid people look/act when they're drunk
12. Make an effort to learn more jokes/be more humorous as a way of relaxing (rather than drinking)
13. Pretend that you are more drunk than you are or make yourself believe that you are more drunk
14. Find other ways to relax or be less inhibited (e.g. meditation, watching television) prior to going out
15. Use open-ended questions to make others talk more, thus making you feel more comfortable
16. Make a contest (with yourself or with others) out of meeting new people or making more people laugh at gatherings
17. Pretend that you are more self-confident or comfortable than you feel
18. "Borrow" ideas, jokes, or "attitude" from people who have fun easily, without drinking too much

Appendix G

Here is a list of some effects or consequences that some people experience after drinking alcohol. How likely is it that these things happen to you when you drink alcohol? Please circle the number that best describes how drinking alcohol would affect you.

	No Chance	Very Unlikely			Very Likely	Certain to happen
1. I am more accepted socially	1	2	3	4	5	6
2. I become aggressive	1	2	3	4	5	6
3. I am less alert	1	2	3	4	5	6
4. I feel ashamed of myself	1	2	3	4	5	6
5. I enjoy the buzz	1	2	3	4	5	6
6. I become clumsy or uncoordinated	1	2	3	4	5	6
7. I feel good	1	2	3	4	5	6
8. I get into fights	1	2	3	4	5	6
9. I can't concentrate	1	2	3	4	5	6
10. I have a good time	1	2	3	4	5	6
11. I have problems driving	1	2	3	4	5	6
12. I feel guilty	1	2	3	4	5	6
13. I get a hangover	1	2	3	4	5	6
14. I feel happy	1	2	3	4	5	6
15. I get a headache	1	2	3	4	5	6
16. I am more sexually assertive	1	2	3	4	5	6
17. It is fun	1	2	3	4	5	6
18. I get mean	1	2	3	4	5	6
19. I have problems with memory and concentration	1	2	3	4	5	6
20. I am more outgoing	1	2	3	4	5	6
21. It takes away my negative moods and feelings	1	2	3	4	5	6
22. I have more desire for sex	1	2	3	4	5	6
23. It is easier for me to socialize	1	2	3	4	5	6
24. I feel pleasant physical effects	1	2	3	4	5	6
25. I am more sexually responsive	1	2	3	4	5	6
26. I feel more sociable	1	2	3	4	5	6
27. I feel sad or depressed	1	2	3	4	5	6
28. I am able to talk more freely	1	2	3	4	5	6
29. I become more sexually active	1	2	3	4	5	6
30. I feel sick	1	2	3	4	5	6
31. I feel less stressed	1	2	3	4	5	6
32. I am friendlier	1	2	3	4	5	6

Appendix G (continued)

	No Chance	Very Unlikely	Unlikely	Likely	Very Likely	Certain to happen
33. I experience unpleasant physical effects	1	2	3	4	5	6
34. I am able to take my mind off my problems	1	2	3	4	5	6

Appendix H

Listed below are a number of situations which people report happen to them once they decrease their drinking. Indicate whether you agree or disagree that each of the following situations will happen to you if you decrease your drinking.

Strongly Agree = 1
Agree Somewhat = 2
Don't Know = 3
Disagree Somewhat = 4
Disagree Strongly = 5

1. I would feel more depressed

2. I would feel lonelier

3. The world would look better to me

4. I would be moodier

5. Some of my drinking friends would avoid me

6. I would be less flirtatious

7. I would feel less guilty about what I did while I was drunk

8. I would be happier

9. I would be less sexually aggressive

10. Things would be better at work and school with boss/teachers and co-workers/schoolmates

11. I would be more tense and anxious

12. I would be less fun to be with

13. I would have more sudden urges to drink

14. My mind would be clearer

15. I would be healthier

16. I would have more energy to do things

Strongly Agree = 1
Agree Somewhat = 2
Don't Know = 3
Disagree Somewhat = 4
Disagree Strongly = 5

17. My future would look better

18. I would be bored more often

19. I would be offered drinks from my friends more often

20. I would feel more in control of things

21. I would feel awkward in social situations

22. I would be better at my job

23. I would enjoy life more

24. I would eat better

25. I would be more intimidated when interacting with the opposite sex in social situations

26. I would be steadier on my feet

27. I would have less fun with my friends

28. I would have more money

29. I would be healthier

30. I would feel more left out when others were drinking

31. My job would be more secure

32. I would have more urges to drink if I went to my usual drinking spots

33. I would be friendlier and more outgoing

34. I would enjoy sex more

35. I would lose weight

36. I would have more difficulty meeting others

Strongly Agree = 1
Agree Somewhat = 2
Don't Know = 3
Disagree Somewhat = 4
Disagree Strongly = 5

37. I would feel more self-confident

38. Other people would respect me more

39. I would develop new bad habits

40. I would get better grades

41. I would have a better memory of what happened while I was drinking

42. I would find it easier to express my feelings to others

43. I would not feel hungover in the morning

44. I would be more withdrawn when I am with others

45. I would feel better about myself

46. My relationship with my boyfriend or girlfriend would be better

47. I would have more self-respect

48. I would be more relaxed and confident with others

Appendix I

INSTRUCTIONS FOR COMPLETING THE TIMELINE CALENDAR

1. It is important that for each day on the calendars you list the number of drinks you consumed. Remember that by one drink we mean 12 oz. of beer, one standard cocktail containing one ounce of 86 proof liquor, or one 4 oz. drink of wine.

2. On any day in which you did consume an alcoholic beverage, write in the number of drinks for each day. This includes days of combined beverage use. For example, if you drank a 4 oz. glass of wine with dinner and a 12 oz. beer, you would count that as two.

3. On all days in which you did not drink any alcoholic beverages, write "0". Make sure that something is filled in for every day on the calendars.

4. Do not be overly concerned about giving a precise, day-by-day account of your drinking. Just try to remember as well as you possibly can and put down your best estimate.

5. In filling out the calendars, try to be as accurate as possible. However, if you cannot recall whether you consumed an alcoholic beverage on Tuesday or Wednesday of a certain week, or whether it was the week of November 9th or the week of November 16th, just use your best guess.

HINTS:

1. Write down the days that are specific to yourself, such as birthdays, test dates, parties, etc. Marking down these special days can help you remember when and how much you drank.

2. If you have a planner or appointment book with you, use it to help you recall your drinking.

3. Sometimes people have certain patterns to their drinking and this may help you to fill out the calendars. For example, if you usually go out with friends on Friday or Saturday nights, you may recall that you would have had a certain number of drinks on those evenings, or you may have a week-end change in your drinking, or your drinking may be different depending on the season or semester.

Appendix I(Continued)

Month _____ Year _____

Table 1

Correlations, Means and Standard Deviations (N=236)

Correlations	BD	SCQ	FWC	CEPOS	CENEG	EEPOS	EENEG	ACESCOG	ACESBEH
binge drinking (BD)	1.00								
situational self-efficacy (SCQ)	-0.25	1.00							
coping efficacy – new scale (FWC)	-0.32	0.51	1.00						
change expectancies-positive (CEPOS)	0.09	0.04	-0.13	1.00					
change expectancies-negative (CENEG)	-0.24	0.44	0.28	0.18	1.00				
effect expectancies-positive (EEPOS)	0.12	-0.25	-0.22	0.13	-0.47	1.00			
effect expectancies-negative (EENEG)	0.09	-0.24	-0.08	-0.31	-0.37	0.22	1.00		
cognitive coping efficacy (ACESCOG)	-0.31	0.49	0.76	-0.09	0.27	-0.27	-0.03	1.00	
behavioral coping efficacy (ACESBEH)	-0.35	0.47	0.70	-0.10	0.23	-0.19	-0.13	0.70	1.00
Means	11.17	3.64	3.36	2.94	3.33	4.51	3.28	3.45	3.21
Standard Deviations	7.79	0.82	0.90	0.71	0.74	0.51	0.49	0.92	1.02

Note: All values are correlation coefficients unless otherwise noted

Table 2

Properties of the Measurement Model

Construct and Indicators	Unstandardized Loading	t-value	Standardized Loading	Indicator Reliability	Variance Extracted Estimate
Effect Expectancies					**0.48**
positive	0.42	2.47	0.85	0.72	
negative	0.13	2.12	0.26	0.07	
Coping Efficacy					**0.72**
fwc	0.78	15.93	0.87	0.76	
cognitive coping	0.81	16.10	0.88	0.77	
behavioral coping	0.81	14.05	0.80	0.63	

Table 3

Model Comparisons (N=236)

Model	Theory Base	Chi-square	df	p-value	GFI	CFI	RMSEA	CI
Null	Null	680.26	28	.000	.510	.000	.315	.295, .336
Model 1	Kirsch	10.49	12	.573	.99	1.00	.000	.000, .059
Model 2	Bandura	17.86	12	.120	.98	.99	.046	.000, .087

Table 4.

Parameter Estimates for Kirsch Model (N=236)

			Unstandardized Estimate	Standardized Estimate	Standard Error	Critical Ratio	p-value	Squared Multiple Correlation
Change Expectancies	<---	Coping Efficacy	.140	.206	.067	2.10	.036	.545
Change Expectancies	<---	Effect Expectancies	-.819	-.650	.264	-3.101	.002	
Self Efficacy	<---	Change Expectancies	.385	.325	.117	3.274	.001	.735
Self Efficacy	<---	Coping Efficacy	.479	.597	.067	7.107	<.001	
Drinking	<---	Effect Expectancies	-1.043	-.058	2.404	-.434	.665	.041
Drinking	<---	Change Expectancies	1.023	.072	2.799	.366	.715	
Drinking	<---	Self Efficacy	-7.028	-.584	1.833	-3.834	<.001	
eepostot	<---	Effect Expectancies	1.00	.885				.782
eenegtot	<---	Effect Expectancies	.311	.263	.119	2.616	.009	.069
acescog	<---	Coping Efficacy	1.00	.872				.761
cenegtot	<---	Change Expectancies	1.00	.737				.543
fwctot	<---	Coping Efficacy	.971	.872	.059	16.380	<.001	.760
Dpocrit	<---	Drinking	1.00	.998				.995
acesbeh	<---	Coping Efficacy	1.019	.804	.069	14.768	<.001	.646
scqtot	<---	Self Efficacy	1.00	.793				.629

Table 5.

Parameter Estimates for Bandura Model (N=236)

			Unstandardized Estimate	Standardized Estimate	Standard Error	Critical Ratio	p-value	Squared Multiple Correlation
Self Efficacy	<---	Coping Efficacy	.594	.636	.062	9.590	<.001	.405
Change Expectancies	<---	Effect Expectancies	-1.220	-.652	.223	-5.480	<.001	.587
Change Expectancies	<---	Self Efficacy	.253	.288	.061	4.175	<.001	
Drinking	<---	Effect Expectancies	18.247	.883	3.432	5.316	<.001	.526
Drinking	<---	Change Expectancies	5.094	.461	1.451	3.510	<.001	
Drinking	<---	Self Efficacy	-4.537	-.469	1.503	-3.019	.003	
eepostot	<---	Effect Expectancies	1.00	.718				.516
eenegtot	<---	Effect Expectancies	.387	.267	.113	3.417	<.001	.072
acescog	<---	Coping Efficacy	1.00	.870				.757
cenegtot	<---	Change Expectancies	1.00	.919				.844
fwctot	<---	Coping Efficacy	.981	.878	.059	16.540	<.001	.771
Dpocrit	<---	Drinking	1.00	.933				.871
acesbeh	<---	Coping Efficacy	1.012	.800	.069	14.724	<.001	.633
scqtot	<---	Self Efficacy	1.00	.921				.849

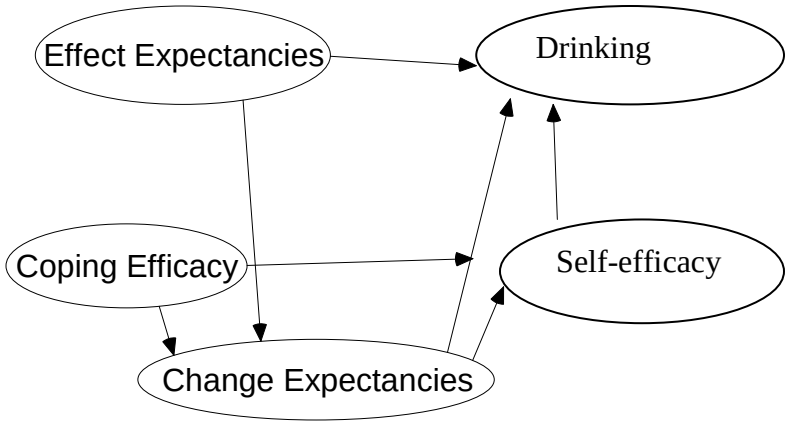

Figure 1. Conceptual Model Based on Kirsch's Theory
(N=236)

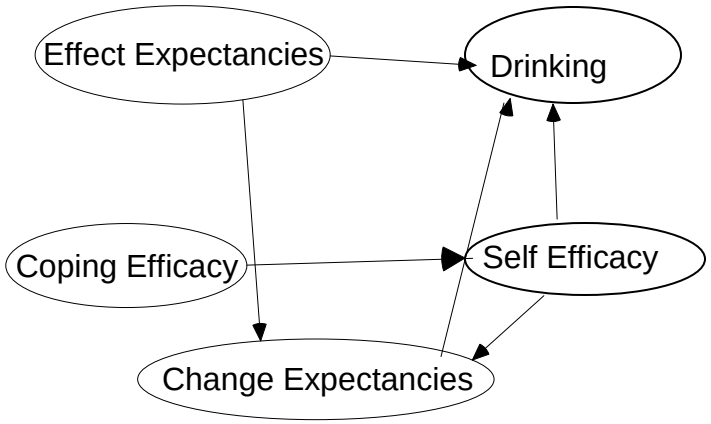

Figure 2. Conceptual Model Based on Bandura's Theory
(N=236)

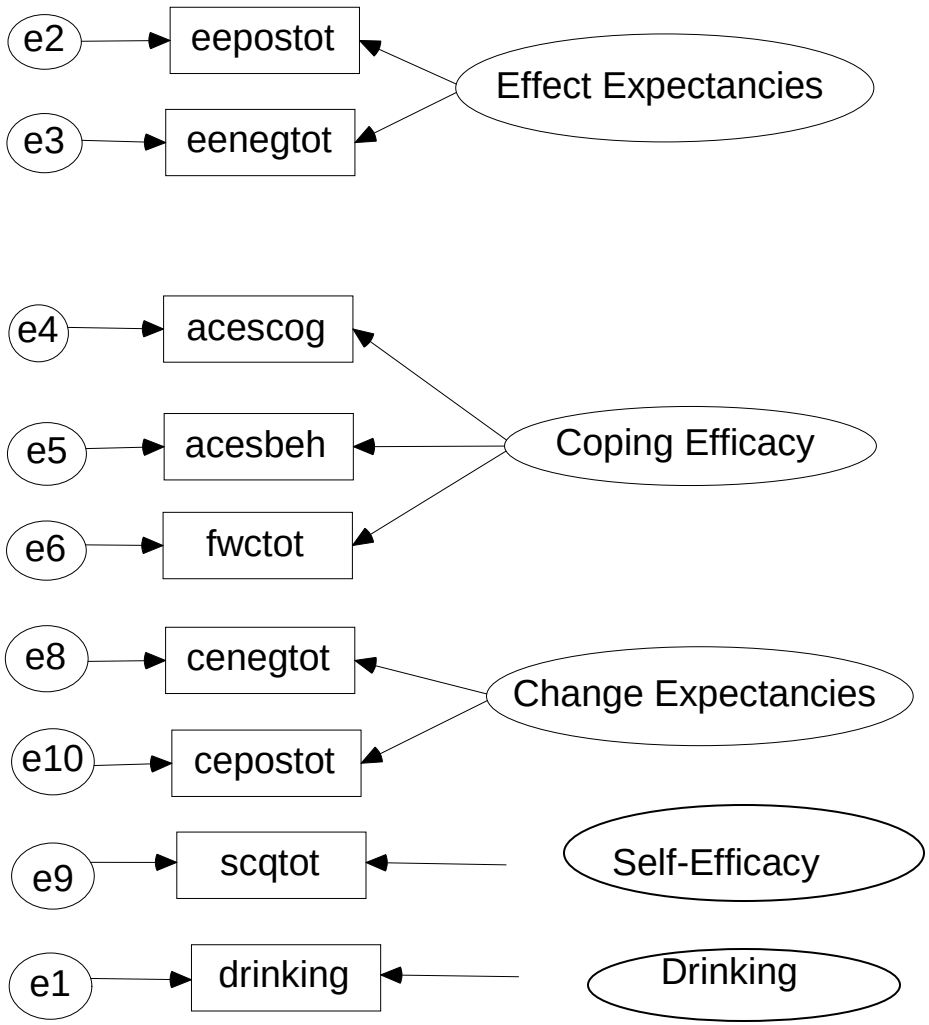

Figure 3. Measurement Model

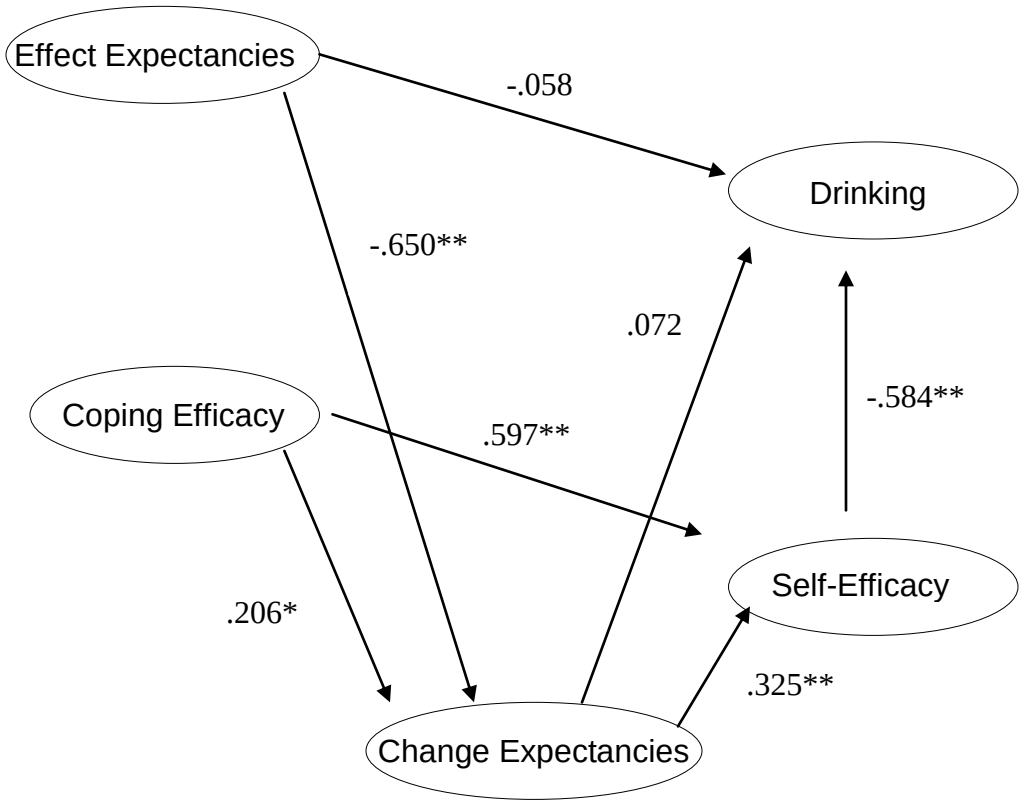

Figure 4. Standardized Path Coefficients for Model 1 (Kirsch) (N=236)

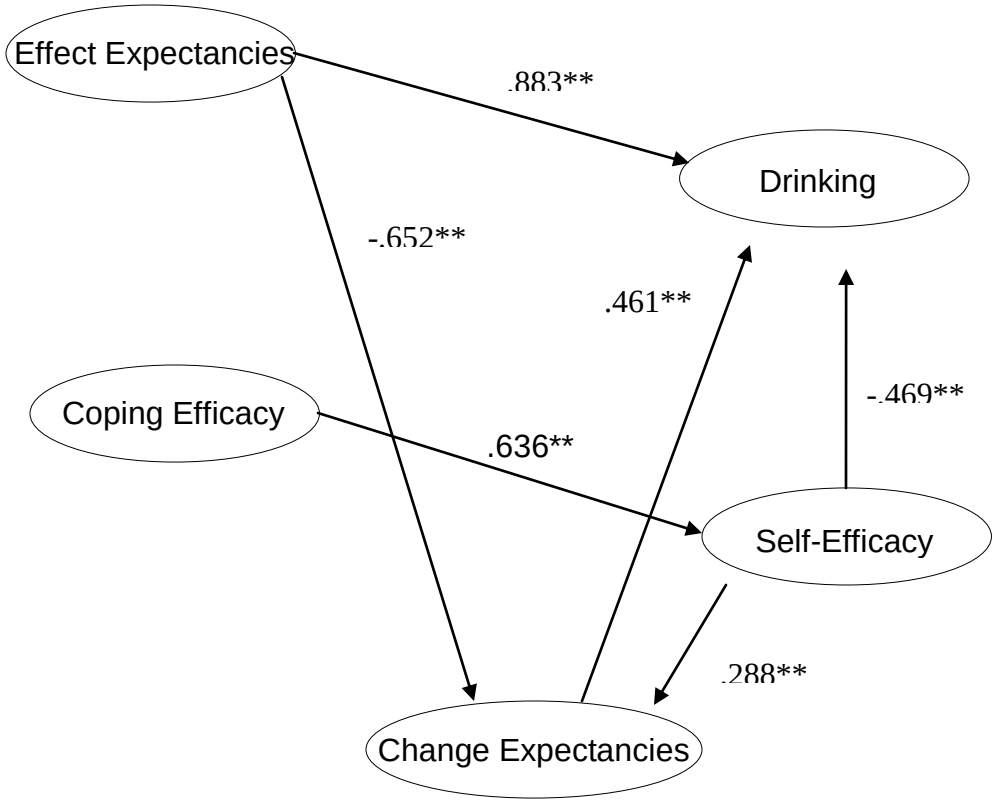

Figure 5. Standardized Path Coefficients for Model 2 (Bandura) (N=236)